Explore an Issue: Take a Stand: Energy Options

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(Answers will vary.)

Advantages	Disadvantages
hydroelectric power; no air pollution	impact on watersheds of major development such as James Bay; high capital cost
fossil fuel power; low capital cost	pollution, including acid rain and greenhouse effect; ready access to fuel gases
nontraditional fuels; no air pollution	limited application due to geography; high capital cost per unit of power produced
soft energy paths; no air pollution	resistance of people unwilling to change lifestyle
no consumption of natural resources	

PRACTICE

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Understanding Concepts

3. (a) $\Delta H = n\Delta H_{\text{fission}}$

$= 4.26 \text{ mol} \times 1.9 \times 10^{10} \text{ kJ/mol}$

$\Delta H = 8.1 \times 10^{10} \text{ kJ}$

(b) $n_{\text{He}} = 1000 \text{ g} \times \dfrac{1 \text{ mol}}{4.00 \text{ g}}$

$n_{\text{He}} = 250 \text{ mol}$

$\Delta H = n\Delta H_{\text{fusion}}$

$= 250 \text{ mol} \times 1.7 \times 10^{9} \text{ kJ/mol}$

$\Delta H = 4.3 \times 10^{11} \text{ kJ}$

(c) Helium has a much lower molar mass, so 1 kg represents many more moles.

4. (a) Answers will vary, but fusion reactions require temperatures and concentrations of isotopes that are technologically challenging. No safe and efficient nuclear fusion reactors have been developed as of 2002.

SECTION 5.6 QUESTIONS

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Understanding Concepts

1. Fission of uranium produces about 2×10^{10} kJ/mol and fusion of hydrogen produces about 2×10^{9} kJ/mol. Thus, uranium produces about 10 times as much energy, per mole, as hydrogen. However, there are many more moles of hydrogen per kilogram, so the energy production per kilogram would be greater from hydrogen fusion than from uranium fission.

Making Connections

2. Answers will vary, but will include: descriptions of the Pickering and Bruce nuclear power stations; recent information on power output; and mention of the "pollution-free" nature of atomic energy balanced against the problems of disposal and large capital cost of facilities.