



ACTIVITY 8

Stakeholder Recommendation

INVESTIGATION

ACTIVITY 8

Stakeholder Recommendation

ACTIVITY SUMMARY

Students make a recommendation about the land-use requirements for different types of solar and wind generation for Project REV, from the perspective of a stakeholder. To make the recommendation, they weave facts and values about the land-use requirements for different types of solar and wind generation and incorporate their stakeholders' values.

ACTIVITY TYPE
INVESTIGATION

NUMBER OF
40-50 MINUTE
CLASS PERIODS
2-3

KEY CONCEPTS & PROCESS SKILLS

- 1 Facts support informed decision-making by leading to more accurate predictions about the likely outcomes of different choices.
- 2 Values affect people's decisions. There can be disagreement within a community when people hold a variety of values.
- 3 Community decisions are more likely to be accepted if the values of all stakeholders, especially those who are underrepresented, are considered in the decision-making process.
- 4 Decision analysis is the process of breaking down a decision in a way that can help the decision-maker consider both the facts and values related to a choice.

NEXT GENERATION SCIENCE STANDARDS (NGSS) CONNECTION:

Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and trade-off considerations. (*Science and Engineering Practice: Constructing Explanations and Designing Solutions*)

CONCEPTUAL
TOOLS



TEACHER BACKGROUND INFORMATION

Generation Capacity

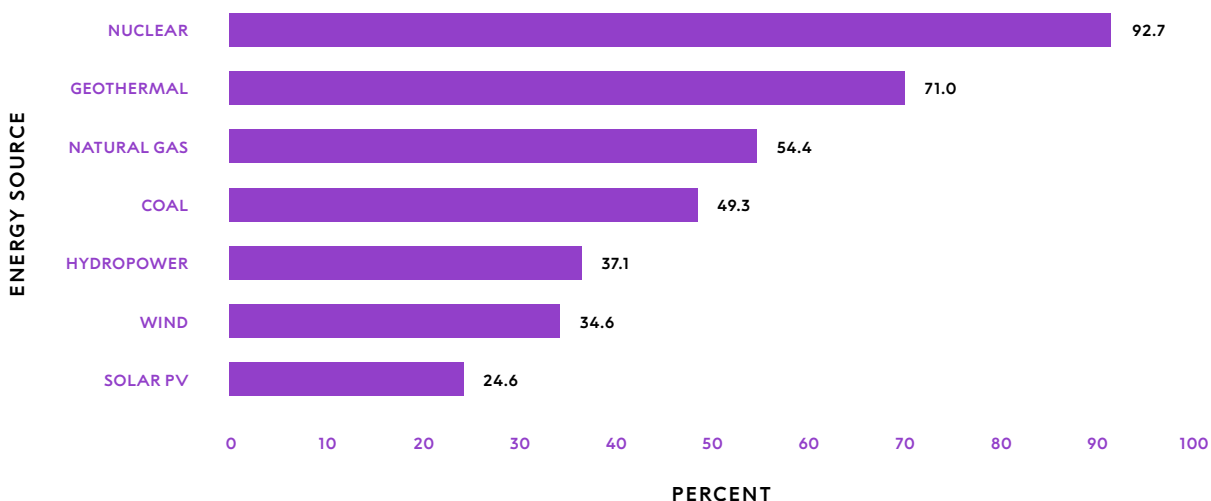
Capacity is the maximum electric output a generator can produce. Power plants are rated by maximum capacity. This means a 500-megawatt plant is capable of producing 500 megawatts (MW) operating at continuous full power. This rating is used for all power plants, regardless of the resource used to run the plant.

However, most generators do not operate at their maximum capacity all the time. A power plant's level of generation is based on many factors, including maintenance issues, weather conditions, time of day, fuel costs, or conditions on the grid. For example, it is not unusual for a wind-turbine plant that has a maximum capacity of 1,000 MW to typically produce an average of 300 MW.

Capacity Factor

The capacity factor of a power plant is the ratio between a generator's actual generation divided by the maximum output over a given time period. Capacity factor varies by fuel types. Utility-scale wind or solar facilities are significantly less than fossil fuel plants. Nuclear plants have the highest capacity factor, followed by fossil fuel plants. This is because nuclear, coal, natural gas, and hydro can operate continuously, unlike variable resources such as wind and solar. This means that a 50-megawatt wind farm is not equivalent to a 500-megawatt nuclear power plant because of the significant differences in their capacity factors. This key difference between maximum generation capacity and actual power produced is an important distinction when considering different generation resources. Figure 8.1 shows the differences between capacity factors for different generation methods.

FIGURE 8.1
Capacity Factor by Energy Source, 2021



MATERIALS & ADVANCE PREPARATION

FOR THE TEACHER

- VISUAL AID 8.1
"City of Vanwick"

FOR EACH GROUP OF FOUR STUDENTS

- SITE SURVEY CARDS (9)
- STAKEHOLDER CARD
(FROM SET OF 8)

FOR EACH PAIR OF STUDENTS

- COMPUTER WITH
INTERNET ACCESS

FOR EACH STUDENT

- STUDENT SHEET 8.1
"Vanwick Site Map:
Stakeholder"
- STUDENT SHEET 8.2
"Vanwick Planning:
Facts and Values"
(OPTIONAL)
- STUDENT SHEET 8.3
"Anticipation Guide:
Solar and Wind"
(OPTIONAL)

Students need to use the Decision-Analysis Tool independently in this activity. If they do not have experience using the app, complete Activity 7: Building Initiatives with students before beginning this activity.

The Stakeholder cards provided in this activity are similar to those from Activity 3 but have been modified to provide the information that students need to use the Decision-Analysis Tool.

TEACHING NOTES

Suggestions for **discussion questions** are highlighted in gold.

Strategies for the **equitable inclusion of diverse students** are highlighted in pink.

GETTING STARTED (10 MIN)

1 Review the key decision-making content of the unit that will be applied in the activity.

- This activity does not introduce any new content, but allows students to apply what they have learned, including how to integrate the Decision-Analysis Tool from Activity 7 to a complicated decision.
- To formatively assess that students have a grasp of the key decision-making content they need to apply in the activity, provide students with the following lists of words and conduct a word sort. For more information on a word sort, see Appendix 1: Literacy Strategies.

LIST 1

group decision-making
value
scenario planning
underrepresented stakeholder
fact

LIST 2

option rating
options
value
decision analysis
claim of fact

- In each list, look for a relationship among a list of four or five words or phrases related to a topic.
- Cross out the one word or phrase that does not belong.
- Highlight any word or phrase that includes all the other words.
- Explain how the highlighted word or phrase is related to all the other words or phrases in the list. (There may be more than one correct answer to a single word sort.)

Sample Student Response

LIST 1

group decision-making
value
scenario planning
underrepresented stakeholder
fact

In group decision-making, the values of underrepresented stakeholders should be sought out so the facts can be evaluated against those values.

LIST 2

option rating
options
value
decision analysis
claim of fact

When a stakeholder completes a decision analysis using the app, fact ratings evaluate how well the fact fulfills the values of that option.

PROCEDURE SUPPORT (80 MIN)

2 Introduce the scenario and information about the generation sites in Vanwick.

- Review the introduction and the scenario. Students will get to decide the kind and location of renewable generation in Vanwick. Remind students that their group recommendation in this activity is from the perspective of one of the stakeholders that was introduced in Activity 3. In Activity 10, students (as their respective stakeholders) will get together with other stakeholders and come to a final decision.
- Use the optional [Anticipation Guide](#) to elicit students' initial ideas about solar and wind generation. Student Sheet 8.3, "Anticipation Guide: Solar and Wind," provides a preview of science concepts in this activity. An Anticipation Guide gives students an opportunity to explore their initial ideas and revisit and modify them at the end of the activity. Be sure students understand that they should complete only the "Before" column for the statements at this time; they will have a chance to revisit these statements after the reading to see whether their ideas have changed. For more information on an Anticipation Guide, see [Appendix 1: Literacy Strategies](#).
- While an Anticipation Guide supports sensemaking, it requires additional reading and interpretation and may need to be modified for some student populations, such as emerging multilingual learners. You may wish to complete Student Sheet 8.3 as a class, use it at the end of the activity to summarize key ideas, or use it as a formative assessment of students' learning.
- In Procedure Step 2, draw students' attention to the types of solar and wind that are identified in the infographic in the Student Book. Point out that not all types of generation are appropriate for all locations, both because of the suitability of the location and because of residents' values related to those locations.
- If students live near a coastal community, they may be familiar with offshore wind. Offshore towers are similar to the large utility turbines but are even larger with blades that are 80 meters (260 ft) wide and a maximum capacity of over 10 MW. These are not included in the infographic in the Student Book because Vanwick is not a coastal city in the scenario, but it may be worth mentioning depending on your location.

- If students are using the optional Anticipation Guide, direct them to complete the “After” column on Student Sheet 8.3. after completing the background information in the beginning of the activity. Review student responses as a class to ensure that all students understood the important ideas they need to know in order to complete the activity. A sample student response is shown at the end of this activity.

3 Provide stakeholder roles for each group of students.

- This activity assumes students hold the perspective for the entirety of the procedure. The Stakeholder cards provided are the same as in Activity 3 but have been modified to provide the information that students need to use the Decision-Analysis Tool. The two or three weighted values on this version of the cards are consistent with the cards in Activity 3, but they have a narrower focus on values related to this activity.
- In Procedure Step 3, assign each group of four students to one stakeholder role and provide them with the corresponding stakeholder card from this activity. You may want to create groups based on the Stakeholder roles students used in Activity 3, or have students consider a new perspective with a new role. Either way, students need to be organized into same-stakeholder groups.
- Students’ task is to find sites that fulfill the values of the stakeholders, using the facts provided. This is easier for some stakeholder perspectives than others, and variation is expected. There are some obvious sites for some stakeholders, and others they will have to consider more closely. During the activity, encourage students to identify the trade-offs they are making when selecting locations.
- In this activity, there is no requirement for the total amount of generation students need to recommend. This allows students to focus on evaluating the options based on the facts and stakeholders’ values related to those options. In Activity 10, students will revisit the locations with other stakeholders and make a group decision with a singular recommendation. In that activity, they will have the additional challenge of needing to meet a 1,000 MW generation requirement.

4 Have students gather facts about the generation options from the Site Survey cards.

- In Procedure Step 2, distribute a set of 9 Site Survey cards to each group of 4 students. Students should read the Site Survey cards and identify the locations on the map on Student Sheet 8.1, “Vanwick Site Map: Stakeholder.” Answer any questions students have about the information. Use Visual Aid 8.1, “City of Vanwick,” to help orient students to the locations on the cards.
- For students who need more support reading the cards, have students divide into pairs and pre-read the cards. They can describe each location by using whatever modality is most comfortable, such as verbal (story) or visual (drawing). If there is time, students could find a generic picture on the Internet that matches each description.

- In this activity and in Activity 10, students choose the maximum generation capacity identified from each site. Since the activity is from the perspective of renewable generation, it does not focus on how much energy in kilowatt-hours is consumed by the end user, (For that information, see Teacher Background Information in Activity 4.) This type of analysis is beyond the scope of what is needed for this activity.

5 Students use the facts given to use the Decision-Making Tool for their stakeholder.

- Students' approach to using the app to inform their decisions will vary depending on their comfort with the app. Since the app provides space for up to five options, students will have to think about how to use the tool for the nine locations. Two suggested procedures are provided here.
 - After testing three locations, students can substitute the location with the lowest score and keep comparing until they find the top three scores.
 - Students can initially knock out the locations they know do not fit with their stakeholder values at all and focus on the trickier ones.
- When inputting data into the app, remind students to decide how well each generation site fulfills their stakeholder values on a scale of 1 (not at all) to 5 (completely). This process is similar to the process from the previous activity.
- In Procedure Step 6, if students need support using the app, you may wish to provide optional "Student Sheet 8.2, "Vanwick Planning: Facts and Values." Have students review the values and priorities on their Stakeholder cards and record them in the top row of the table, as they did in Activity 7. A sample student response for Student Sheet 8.2 is found at the end of this activity.
- Make sure students record their work, as instructed in Procedure Step 7. They may need the justification for their sites when they bring their recommendations to the larger group in Activity 10.
- Student responses using the app will vary depending on what sites they choose. Figure 8.2 on the following page is a sample student response that includes a comparison for Amber Wogan who is considering the Warehouse District, the City-Owned Buildings, and the Distant Hills Open Space Preserve.

FIGURE 8.2
Sample Student Response, Procedure Step 6

What are you deciding?
 Where to put generation?

OPTION 1
 warehouse district

OPTION 2
 city-owned buildings

OPTION 3
 distant hills osp

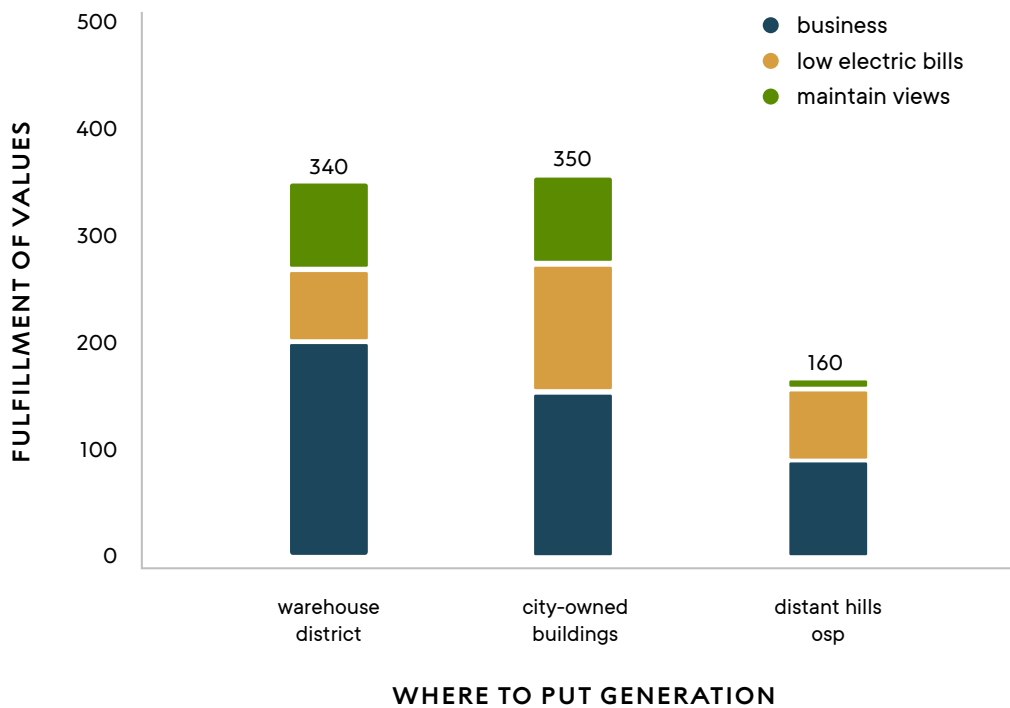
VALUE 1
 business

VALUE 2
 low electric bills

VALUE 3
 maintain views

VALUE WEIGHTS
 50 30 20

Option	Fact	Rating
warehouse district	yes, collect	4
	stay same	2
	can't see	0
city-owned buildings	yes, supports	3
	cost will decrease	3
	can't see	0
distant hills osp	might lead to	2
	stay same	2
	visible	0



6 Support students as they choose generation sites based on the facts and values.

- In Procedure Step 8, students should complete Student Sheet 8.1 to select the locations, type of electrical generation, and amount of generation for their stakeholders. Student responses will vary, but one student response is completed at the end of this activity. Following is a table showing the reasonable prioritized selections for each stakeholder.

TABLE 8.1
Priority Locations for Each Stakeholder

NAME	VALUES	PRIORITY LOCATIONS
Amber Wogan	<ul style="list-style-type: none"> • supporting businesses 50 • low electric bills 30 • maintaining beautiful views” 20 	<ul style="list-style-type: none"> • Warehouse District • City-Owned Buildings • Commercial Farm • Family Farm
Jackson Moore	<ul style="list-style-type: none"> • lots of renewable generation 80 • creating jobs 20 	<ul style="list-style-type: none"> • Old Mining Site • Distant Hills Open Space Preserve • Commercial Farm
Flora Salazar	<ul style="list-style-type: none"> • keeping noise down 60 • maintaining jobs 40 	<ul style="list-style-type: none"> • Old Mining Site • Family Farm
Miguel Ortiz	<ul style="list-style-type: none"> • lots of renewable generation 50 • keeping noise down 50 	<ul style="list-style-type: none"> • Distant Hills Open Space Preserve • Old Mining Site • Commercial Farm
Roman Kozlov	<ul style="list-style-type: none"> • wind turbines 50 • lots of generation 30 • his location’s contribution 20 	<ul style="list-style-type: none"> • Distant Hills Open Space Preserve • Family Farm • City Park • Warehouse District, turbine • Nature Forest, turbine
Olivette Allard	<ul style="list-style-type: none"> • increasing jobs 70 • reducing transmission 20 • maintaining beautiful forests 10 	<ul style="list-style-type: none"> • Gentle Hills Open Space Preserve • Old Mining Site
Thomas Cho	<ul style="list-style-type: none"> • lots of renewable generation 50 • maintaining beautiful views 40 • creating jobs 10 	<ul style="list-style-type: none"> • Old Mining Site • Commercial Farm
Diya Khan	<ul style="list-style-type: none"> • maintaining beautiful views 80 • no land changes 20 	<ul style="list-style-type: none"> • City-Owned Buildings • Warehouse District

7 Instruct students to record and keep their work from this activity.

- Do not allow groups to share their selections and reasoning with other students at this time. The information from this activity will be carried forward into Activity 10, so make sure students keep a copy of their work for the upcoming activity. Likewise, they should hold onto their notes from Procedure Step 7 and/or optional Student Sheet 8.2.

SYNTHESIS OF IDEAS (10 MIN)

8 Reflect on the process of making stakeholder recommendations.

- Ask, **What would happen if the generation locations were limited and did not match your stakeholder's values?** Students should say that this would be a big problem because then they couldn't really make a recommendation. Point out how challenging that could be to move forward with the group decision if there is a stakeholder for whom there are no good options. Use this to foreshadow the introduction of the concept of compromise in group decisions in the upcoming activities.
- Point out that there are multiple recommendations developed, but that Vanwick can only implement one plan. Ask, **Do you think your decision from your stakeholder perspective represents what the larger Vanwick community wants?** Responses will vary but should indicate that students can see the potential of conflict between stakeholders. Let students know that in Activity 10, they will have to narrow down their choices to one recommendation.
- Evaluate if your students are able to identify the essential ideas of the activity by revisiting the Guiding Question, **How can facts and values inform planning for the future?** Formatively assess if students are able to use relevant facts to fulfill values during decision-making.

SAMPLE STUDENT RESPONSES

BUILD UNDERSTANDING

- ① **How did creating the plan to meet the values of your stakeholder, instead of for yourself, impact the plan you made?**

The plan for the stakeholder was different than what I would have done myself. My stakeholder valued supporting businesses, so we chose all the sites that had any businesses on them. I would have chosen the sites that had a lot of generation, like the Distant Hills Open Space Preserve and Gentle Hills Open Space Preserve, because my top value is to generate the most electricity possible.

- ② **What trade-offs did you make in choosing the locations for your recommendation?**

Answers will vary. One sample response is shown here.

The trade-off of the sites Amber Wogan chose is that the sites selected, compared to those I did not choose, do not generate a lot of electricity. The sites I didn't select can generate 734 MW, compared to just over 300 MW for the business sites.

- ③ **Imagine that two different stakeholder groups decided to join together to make a single group decision. What are some ways they could go about it?**

Answers will vary. One sample response is shown here.

The two groups could start by comparing their values and looking for ones that are common. Those ones could be the prioritized values for the new group. If they couldn't do that, maybe they could use some of the tools in the unit, like scenario planning or the Decision-Analysis Tool, to inform their decision.

CONNECTIONS TO EVERYDAY LIFE

- ④ **Describe a situation in which you and someone else had the same facts about a situation but had different values about it. Explain how facts and values resulted in different decisions and outcomes.**

I know someone who thinks it is cool to take as many easy classes as possible. We agree on which classes are easy, so our facts are the same. But I think having a transcript with all easy classes is kind of a waste of time because it doesn't show how smart you are. My friend, however, values not ever having to do any homework. They think differently than me about the facts because their top value is reducing effort, and my top value is to get into a decent college.

REFERENCES

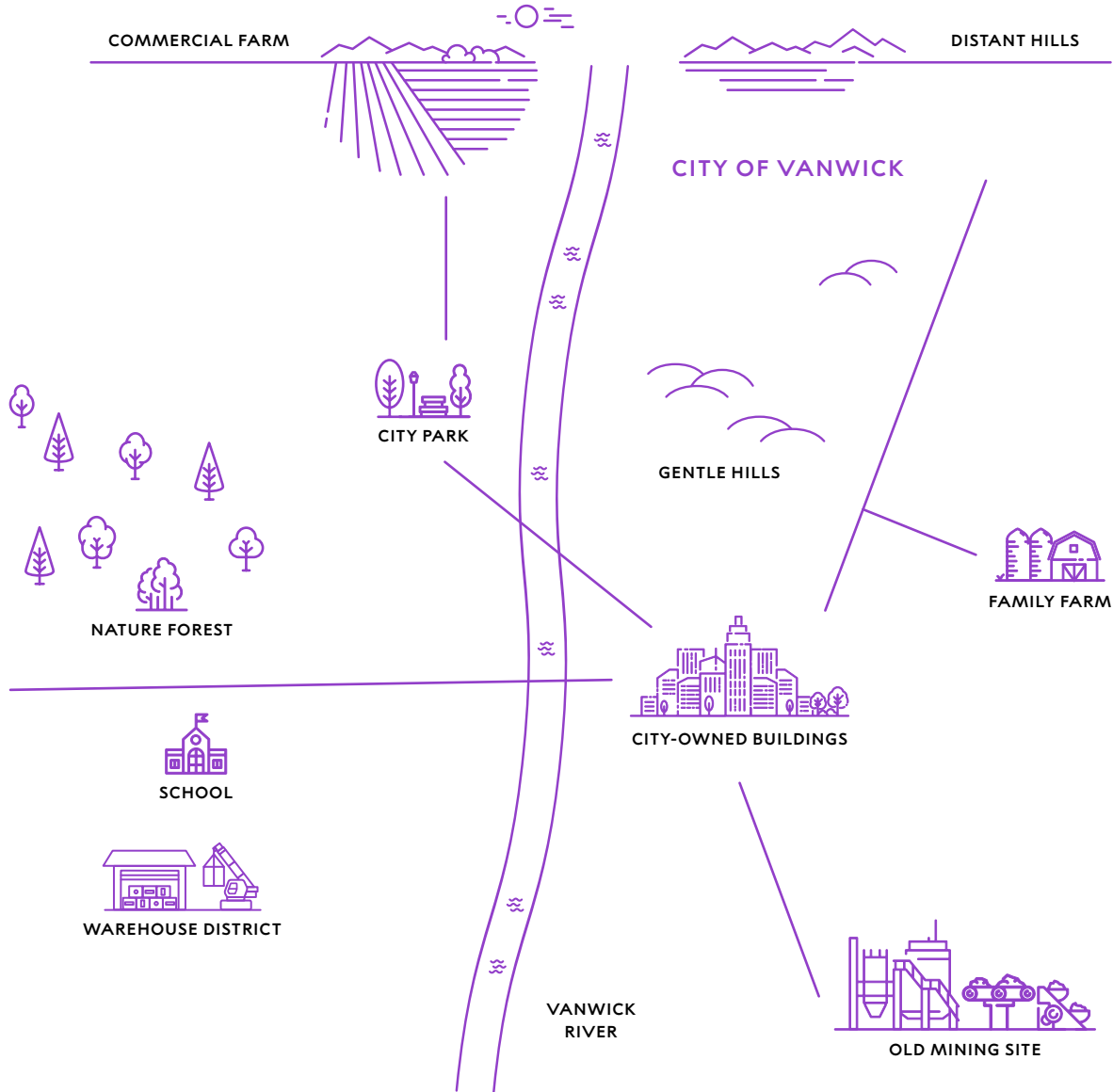
Gross, S. (2020, January). Research: Renewables, land use, and local opposition in the United States. *Brookings*. Retrieved from <https://www.brookings.edu/articles/renewables-land-use-and-local-opposition-in-the-united-states/#:~:text=Wind%20and%20solar%20generation%20require,and%20transport%20the%20fossil%20fuels>

Lawhorn, W. (2021, February 26). Solar and wind generation occupations: A look at the next decade. *Beyond the Numbers*, 10(4). U.S. Bureau of Labor Statistics. Retrieved from <https://www.bls.gov/opub/btn/volume-10/solar-and-wind-generation-occupations-a-look-at-the-next-decade.htm>

Sullivan, R., Kirchler, L., Lahti, T., Roché, S., Beckman, K., Cantwell, B., Richmond, P. (2012, May). Wind turbine visibility and visual impact threshold distances in western landscapes. Argonne National Laboratory, U.S. Department of Energy. Retrieved from <https://blmwyomingvisual.anl.gov/docs/WindVITD.pdf>

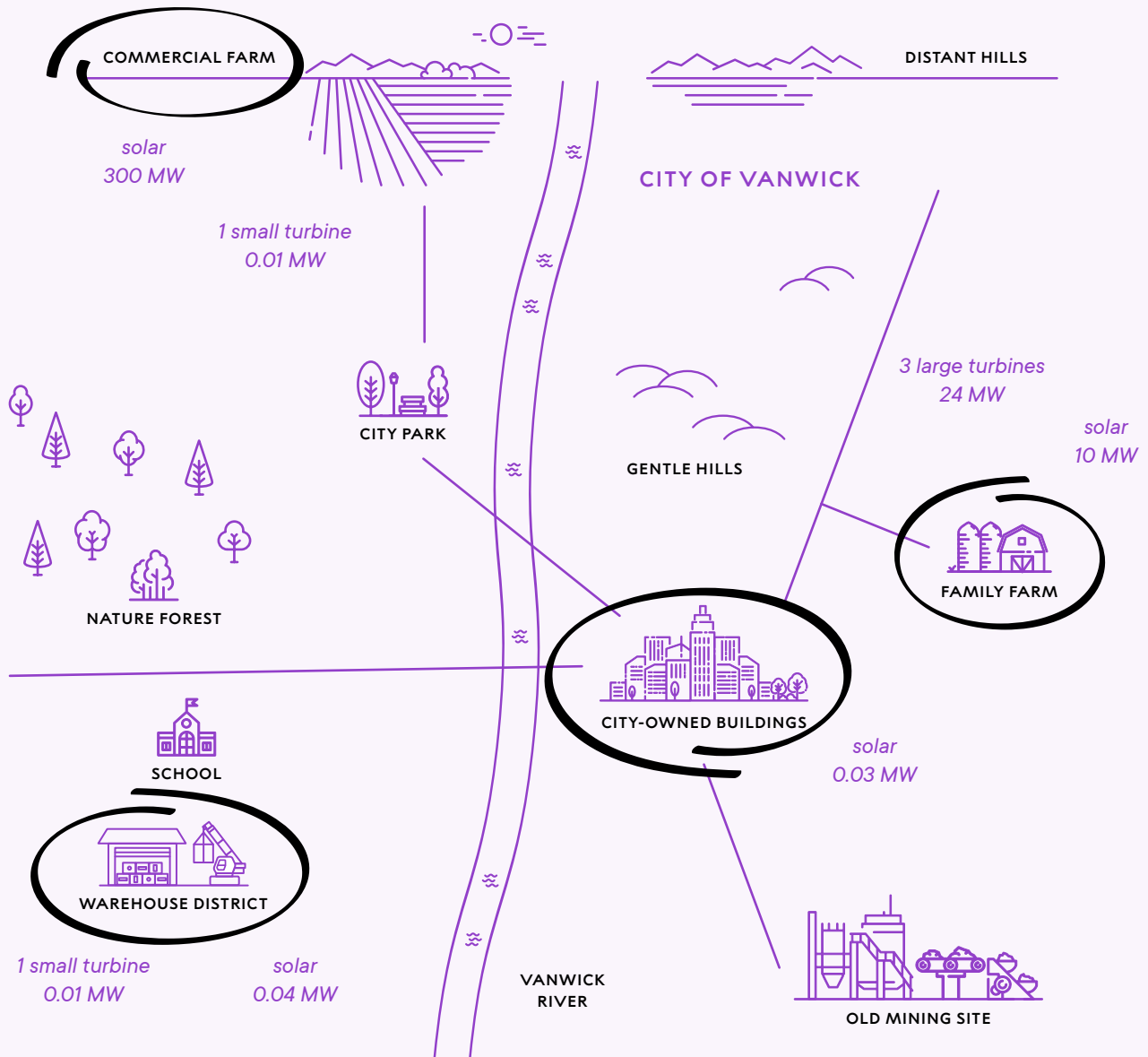
US Department of Energy. (2020, May 1). What is generation capacity? Office of Nuclear Energy. Retrieved from <https://www.energy.gov/ne/articles/what-generation-capacity>

Stakeholder: _____



Reasoning:

Stakeholder: Amber Wogan



Reasoning:

Since Amber's highest weighted value was supporting businesses, I selected all the sites that included businesses. That is the Warehouse District, City-Owned Buildings, the Commercial Farm, and the Family Farm. Amber's second value of low electric bills did not influence my choices much because the costs for all the choices in Vanwick are predicted to be the same, except for the City-Owned Buildings, which I already chose. I did not select the places that might have a bad impact on tourism in Vanwick, which was also one of Amber's values. So I didn't choose anywhere that might have a natural view, which is Nature Forest, City Park, and Gentle Hills Open Space Preserve.

Stakeholder perspective: _____

TABLE 1: VALUES

STAKEHOLDER VALUE	DESCRIPTION	WEIGHT
1		
2		
3		
TOTAL		

CONTINUED

TABLE 2: EVALUATING FACTS

OPTIONS	VALUE 1		VALUE 2		VALUE 3	
	FACTS	RATING	FACTS	RATING	FACTS	RATING

Stakeholder perspective: Amber Wogan

TABLE 1: VALUES

STAKEHOLDER VALUE	DESCRIPTION	WEIGHT
1	<i>supporting businesses</i>	50
2	<i>not increasing electric bills</i>	30
3	<i>maintaining beautiful views</i>	20
TOTAL		100

CONTINUED

TABLE 2: EVALUATING FACTS

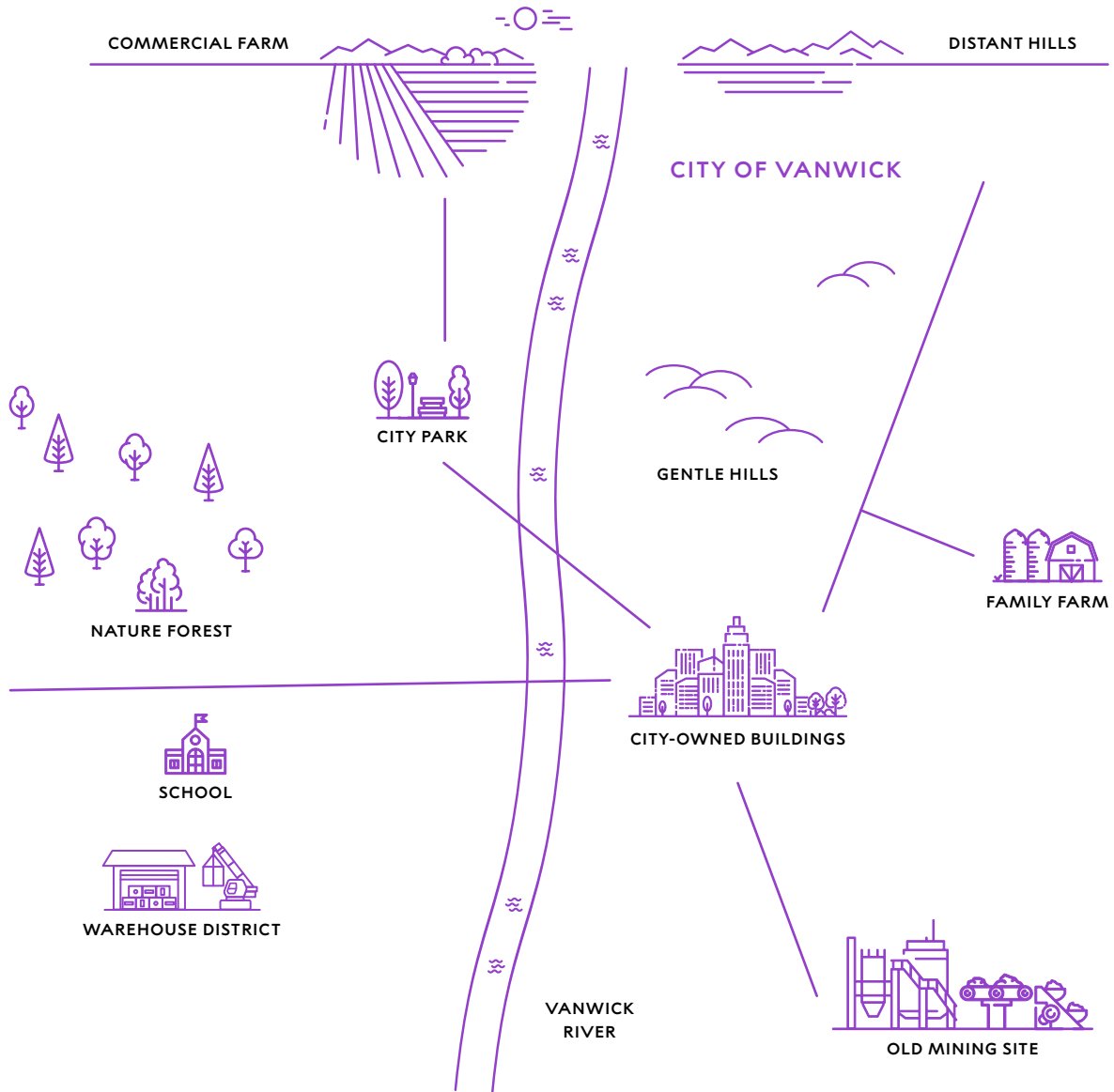
OPTIONS	VALUE 1 <i>business</i>		VALUE 2 <i>electric bills</i>		VALUE 3 <i>views</i>	
	FACTS	RATING	FACTS	RATING	FACTS	RATING
Warehouse District	<i>business owners would collect rent</i>	4	<i>costs are predicted to stay about the same</i>	2	<i>would not impact views</i>	4
City-Owned Buildings	<i>run by the city, which supports jobs and businesses</i>	3	<i>costs over 5 years would go down because city owns the panel</i>	4	<i>would not impact view</i>	4
Commercial Farm	<i>run by company, business owners would collect rent</i>	4	<i>costs are predicted to stay about the same</i>	2	<i>would impact views but tourists unlikely to be on farm</i>	2
Family Farm	<i>small business, business owners would collect rent</i>	4	<i>costs are predicted to stay about the same</i>	2	<i>would impact views but not a huge installation</i>	1
Gentle Hills Open Space Preserve	<i>supports business through tourism</i>	2	<i>costs are predicted to stay about the same</i>	2	<i>would negatively impact views</i>	0
Old Mining Site	<i>does not directly support businesses</i>	0	<i>costs are predicted to stay about the same</i>	2	<i>can be seen but would not impact views since tourists don't go to that site</i>	3
Distant Hills Open Space Preserve	<i>supports business through tourism</i>	2	<i>costs are predicted to stay about the same</i>	2	<i>would negatively impact views</i>	0
City Park	<i>does not directly support businesses</i>	0	<i>costs are predicted to stay about the same</i>	2	<i>might deter walkers</i>	1
Nature Forest	<i>supports business through tourism</i>	2	<i>costs are predicted to stay about the same</i>	2	<i>would negatively impact views</i>	0

In the "Before" column, mark whether you agree (+) or disagree (-) with each of the following statements. Then complete the reading. In the "After" column, mark whether you agree (+) or disagree (-) with the statements. Under each statement you agree with, explain how the activity gave evidence to support or change your ideas. Under each statement you disagree with, write and explain a corrected statement.

BEFORE	AFTER	
		1 Solar does not release greenhouse gases during operation.
		2 Solar panels do not require a lot of workers to install.
		3 Solar panels work well in locations that are open and flat.
		4 Paying off solar panels with savings from electricity bills takes about 20 years.
		5 Fossil fuels are typically used to build wind turbines.
		6 A single large wind turbine can generate 100 MW of power.
		7 Wind turbines need more maintenance than solar panels.
		8 Space can be saved by putting wind turbines close together.

In the “Before” column, mark whether you agree (+) or disagree (–) with each of the following statements. Then complete the reading. In the “After” column, mark whether you agree (+) or disagree (–) with the statements. Under each statement you agree with, explain how the activity gave evidence to support or change your ideas. Under each statement you disagree with, write and explain a corrected statement.

BEFORE	AFTER	
+	+	<p>1 Solar does not release greenhouse gases during operation.</p> <p><i>The energy transformation in solar panels does not include burning fossil fuels, so no greenhouse gases are released during operation.</i></p>
+	–	<p>2 Solar panels do not require a lot of workers to install.</p> <p><i>Solar panels take a lot of people to install, but not as many to maintain once they are built.</i></p>
+	+	<p>3 Solar panels work well in locations that are open and flat.</p> <p><i>Solar panels need a direct line to the Sun as it travels across the sky, so location needs to be open for panels.</i></p>
+	–	<p>4 Paying off solar panels with savings from electricity bills takes about 20 years.</p> <p><i>Paying off solar panels with savings from electricity bills takes about 5 years.</i></p>
–	+	<p>5 Fossil fuels are typically used to build wind turbines.</p> <p><i>Energy is required to get materials and to build the turbines, most of which is supported by traditional energy fossil fuels sources.</i></p>
+	–	<p>6 A single large wind turbine can generate 100 MW of power.</p> <p><i>A turbine generates about 8 MW. Offshore turbines generate more, closer to over 10 MW each.</i></p>
+	+	<p>7 Wind turbines need more maintenance than solar panels.</p> <p><i>There are moving parts in turbines, unlike in solar panels, so they need to be worked on and maintained.</i></p>
+	–	<p>8 Space can be saved by putting wind turbines close together.</p> <p><i>Large wind turbines are spread apart by half a mile so they do not disturb the wind traveling through each one.</i></p>



CITY PARK

This area has a mix of flat and hilly areas. There are a few hiking trails, picnic areas, activity fields, and a small community amphitheater. There is one steep hill called City View Hill with a popular hiking trail. The top of City View Hill has a lookout area that overlooks the Vanwick River and the Gentle Hills Open Space Preserve area. The trail is steep and often windy at the top.

- 1 small turbine
10 kW = 0.01 MW

SCIENTIFIC THINKING FOR ALL: A TOOLKIT
UNIT 6: Group Decision-Making, Activity 8

FAMILY FARM

This small farm grows organic hay and wheat. The farm is relatively close to town, so there is a section of it used for a community garden that is visited by those who live in the city. There are no livestock on the farm. The farm is located at the base of the Gentle Hills, which is windy enough to support a mile of large wind turbines. There are a few open sunny areas that are not used for crops and that could be used for solar panels. The farmer has indicated that they support renting their land for wind turbines in order to help meet the goals of Project REV.

- 3 large turbines
24 MW and/or
- solar panels
10 MW

SCIENTIFIC THINKING FOR ALL: A TOOLKIT
UNIT 6: Group Decision-Making, Activity 8

DISTANT HILLS OPEN SPACE PRESERVE

This is a beautiful natural area full of plants and animals. The preserve is the farthest point away from downtown and the largest in the area. It has a mix of trees near the river and grassy areas higher up on the hills. The hills, which are the highest in the area, include tall ridges that have high winds for a large portion of the day and night. There is also a flat sunny area at the foothills of the ridge that is a total of 10 km².

- 25 large turbines
200 MW and/or
- solar panels
10 MW

SCIENTIFIC THINKING FOR ALL: A TOOLKIT
UNIT 6: Group Decision-Making, Activity 8

COMMERCIAL FARM

This is a large farm run by a company that grows wheat, much of which is sent out of the area. They also raise some livestock. The area lies flat and low next to the Vanwick River and is not windy. The landowner has agreed to lease land for Project REV, but it means that he will switch his business to be entirely cattle, which will give off much more greenhouse gas emissions than his current farm.

- solar panels
300 MW

SCIENTIFIC THINKING FOR ALL: A TOOLKIT
UNIT 6: Group Decision-Making, Activity 8

GENTLE HILLS OPEN SPACE PRESERVE

This area is filled with wild grass on gentle rolling hills. Like the Distant Hills Open Space Preserve, this area is known for its great natural beauty and wildlife. There is no development in the area, although the Community Farm is nearby, which is closer to downtown than this Open Space Preserve. There is a diversity of plants and animals in the area. About 50% of the area is open and sunny and very windy in the evening.

- solar panels
200 MW and/or
- 20 large wind turbines
160 W

SCIENTIFIC THINKING FOR ALL: A TOOLKIT
UNIT 6: Group Decision-Making, Activity 8

CITY-OWNED BUILDINGS

This area includes all the city recreation, school, and office buildings in downtown Vanwick. While the roofs mostly have a clear view of the Sun, the wind does not meet minimum requirements for small turbines on most days. The city would get the electricity direct from these panels.

- rooftop solar panels
0.030 MW

SCIENTIFIC THINKING FOR ALL: A TOOLKIT
UNIT 6: Group Decision-Making, Activity 8

NATURE FOREST

Although close to neighborhoods, this area is mostly forested and has never been developed. The low-lying area has trees that block the light and wind. There is a hill with a small, exposed ridge. Recently, a nonprofit started bird-watching programs and hiking programs in the forest for the community. A local timber company wants to cut the trees for building lumber, which would clear space for solar panels.

- 4 large wind turbines
32 MW (on hill) and/or
- solar panels
100 MW (after cutting timbered area)

SCIENTIFIC THINKING FOR ALL: A TOOLKIT
UNIT 6: Group Decision-Making, Activity 8

OLD MINING SITE

There is an abandoned mine that includes a big pit; water that has accumulated in it; and a large, cleared area around it. The water in the lake is considered contaminated, and there have been some discussions about cleaning it up. The rest of the area is not currently utilized. The land is flat, rocky, and has few dry shaded areas.

- solar plant
600 MW

SCIENTIFIC THINKING FOR ALL: A TOOLKIT
UNIT 6: Group Decision-Making, Activity 8

WAREHOUSE DISTRICT

There are five privately owned warehouses near the Vanwick Elementary School, with a total of a 200 m² roof area. The warehouses are currently in use and maintained by a group of business owners who will rent their roofs to Project REV. The roofs just meet the daily requirement of sunlight for solar panels and wind for small turbines.

- rooftop solar panels
0.040 MW and/or
- 1 smaller turbine
10 kW = 0.01 MW

SCIENTIFIC THINKING FOR ALL: A TOOLKIT
UNIT 6: Group Decision-Making, Activity 8

AMBER WOGAN

SMALL BUSINESS OWNER

I own a restaurant in downtown Vanwick that has been in my family for three generations. As someone who has lived and worked in Vanwick my whole life, I hope that Project REV is good for all the small businesses in town. My biggest concern about Project REV is if there will be an increase in the cost of electricity for consumers due to the change in electrical systems. I am not sure my business could afford to pay more for electricity that runs the restaurant. We already pay a lot to keep the lights, heat, stoves, and ovens running. I hope that Project REV doesn't stop tourists from visiting the town to enjoy the Nature Forest, City Park, and Gentle Hills because they are full of unattractive solar panels and wind turbines.



WEIGHTED VALUES

- | | |
|------------------------------|----|
| •supporting businesses | 50 |
| •low electric bills | 30 |
| •maintaining beautiful views | 20 |

SCIENTIFIC THINKING FOR ALL: A TOOLKIT
UNIT 6: Group Decision-Making, Activity 8

JACKSON MOORE

HIGH SCHOOL STUDENT

I'm a student at Vanwick High School. I really care about what happens to our environment in the future, and I completely support Project REV. It is about time we worked together to address this issue! It has been difficult knowing that the biggest challenge of our time is lowering our greenhouse gas emissions, but as an individual, I am only able to do small things toward this goal. My mom works at the power plant that is closing down, so I am worried that she won't be able to get another job. If she can't find permanent work after the plant closes, I may have to work a lot more at my after-school job. However, I am grateful that she will no longer be subjected to the poor air quality near the plant.



WEIGHTED VALUES

- | | |
|-------------------------------|----|
| •lots of renewable generation | 80 |
| •creating jobs | 20 |

SCIENTIFIC THINKING FOR ALL: A TOOLKIT
UNIT 6: Group Decision-Making, Activity 8

FLORA SALAZAR

VANWICK CITY LIBRARIAN

I am excited that Project REV will bring money into our city, but I am most concerned about installing wind turbines. I know someone who knows someone who says that wind turbines can be very noisy. I want to make sure there aren't any devices such as wind turbines or electrical substations where I live near City Park. They could disrupt me at home. Getting solar panels instead of wind turbines sounds better to me, but how can they be reliable if they don't work at night? I don't want to close the library early when it gets dark! I have lived and worked in Vanwick for a long time, and I just love the community of readers that are here. I hope this gets worked out because I don't want friends to lose their jobs in Vanwick.



WEIGHTED VALUES

- keeping noise down 60
- maintaining jobs 40

SCIENTIFIC THINKING FOR ALL: A TOOLKIT
UNIT 6: Group Decision-Making, Activity 8

MIGUEL ORTIZ

HOSPITAL WORKER

I'm a medical worker at Vanwick General Hospital. I am very happy that we are considering replacing the coal plant with renewable energy options. I have worried for a long time about the greenhouse gas emissions that coal plants put into the atmosphere. At my job, I see a lot of people with health effects from the coal plant, such as asthma, that can be triggered by the air pollution. Something else that's really important to me is to make sure the new infrastructure for energy generation is quiet. The hospital setting is sometimes very hectic, and I really value quiet time at my home in Vanwick to keep a balanced lifestyle.



WEIGHTED VALUES

- lots of renewable generation 50
- keeping noise down 50

SCIENTIFIC THINKING FOR ALL: A TOOLKIT
UNIT 6: Group Decision-Making, Activity 8

ROMAN KOZLOV

FARMER

I run a small farm, and I was born and raised in Vanwick. As someone who works on the land, I want to help take care of it. My family and I love this place and want to help move it into a good future. I have started lowering our greenhouse gas emissions on the farm in other ways, so I support Project REV. I'd be willing to have renewables installed on my land, especially wind turbines installed in my fields. I think wind turbines are the coolest, and I wonder if we could run the whole city off of them! I'm looking forward to someday replacing my diesel-powered tractors with electric versions. If I could get the electricity for the electric tractors from renewable energy, that would really help bring down the greenhouse gas emissions from my farm. Plus, I think it will support my business because the changes I'm willing to make for Project REV will reduce my overall energy costs for the farm to help keep expenses down.



WEIGHTED VALUES

- wind turbines 50
- lots of generation 30
- his location's contribution 20

SCIENTIFIC THINKING FOR ALL: A TOOLKIT
UNIT 6: Group Decision-Making, Activity 8

OLIVETTE ALLARD

CONTRACTOR

As a contractor, I do electrical work frequently, so I know how important electricity is to our everyday lives. I think Project REV is a great way to increase job opportunities for electrical workers in the area. Transitioning to renewable energy generation will mean the whole system will need to be upgraded. There will be jobs that help increase the capacity of the system as well as jobs to upgrade the electrical power transmission lines and improve distribution. At the same time, I am worried that Project REV is going to put this new infrastructure, along with the solar panels and wind turbines, in an area that will disrupt our beautiful landscape. We have ruined so much forest already by running transmission lines to faraway places. Furthermore, ruining the natural world surrounding Vanwick might make this a less desirable place to live. I'm worried this change to Vanwick might decrease my home's property value, and I could lose money.



WEIGHTED VALUES

- increasing jobs 70
- reducing transmission 20
- maintaining beautiful forests 10

SCIENTIFIC THINKING FOR ALL: A TOOLKIT
UNIT 6: Group Decision-Making, Activity 8

THOMAS CHO

OFFICE WORKER

At the office, I see the energy bill for our building when it comes in. I know how much natural gas we burn in the furnaces all winter just to keep our large building heated. When I think about all the buildings in the area that all emit a lot of fossil fuels with our heating systems, it feels like we are just burning up our future! Project REV can change that, so I am thrilled it is happening. My high-rise building has a beautiful view of the Distant Hills Open Space Preserve, so I don't want to disrupt that because I see it every day. I feel lucky because I have friends who will need new jobs when the coal plant is closed. I hope Project REV will give them at least short-term work helping build everything for the new energy system.



WEIGHTED VALUES

•lots of renewable generation	50
•maintaining beautiful views	40
•creating jobs	10

SCIENTIFIC THINKING FOR ALL: A TOOLKIT
UNIT 6: Group Decision-Making, Activity 8

DIYA KHAN

VANWICK HISTORICAL SOCIETY MEMBER

I go hiking every week in the Gentle Hills area, and I heard that they are thinking of installing wind turbines or solar panels for Project REV there. What a horrible idea! Solar panels will take up so much room in that area that the hiking trails could be ruined. I am not so sure I want to hike the trails anyway if I am just looking at a sea of black panels. I think it is important to not have any changes to the land so we can preserve our history and way of life in Vanwick. Plus, I've heard from a family member that solar panels and wind turbines only work when the weather is sunny and windy. We might use all our resources to install these huge devices, and they may not even work when the weather conditions aren't right. I don't understand why Project REV wants to replace a reliable energy source with one that doesn't work all the time. This Project REV is not the answer!



WEIGHTED VALUES

•maintaining beautiful views	80
•no land changes	20

SCIENTIFIC THINKING FOR ALL: A TOOLKIT
UNIT 6: Group Decision-Making, Activity 8