

**Prospects for a Sustainable Energy Future**  
SPN LESSON #44

**TEACHER INFORMATION**

***LEARNING OUTCOME***

After exposure to the Johansson and Goldemberg definition of the term *sustainable*, students are able to cite criteria that characterize a sustainable energy system.

***LESSON OVERVIEW:*** The purpose of this lesson is to introduce students to the concept of “sustainability,” as it was originally considered in 1987 by the World Commission on Environment and Development, and to evaluate the degree of support for sustainability in the recommendations of Thomas B. Johansson and José Goldemberg in *Energy for Sustainable Development*, prepared for the United Nations Development Programme for the World Summit on Sustainable Development in Bali, 27 May – 7 June 2002.

***GRADE-LEVEL APPROPRIATENESS***

This Level III Environmental Considerations lesson is intended for use in high school social studies classrooms.

***MATERIALS:*** Student handout

***SAFETY:*** No special safety considerations are necessary.

***TEACHING THE LESSON:*** Have students read the two introductory paragraphs in the student handout expressing the key ideas of *Energy for Sustainable Development*, and then answer the questions in the Develop Your Understanding section.

***ACCEPTABLE RESPONSES FOR DEVELOP YOUR UNDERSTANDING SECTION:***

1. What definition do Johansson and Goldemberg adopt for the term *sustainable*?

*Answer: Their definition is “must not compromise the prospects of future generations.”*

2. What are their criteria for a “sustainable” energy system? How well do these criteria match Johansson and Goldemberg’s definition of *sustainable*?

*Answer: Their criteria are “accessibility, reliability, affordability, efficiency, and renewability.” Renewable energy sources replenish themselves as rapidly as they are used and thus meet the definition of sustainable. Efficiency refers to using the least amount of energy to accomplish a given task. If the energy used is not renewable, the use is not sustainable but can be efficient.*

3. What additional criteria would you include to characterize a sustainable energy system?

*Answer: The New York Energy Education Project suggested the following criteria to evaluate energy sources: abundance, renewability, concentration, convenience, freedom from pollution, affordability. Along with renewability, “freedom from pollution” also supports sustainability. Students can be expected to come up with additional criteria.*

4. Which of the “new energy technologies” listed by Johansson and Goldemberg satisfy their definition of *sustainable*? Which do not?

*Answer: The following new energy technologies support sustainability: small engines for cogeneration (if they run on renewable energy sources), fuel cells (if they run on renewable energy sources), oxygenated fuels (if they come from biomass sources, which are renewable), alcohol (because it comes from biomass, which is renewable), syngas-derived fuels (if they come from biomass, which is renewable), polygeneration strategies (if they are based on renewable energy sources), and hydrogen (if it is made from renewable energy sources).*

*The following new energy technologies do not support sustainability: natural gas and gas turbines, oxygen-blown coal gasification and integrated gasifier combined cycle, small engines for cogeneration, fuel cells, decarbonization and carbon dioxide sequestration, oxygenated fuels, alcohol, syngas-derived fuels, polygeneration strategies, and hydrogen, if they are based on or derived from nonrenewable fossil fuels.*

### ***ADDITIONAL SUPPORT FOR TEACHERS***

**SOURCE FOR THIS ADAPTED ACTIVITY:** Thomas B. Johansson and José Goldemberg (eds.), *Energy for Sustainable Development*, United Nations Development Programme, 2002.

*Energy Options: Choices That Will Shape Your Future, Part II: Making Your Choices* (filmstrip), New York Energy Education Project, 1983.

### **BACKGROUND INFORMATION**

The definition of *sustainable development* cited by Johansson and Goldemberg originated from the World Commission on Environment and Development, chaired by former Norwegian Prime Minister and present World Health Organization head Gro Harlem Brundtland. Their report, titled “Our Common Future,” stressed that making development sustainable “requires meeting the basic needs of all” and “ensure[s] that it meets the needs of the present without compromising the ability of future generations to meet their own needs.” In evaluating the present situation, they found that “many present efforts to guard and maintain human progress . . . are simply unsustainable. . . . They draw too heavily . . . on already overdrawn environmental resource accounts to be affordable far into the future without bankrupting those

accounts. They may show profits on the balance sheets of our generation, but our children will inherit the losses. We borrow environmental capital from future generations with no intention . . . of repaying. They may damn us for our spendthrift ways, but they can never collect on our debt to them. We act as we do because we can get away with it: future generations . . . cannot challenge our decisions.”

“How can such development serve next century’s world of twice as many people relying on the same environment?” the Commission asked, and they concluded that bringing the whole world up to a scale of energy use like that in industrial countries would multiply present world energy use by five. But they observed that the environmental consequences of nonrenewable (and hence unsustainable) fossil fuels questioned even a doubling of their use and called for focusing research and development on renewable energy sources, greater efficiency in energy use, and the safety of nuclear energy. Johansson and Goldemberg agree with the focus on renewable energy sources and more efficient energy use, but only once do they mention the possibility of a safer nuclear energy. Instead, they list a variety of new energy technologies, many of which could or would involve the unsustainable use of fossil fuels.

**REFERENCES FOR BACKGROUND INFORMATION:** World Commission on Environment and Development, *Our Common Future*, Oxford University Press, Oxford, 1987.

Howard Geller, *Energy Revolution: Policies for a Sustainable Future*, Island Press, Washington, 2003.

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[www.nyserda.ny.gov](http://www.nyserda.ny.gov)

*(STUDENT HANDOUT SECTION FOLLOWS)*

Name \_\_\_\_\_

Date \_\_\_\_\_

## Prospects for a Sustainable Energy Future

Three-quarters of the world's population uses only one-third of the world's energy, at half the average per capita rate, while the per capita energy use in industrialized countries is six times that in developing countries. But the gap is narrowing: energy use in industrialized countries increases at 1.7% per year but in developing countries at 3.8% per year. With this in mind, Thomas B. Johansson and José Goldemberg edited a book, *Energy for Sustainable Development*, for the United Nations Development Programme for the World Summit on Sustainable Development in Bali, 27 May – 7 June 2002.

“Given that they can so dramatically increase human capabilities and opportunities, adequate energy services are integral to poverty alleviation and environmentally sound social and economic development,” they wrote. “For such development to be sustainable, in the well-accepted definition put forth 15 years ago by the World Commission on Environment and Development, it must not compromise the prospects of future generations . . . must be achieved in ways that are environmentally sound, as well as safe, affordable, convenient, reliable, and equitable . . . can be achieved through improvements in the efficiency with which modern energy carriers are produced and used, coupled with a greater reliance on modern forms of renewable energy and cleaner utilisation of fossil fuels using technologies now available or in the development stage.” They list five criteria for a sustainable energy system—accessibility, reliability, affordability, efficiency, and renewability—and pin their hopes on new energy technologies, some of which they list as follows: natural gas and gas turbines, oxygen-blown coal gasification and integrated gasifier combined cycle, small engines for cogeneration, fuel cells, decarbonization and carbon dioxide sequestration, oxygenated fuels, alcohol, syngas-derived fuels, polygeneration strategies, and hydrogen.

### DEVELOP YOUR UNDERSTANDING

From your reading of the above information from *Energy for Sustainable Development*, answer the following questions:

1. What definition do Johansson and Goldemberg adopt for the term *sustainable*?
2. What are their criteria for a “sustainable” energy system? How well do these criteria match Johansson and Goldemberg’s definition of *sustainable*?

3. What additional criteria would you include to characterize a sustainable energy system?

4. Which of the “new energy technologies” listed by Johansson and Goldemberg satisfy their definition of *sustainable*? Which do not?