



ACTIVITY 10

Group Decision for Vanwick

DISCUSSION

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ACTIVITY SUMMARY

In this culminating activity, students participate in a group decision about Vanwick's energy future. Students review the location recommendations of different stakeholders from Activity 8 and bring those recommendations, and the stakeholder roles, into a final recommendation for the City Council. They draw from the unit's key concepts and process skills to work together to make a decision that is acceptable to all stakeholders.

ACTIVITY TYPE
DISCUSSION

NUMBER OF
40-50 MINUTE
CLASS PERIODS
3

KEY CONCEPTS & PROCESS SKILLS

- 1 Values affect people's decisions. There can be disagreement within a community when people hold a variety of values.
- 2 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.
- 3 When making a group decision where there are conflicting values, a compromise is sometimes necessary.

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



MATERIALS & ADVANCE PREPARATION

FOR THE TEACHER

- VISUAL AID 10.1
“Scoring Guide:
Decision-Making (DM)”
(OPTIONAL)
- ITEM-SPECIFIC
SCORING GUIDE:
Activity 10, Build
Understanding item 1

FOR THE CLASS

- SURVEY RESULTS
FROM ACTIVITY 3
(OPTIONAL)

EACH GROUP OF FOUR STUDENTS

- POSTER BOARD OR
SLIDE PRESENTATION

FOR EACH STUDENT

- STUDENT SHEET 8.1
“Vanwick Site Map:
Stakeholder”
(COMPLETED)
- STUDENT SHEET 10.1
“Vanwick Site Map:
Group Decision”
- STUDENT SHEET 10.2
“Writing Frame:
Decision-Making”
(OPTIONAL)
- SCORING GUIDE:
DECISION-MAKING (DM)
(OPTIONAL)
- STAKEHOLDER CARD
FROM ACTIVITY 8
(OPTIONAL)

Plan on how you'd like to have groups share their plans with the class. Options to present to the class could be a poster, gallery walk, video, or slideshow. If your students will not do well in a large group of eight students during the procedure, plan an alternate way for students to work on their recommendation (see Procedure Support Step 2). Lastly, decide how you would like the class to make a final recommendation, or not, for Vanwick after the presentations (see Procedure Support Step 3).

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 Revisit the stakeholder recommendations from Activity 8.

- Ask students to locate their recommendations from Activity 8. They should have their completed recommendations in the form of Student Sheet 8.1, “Vanwick Site Map: Stakeholder.” Remind students that each group made a recommendation, in the role of a stakeholder, about which generation sites they prefer. Review the map and the potential sites. Optionally, provide student groups with their stakeholder cards from Activity 8. Let students know that in this activity, they will start in the same groups they were in for Activity 8, using the same stakeholder perspective.
- Read the scenario and answer any questions students might have about it. In particular, revisit the concept of electrification as introduced in the Science Review in Activity 5. Make sure students understand why the demand for electricity in the future is predicted to grow significantly, while the overall consumption of energy in most developed countries is not. The predicted doubling of electricity in Vanwick reflects the real-world credible scientific predictions for the transitioning to renewable energy.
- Let students know that in this activity, they will have an opportunity to apply what they’ve learned in the unit to a final decision about where the renewable generation will be located.

PROCEDURE SUPPORT (75 MIN)

2 Divide students into mixed-stakeholder groups for the decision-making process.

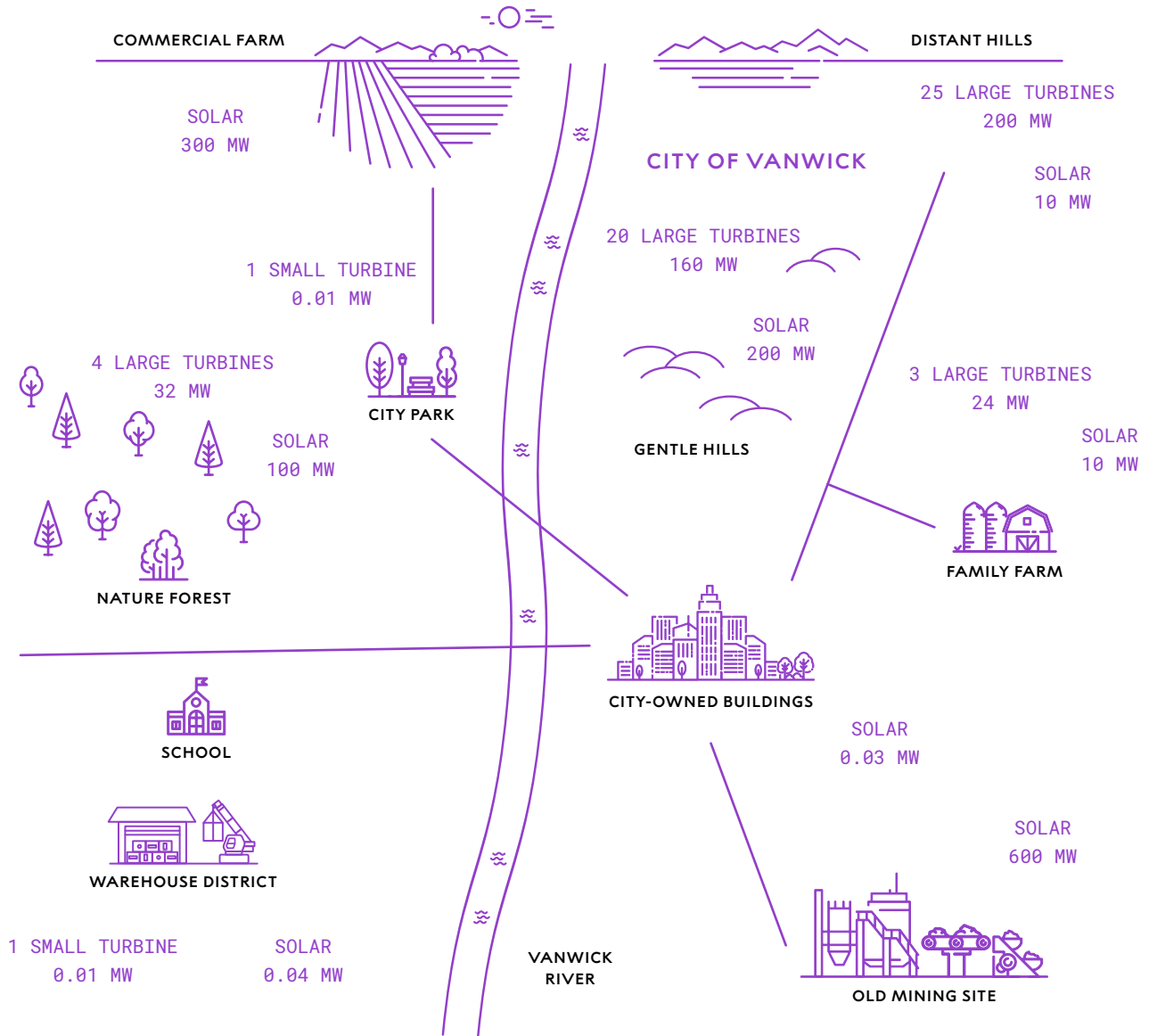
- In Procedure Step 2, consider distributing the Stakeholder cards from Activity 8 so students can reference their role from the last activity. After groups review their stakeholder recommendations from that activity, reorganize students into mixed-stakeholder groups for Procedure Step 3. Each mixed-stakeholder group should include one representative from each of the eight stakeholder groups—to emphasize that the situation will truly be a group decision.

- If a group of eight is not manageable in your classroom, consider altering the procedure. One suggestion is to divide students into groups of four, instead of groups of eight. After each group comes to a consensus for the stakeholders in their group, they can present those plans to the class, or they can meet with another group of four to renegotiate a recommendation for the class.

3 Support students as they make a group decision about the location of the renewable generation in Vanwick.

- Students may ask about using the survey results from Activity 3 to guide their decision-making. Since the stakeholder perspectives provided in this activity are the same as in previous activities (Activity 3 and Activity 8), the most commonly held values are represented. However, you may want to remind students of the three most weighted values from the survey in Activity 3 as information they can use in their deliberations. Encourage groups to come up with decisions that are consistent with all stakeholder values so the group decision has a higher chance of being approved by the Vanwick community.
- Students should find that many of the recommendations from Activity 8 do not meet the 1,000 MW generation minimum. This means that students are not only forced to compromise with one another, but they must navigate the trade-offs needed to meet the generation needs. This reflects the challenging real-world situation many communities are facing. Often, the value of wanting renewable energy conflicts with people's values about land use.
- Students may also notice that there is an easy consensus around some sites. Examples are agreement to select the Old Mining Site and to not select the Nature Forest. Other sites have consensus but don't provide a lot of generation, such as the rooftop installations at the City-Owned Buildings, City Park, or the Warehouse District. Much conversation may be centered around the facts and values of a few critical sites—the Distant Hills Open Space Preserve, the two farms, and the Gentle Hills Open Space Preserve.
- As students work in their groups, circulate around the room to support their interactions. Remind students of the tool of compromise that was illustrated in the last activity. Suggest possible ways forward if students are struggling to find an acceptable compromise.
- While the Site Survey cards show the possible power generation quantities for each site, Figure 10.1 shows all the quantities together as a reference.

FIGURE 10.1
Possible Power Generation Quantities



4 Students present their recommendations to the class.

- Students should complete Student Sheet 10.1, “Vanwick Site Map: Group Decision,” as they work in their groups to make a decision. Student responses for the student sheet will vary. One sample student response is shown at the end of this activity.
- Make sure students record their reasoning in their science notebooks so they can respond to the Build Understanding items. Consider having students preread the questions, particularly Build Understanding item 1, to provide guidance on what they need to record. The following is a sample of student notes, based on the sample student response to Student Sheet 10.1.

Sample Student Response, Procedure Step 5

Old Mining Site	<i>Everyone agrees on this. It is out of sight in an area that is already disturbed and has lots of generation.</i>
Business Farm	<i>The trade-off for this is that livestock creates more greenhouse gas emissions, which is not helpful, but those who valued natural views were willing to make that trade-off.</i>
Gentle Hills, solar	<i>It was a compromise because the other two sites don't have enough power. Those who valued views were willing to use solar panels if they were low and screened by greenery. Those who valued generation were willing to not put up the wind turbines at Gentle Hills Open Space Preserve to get more generation there.</i>
Warehouse District, solar	<i>Why not? Even though it is a small amount, it supported everyone's values. Aligned with businesspeople's values.</i>
City-Owned Buildings	<i>Why not? Even though it is a small amount, it aligned with everyone's values.</i>

Our big compromise happened because those who wanted lots of jobs also wanted wind, but we did not choose any wind. The compromise was that we picked an amount that went over 1,000 MW minimum so as to add some jobs.

- Provide the expectations for each group's presentation. Some choices are as follows:
 - completing a written proposal
 - designing a poster for a poster session and/or gallery walk
 - creating a slideshow to present to the class

- After all groups present their ideas, decide how students will make a final decision. Students can take a simple vote by a show of hands, using a ballot box, or taking an online survey. Alternatively, students could work together as a class to incorporate compromises and create a single plan based on consensus. Students will have an opportunity after the group decision to reflect on how the decision differs from their own choices.
- Complete the final class decision. Combine it with the previous decisions about energy storage and the Building Initiative. Put it all together with students and display it prominently in the classroom.

SYNTHESIS OF IDEAS (40 MIN)

5 Responses to Build Understanding item 1 can be assessed using the Decision-Making Scoring Guide.

- Remind students of the Decision-Making Scoring Guide. You may wish to project Visual Aid 10.1, “Scoring Guide: Decision-Making (DM),” for your students to review each level and clarify your expectations.
- Do not share Item-Specific Scoring Guide: Activity 6, Build Understanding item 1 with students, as it provides specific information on how to respond to the question prompt.
- For students who need support organizing and writing their responses, you may wish to provide the [Writing Frame](#) on optional Student Sheet 10.2, “Writing Frame: Decision-Making,” to help them compose their responses. Students could also use the student sheet only as a reference or as a checklist as they write their responses. A sample student response for this student sheet is shown at the end of this activity. For more information on a Writing Frame, see [Appendix 1: Literacy Strategies](#).
- Remind students that you are looking for demonstrated growth in their understanding and explanation of decision-making, and they may want to review their responses to the assessment in Activities 4 (Build Understanding item 1), 6 (Build Understanding item 1), and/or 7 (Build Understanding item 1). Note that this is the last opportunity in the unit to formally assess students, using the decision-making scoring guide.
- Depending on your students, you may want to have them provide feedback on one another’s work for revision prior to turning in the work to you for scoring. Alternatively, consider having students turn in a rough draft to you for feedback and revision.
- Sample responses for Levels 1–4 are provided in the Build Understanding section that follows. Review these responses to get an idea of what is expected for each level, alongside the item-specific scoring guide. See [Appendix 2: Assessment Resource](#) for more guidance and information on using the scoring guides and assessment system with your students.

6 Lead a class discussion to allow students to reflect on the decision-making process.

- Ask, **What were some of the conflicting (or different) values in your mixed-stakeholder group?** Answers will vary but one of the big conflicts that students should recognize is that those who heavily weighted the value of maintaining natural views were at odds with those who valued the reduction of greenhouse gas emissions by generating as much renewable energy as possible. These values conflict because attempting to satisfy one of the values results in a solution that goes against the other value.
- Discuss how the decisions that students made as stakeholders compared to what their personal decisions would have been. Students often find it challenging to act on someone else's behalf, and this activity tested that skill. Students, like all people, will often insert their own values into a situation. Support the ideas that having to consider someone else's perspective builds empathy and supports decision-making.
- Elicit student ideas about how this process of decision-making compares to those from other cultures with which they are familiar. They may have group experiences that differ considerably from what was modeled in the activity. Some cultures are more authoritarian or less authoritarian and range from top-down to consensual leadership. Regardless of the leadership style, every culture has big decisions that involve multiple people's input, and its success depends on the consideration of facts and values.
- Conclude the activity by revisiting the Guiding Question, **What should be considered while making a group decision about Vanwick's Project REV?** The response to the question serves as a summary of the unit and should include key concepts and process skills related to decision analysis such as facts, values, weighted values, scenario planning, and compromise.
- Wrap up the unit by asking students to reflect on what was most impactful about their growth in group decision-making during the unit. Ask, **How can the tools you learned about decision-making in this unit affect how you make decisions in your own life in the future?** Accept all responses and connect students' ideas to their everyday decisions, especially important ones. Remind students that although the scenario in this unit was related to renewable energy—which they also learned about—the point of the unit was gaining the thinking tools related to decision-making concepts.

SAMPLE STUDENT RESPONSES

BUILD UNDERSTANDING

① DM Scoring Guide

Explain how your group decided on what to include in your plan to recommend to the Vanwick City Council. Be sure your explanation includes the following:

- the relevant facts and stakeholder values and how they affected your decision,
- the predicted outcome(s) of your decision,
- any trade-offs involved in your decision, and
- any part of the decision where there was a compromise.

Level 4 response

Our group decided to recommend solar panels only, built on a combination of locations at the Old Mining Site, Commercial Farm, Gentle Hills Open Space Preserve, Warehouse District, and City-Owned Buildings. We discussed all the stakeholder values, the facts related to each possible generation location, and how they all fit together to come up with a plan that would address as many stakeholder values as possible and still generate at least the minimum amount of electricity (1,000 MW) needed for the community. We considered a range of facts, such as how much power could be generated at each site (to meet ProjectREV goals) and if there would be a change of land use or an obstruction of views (to support stakeholder values). We predict that our recommended plan will generate more than the 1,000 MW needed for Vanwick, while supporting most of the stakeholders' common values.

Overall, meeting the ProjectREV goals supports the common stakeholder value of reduction of greenhouse gases. This means that by generating enough power with renewable resources, our plan will line up with that value. There was one area where there was a trade-off—choosing the Commercial Farm site means that the farmer will have to switch to just raising cattle, which will give off more greenhouse gas emissions than his current farm. But we think the trade-off for the solar panels is worth it in the end since that location can hold enough solar panels to produce 300 MW. The common stakeholder value of not obstructing views meant that we had to be careful about choosing locations, but we were able to do that and still have enough sites. However, another common stakeholder value was increasing the number and security of jobs, and we had to compromise on that because putting in solar panels does not create as many jobs. But we tried to address that, at least partially, by choosing sites that together generate more than the 1,000 MW minimum needed and that will still create some jobs.

Level 3 response

Our group decided to recommend solar panels only, built on a combination of locations at the Old Mining Site, Business Farm, Gentle Hills Open Space Preserve, Warehouse District, and City-Owned Buildings. We discussed all the stakeholder values, the facts related to each possible generation location, and how they all fit together. We considered a range of facts, such as how much power could be generated at each site and if it would obstruct views. We predict that our recommended plan will generate more than the 1,000 MW needed for Vanwick.

There was one trade-off—choosing the Commercial Farm site means more greenhouse gas emissions. One common stakeholder value was increasing number and security of jobs, and we had to compromise on that because putting in solar panels does not create as many jobs.

Level 2 response

Our group decided to recommend solar panels at several locations. We made sure that, together, the sites would generate enough MW for Vanwick's needs. We also made sure that there were fewer greenhouse gases emitted, based on our plan. We had to compromise a little because we chose the Commercial Farm as one location and that means the farmer will have more cattle, and cattle produce greenhouse gases.

Level 1 response

Our group decided to recommend solar panels at several locations. We didn't want too many greenhouse gases, and we thought that jobs were important but not the most important thing. We didn't want any wind power generation because the stakeholders might not value that.

② How do you think your stakeholder would have responded to the final recommendation?

Responses will vary. One sample response is shown here.

My stakeholder would not have been happy with the recommendation because it included 10 wind turbines up on the Distant Hills Opens Space Preserve. His top values included not having any obstructed views or turbines, so he would have been upset about the decision.

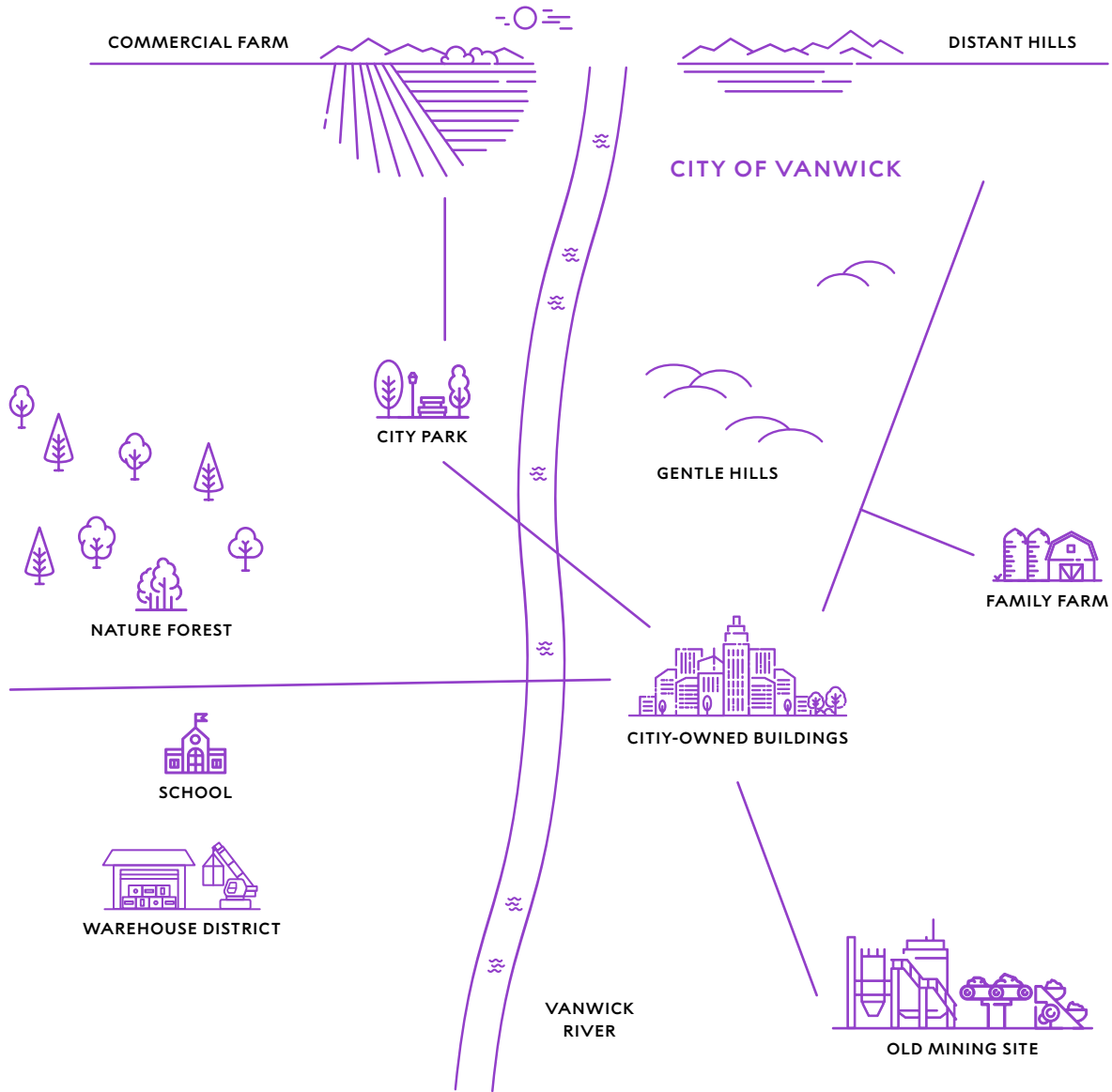
③ Think back on your experience trying to find compromises with your group.

a What was most difficult about the process of group decision-making?

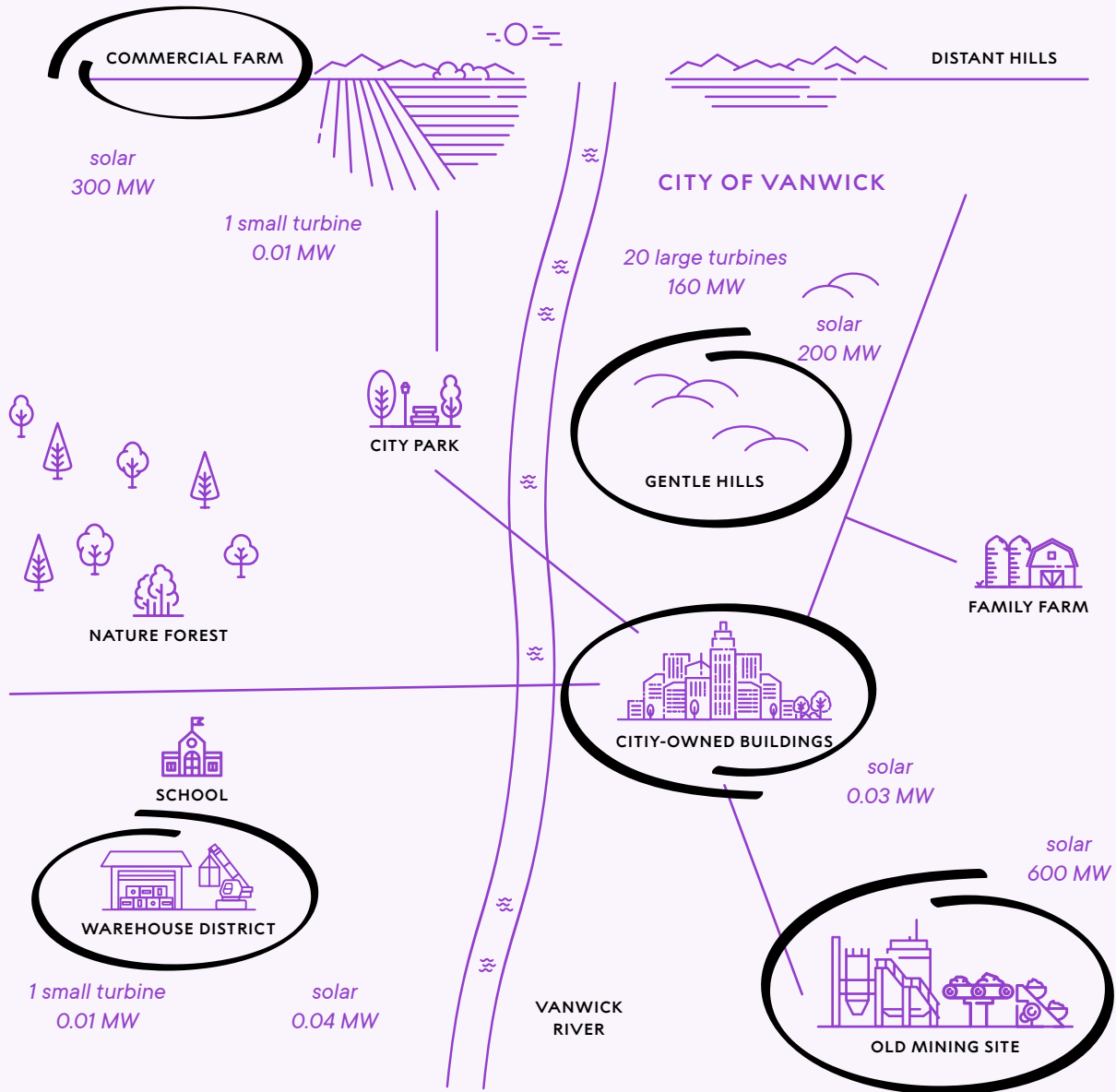
The most difficult thing was making compromises because everyone in my group was really into their roles and would not give up anything. In the end, we agreed on something that not everyone was happy about.

b What are some advantages and disadvantages of compromising during group decision-making?

The advantage is that you can make a decision and move on. Making a decision that everyone can live with is better than not being able to make a decision, but the disadvantage is that no one gets what they want! Sometimes, the compromise leads to mixed-up ideas and solutions that don't make enough sense.



Possible Power Generation	TOTAL	_____ MW
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Possible Power Generation	TOTAL	<u>1,100.07</u> MW
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I/we/they have decided

The value(s) that I/we/they are weighting most heavily is

One fact related to the value is

A second fact related to the value is

Together, these facts and values affect the decision because

The likely outcome of this decision is

(OPTIONAL) The trade-offs of this decision were

(OPTIONAL) This decision involved compromising about

I/we/they have decided

that Vanwick should use solar panels only at commercial locations.

The value(s) that I/we/they are weighting most heavily is

the reduction of greenhouse gases and not obstructing views.

One fact related to the value is

wind turbines obstruct views more than solar panels.

A second fact related to the value is

that some of the bigger commercial locations (Old Mining Site, Commercial Farm) provide a large amount of electrical power through solar.

Together, these facts and values affect the decision because

it means we could reach our goal of 1,000 MW without having to compromise our most important values.

The likely outcome of this decision is

that we will generate over the minimum amount of electricity (1,000 MW) needed for the community with low emissions and without obstructing views with turbines.

(OPTIONAL) The trade-offs of this decision were

choosing the Commercial Farm site means that the farmer will have to switch to just raising cattle, which will give off more greenhouse gas emissions than his current farm. The trade-off for the solar panels is worth it in the end since that location can produce 300 MW without generating greenhouse gases.

(OPTIONAL) This decision involved compromising about

the common stakeholder value of increasing the number and security of jobs. We had to compromise on that because putting in solar panels does not create as many jobs as wind turbines. But we tried to address that, at least partially, by choosing sites that together generate more than the 1,000 MW minimum needed and that will still create some extra jobs.

WHEN TO USE THIS SCORING GUIDE:

This is used when students are explaining a decision (sometimes in the form of a recommendation) that incorporates relevant facts and values and predicts possible outcomes.

WHAT TO LOOK FOR:

- Response incorporates and explains the effects of relevant facts and stakeholder values on the decision.
- Response identifies trade-offs (if appropriate).
- Response describes any compromises made (if appropriate).

LEVEL	GENERAL DESCRIPTION
<p>Level 4 Complete and correct</p>	<p>The student explains a decision made from two or more options that incorporates:</p> <ul style="list-style-type: none"> • one or more relevant stakeholder values. • the facts associated with those values. • how the facts and values affected the decision. • predicted outcome(s) supported by the relevant facts. • any trade-offs made as a result of weighing the relevant facts and values (if appropriate). • any compromise made by stakeholders (if appropriate).
<p>Level 3 Almost there</p>	<p>The student explains a decision made from two or more options that incorporates most of the following, BUT one or more may be insufficiently described:</p> <ul style="list-style-type: none"> • one or more relevant stakeholder values • the facts associated with those values • how the facts and values affected the decision • predicted outcome(s) supported by the relevant facts • any trade-offs made as a result of weighing the relevant facts and values (if appropriate) • any compromise made by stakeholders (if appropriate)

LEVEL	GENERAL DESCRIPTION
Level 2 On the way	The student provides a clear and relevant decision, BUT the explanation of supporting facts and values is incomplete.
Level 1 Getting started	The student provides a clear and relevant decision BUT provides inaccurate or unrelated facts, unrelated values, and/or an illogical explanation of the decision.
Level 0 Missing or off task	Student response is missing, illegible, or irrelevant.
X	The student had no opportunity to respond.

WHEN TO USE THIS SCORING GUIDE:

This Scoring Guide is used when students are explaining a decision (sometimes in the form of a recommendation) that incorporates relevant facts and values and predicts possible outcomes.

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- Response incorporates and explains the effects of relevant facts and stakeholder values on the decision.
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LEVEL	GENERAL DESCRIPTION	ITEM-SPECIFIC DESCRIPTION
<p>Level 4 Complete and correct</p>	<p>The student explains a decision made from two or more options that incorporates:</p> <ul style="list-style-type: none"> • one or more relevant stakeholder values. • the facts associated with those values. • how the facts and values affected the decision. • predicted outcome(s) supported by the relevant facts. • any trade-offs made as a result of weighing the relevant facts and values (if appropriate). • any compromise made by stakeholders (if appropriate). 	<p>The student explains their group’s decision on what to recommend to the City Council, incorporating the following:</p> <ul style="list-style-type: none"> • 2–3 relevant facts OR overall summary of pertinent facts • common stakeholder values (such as reduce emissions, no view obstruction, more jobs) • how facts and values were woven together (general or specific description) • predicted outcomes (may vary, depending on plan) • clear description of trade-off(s) • clear description of compromise(s) <p>However, specific points may vary, depending on the group’s recommendation.</p>

LEVEL	GENERAL DESCRIPTION	ITEM-SPECIFIC DESCRIPTION
<p>Level 3 Almost there</p>	<p>The student explains a decision made from two or more options that incorporates most of the following, BUT one or more may be insufficiently described:</p> <ul style="list-style-type: none"> • one or more relevant stakeholder values • the facts associated with those values • how the facts and values affected the decision • predicted outcome(s) supported by the relevant facts • any trade-offs made as a result of weighing the relevant facts and values (if appropriate) • any compromise made by stakeholders (if appropriate) 	<p>The student explains their group’s decision on what to recommend to the City Council, incorporating the following, BUT one or more may be insufficiently described:</p> <ul style="list-style-type: none"> • 2–3 relevant facts OR overall summary of pertinent facts • common stakeholder values (such as reduce emissions, no view obstruction, more jobs) • how facts and values were woven together (general or specific description) • predicted outcomes (may vary depending on plan) • clear description of trade-off(s) • clear description of compromise(s) <p>However, specific points may vary, depending on the group’s recommendation.</p>

LEVEL	GENERAL DESCRIPTION	ITEM-SPECIFIC DESCRIPTION
Level 2 On the way	<p>The student provides a clear and relevant decision, BUT the explanation of supporting facts and values is incomplete.</p>	<p>The student explains their group’s decision on what to recommend to the City Council, BUT the explanation of supporting facts and values is incomplete (e.g., only one fact, not including values, not stating possible outcomes) or is missing compromises or trade-offs relevant to their plan.</p>
Level 1 Getting started	<p>The student provides a clear and relevant decision BUT provides inaccurate or unrelated facts, unrelated values, and/or an illogical explanation of the decision.</p>	<p>The student explains their group’s decision on what to recommend to the City Council BUT provides inaccurate or unrelated facts, unrelated values, and/or an illogical explanation of the decision.</p>
Level 0 Missing or off task	<p>Student response is missing, illegible, or irrelevant.</p>	
X	<p>The student had no opportunity to respond.</p>	