

TSOKOS READING ACTIVITY

Section 8-1

1. **Essential Idea:** The constant need for new energy sources implies decisions that may have a serious effect on the environment. The finite quantity of fossil fuels and their implication in global warming has led to the development of alternative sources of energy. This continues to be an area of rapidly changing technological innovation.
2. **Nature Of Science: Risks and problem-solving:** Since early times mankind understood the vital role of harnessing energy and large-scale production of electricity has impacted all levels of society. Processes where energy is transformed require holistic approaches that involve many areas of knowledge. Research and development of alternative energy sources has lacked support in some countries for economic and political reasons. Scientists, however, have continued to collaborate and share new technologies that can reduce our dependence on non-renewable energy sources.
3. **International-Mindedness:** The production of energy from fossil fuels has a clear impact on the world we live in and therefore involves global thinking. The geographic concentrations of fossil fuels have led to political conflict and economic inequalities. The production of energy through alternative energy resources demands new levels of international collaboration.
4. **Theory Of Knowledge:**
 - a. The use of nuclear energy inspires a range of emotional responses from scientists and society.
 - b. How can accurate scientific risk assessment be undertaken in emotionally charged areas?
5. **Understandings:**
 - a. Specific energy and energy density of fuel sources
 - b. Sankey diagrams
 - c. Primary energy sources
 - d. Electricity as a secondary and versatile form of energy
 - e. Renewable and non-renewable energy sources
6. **Applications And Skills:**
 - a. Solving specific energy and energy density problems
 - b. Sketching and interpreting Sankey diagrams
 - c. Describing the basic features of fossil fuel power stations, nuclear power stations, wind generators, pumped storage hydroelectric systems and solar power cells
 - d. Solving problems relevant to energy transformations in the context of these generating systems
 - e. Discussing safety issues and risks associated with the production of nuclear power
 - f. Describing the differences between photovoltaic cells and solar heating panels
7. **Guidance:**

- a. Specific energy has units of J kg^{-1} ; energy density has units of J m^{-3}
 - b. The description of the basic features of nuclear power stations must include the use of control rods, moderators and heat exchangers
 - c. Derivation of the wind generator equation is not required but an awareness of relevant assumptions and limitations is required
 - d. Students are expected to be aware of new and developing technologies which may become important during the life of this guide
8. Data Booklet Reference:
- a. $Power = \frac{energy}{time}$
 - b. $Power = \frac{1}{2}A\rho v^3$
9. Utilization:
- a. Generators for electrical production and engines for motion have revolutionized the world (see Physics sub-topics 5.4 and 11.2)
 - b. The engineering behind alternative energy sources is influenced by different areas of physics (see Physics sub-topics 3.2, 5.4 and B.2)
 - c. Energy density (see Chemistry sub-topic C.1)
 - d. Carbon recycling (see Biology sub-topic 4.3)
10. Aims:
- a. Aim 4: the production of power involves many different scientific disciplines and requires the evaluation and synthesis of scientific information
 - b. Aim 8: the production of energy has wide economic, environmental, moral and ethical dimensions
11. Read section 8-1, pgs 314-326, in your textbook.
12. Write a definition for each of the terms listed below within the context of this section.
13. Terms:
- a. primary energy _____

 - b. secondary energy _____

 - c. specific energy _____

 - d. energy density _____

- e. renewable source _____

- f. non-renewable source _____

- g. fossil fuel _____

- h. Sankey diagram _____

- i. induced reaction _____

- j. chain reaction _____

- k. critical mass _____

- l. moderator _____

- m. fuel rods _____

- n. heat exchanger _____

- o. control rods _____

p. photovoltaic cell _____

q. hydroelectric power _____

14. Explain why the equation $Power = \frac{1}{2}A\rho v^3$ is a theoretical maximum. _____

15. Nature of Science: How can present and future energy needs be best met, without compromising the future of the planet? _____

16. This assignment may be typed or neatly printed. Drawings may be freehand, but try to make use of the ‘Shapes’ or ‘Insert Clipart’ functions of MS Word. If you submit this assignment electronically, the filename must be in the following format, “LastnameFirstinitialPerXReadActX-X”. You do not need include a copy of these instructions with the assignment you hand in.