

Energy's Resource Footprint

Evaluate how energy technology changes fossil fuel, water, and land use.

7.19.D "evaluate the effects of scientific discoveries and technological innovations on the use of resources such as fossil fuels, water, and land; and"

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each scientific discovery or technology in the passage. Circle each effect on fossil fuels, water, or land, then write F, W, or L beside the circled effect.

Fracking Changes Resource Use

- ① In the early 2000s, engineers combined horizontal drilling with hydraulic fracturing, often called fracking. The method made it possible to reach oil and natural gas trapped in tight rock layers. This discovery changed how some companies used fossil fuel resources. Wells could produce fuel from places once considered too costly to develop. Supporters noted that burning natural gas usually releases less carbon dioxide than burning coal for the same amount of energy. However, the new access also encouraged continued use of fossil fuels rather than a quick shift to renewable energy.
- ② Fracking requires large volumes of water mixed with sand and chemicals to crack rock. Afterward, some water returns to the surface carrying salts and other substances from underground. Companies can treat, recycle, or dispose of this wastewater, but each choice has limits and costs. In dry regions, taking water for wells can compete with homes, farms, and rivers. Careful well construction and wastewater management can lower the chance that fluids pollute groundwater. Even so, leaks, spills, or poor disposal can damage water resources.
- ③ Technology has also changed the land used for energy. A drilling pad, roads, pipelines, and storage areas can break up habitat and disturb soil. Several wells may be drilled from one pad, which can reduce the number of separate pads and roads needed. Sensors can detect some methane leaks, and companies can repair them sooner. These innovations reduce certain harms, but they do not erase them. Communities must weigh jobs and energy supplies against habitat loss, water demands, climate pollution, and the long-term cleanup of wells.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 What is one benefit and one concern caused by fracking's effect on fossil fuel use?

2 Why can fracking create a water-use problem in a dry region?

3 How can drilling several wells from one pad affect land use? Explain why this effect may be helpful.

4 Evaluate leak-detecting sensors. What harm can they reduce, and why do they not solve every problem?

3 YOUR TURN _____ Your own words

Choose a technological innovation not named in the passage that affects fossil fuels, water, or land. Write exactly four sentences that explain one benefit, one drawback, and your judgment about whether the innovation should be used.

PART 1 • READ AND MARK

Underline each scientific discovery or technology in the passage. Circle each effect on fossil fuels, water, or land, then write F, W, or L beside the circled effect. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What is one benefit and one concern caused by fracking's effect on fossil fuel use?	Benefit: it makes oil and natural gas available from rock layers that were once too costly to develop. Concern: it can encourage continued use of fossil fuels instead of a faster shift to renewable energy.
2	Why can fracking create a water-use problem in a dry region?	Fracking uses large volumes of water, so it can compete with the water needed by homes, farms, and rivers.
3	How can drilling several wells from one pad affect land use? Explain why this effect may be helpful.	It can reduce the number of separate drilling pads and roads, which can reduce habitat disruption and soil disturbance.
4	Evaluate leak-detecting sensors. What harm can they reduce, and why do they not solve every problem?	Sensors can help companies find methane leaks and repair them sooner. They do not erase other harms, such as habitat loss, water demands, climate pollution, or the need to clean up wells.

PART 3 • YOUR TURN (SAMPLE ANSWER)

Smart irrigation sensors could help farms water crops only when soil is dry. This could conserve water and reduce the electricity or fuel used to pump water. However, farmers would need to buy, maintain, and power the sensors, and incorrect readings could leave crops too dry. The town should support the system where training and repairs are available because the likely water savings outweigh the costs.

Accept equivalent evidence-based effects and evaluations from the passage. For Part 3, accept varied innovations if the response has exactly four sentences and clearly states a resource effect, a benefit, a drawback, and a supported judgment.