SUGGESTED REFERENCES

- **Handy Science Answer Book**
  Science and Technology Department
  Carnegie Library of Pittsburgh, 1994

- Couper, Heather and Nigel Henbest
  How the Universe Works
  Reader's Digest, 1994

WEBSITES

- *Power from the Earth's Heat*
  Geothermal Education Office, 1997
  http://www.geothermal.marin.org

- *Fundamentals of Physical Geography*
  Department of Geography,
  Okanagan University
  http://www.geog.ouc.bc.ca/physgeog/contents/10h.html

- *Geothermal Electricity Production*
  Department of Energy
  http://www.eren.doe.gov/geothermal

NATIONAL SCIENCE EDUCATION STANDARDS

Science Content Standards:

K - 4	Properties of Earth Materials Abilities of Technological Design
5 - 8	Transfer of Energy

CREDITS

EDUCATOR ADVISORY PANEL

Fred Barch, M.S.
Rosemary Botting, M.S.
Debra A. Murnan, B.A.
John A. Murnan III, M.S.

PRODUCTION CREDITS

WRITER/PRODUCER:	Deborah Greenspan
ASSOCIATE PRODUCER:	Lee Kane
EDITORS:	M.B. Chaney & Jon Glassman
NARRATORS:	Cyrilla Baer & Joshua Forman

SCIENCE SCREEN REPORT FOR KIDS®

Science Brought To Life In The Classroom

SCIENCE SCREEN REPORT FOR KIDS is a proud participant in the Presidential Awards for Excellence in Mathematics and Science Teaching. For more information visit ***www.nsf.gov/pa***

1000 Clint Moore Road, Suite 211, Boca Raton, FL 33487
tel: 1.800.232.2133 email: info@ssrvideo.com
www.ssrvideo.com

SCIENCE SCREEN REPORT® FOR KIDS

VOLUME 12 ISSUE 1

ENERGY FROM EARTH'S INTERIOR

Accreditation Board for Engineering and Technology

Presidential Awards for Excellence in Mathematics and Science Teaching

Junior Engineering Technical Society
www.jets.org

SYNOPSIS

Before the world's supply of fossil fuels diminishes further, it is important to develop renewable sources of energy from solar, wind, geothermal power, and other sources. Scientists believe that some future energy can come from hot dry rocks, huge granite bodies lying two to three miles beneath the surface, that may be used as the heating elements of future geothermal power plants.

This edition of SCIENCE SCREEN REPORT FOR KIDS explores how hot dry rocks were formed billions of years ago, the techniques scientists use to locate them, and the technology that will allow them to be mined for heat to provide future generations with an abundant source of clean, renewable power.

CURRICULUM UNITS	RUNNING TIME
■ CARTOGRAPHY	14:27
■ EARTH SCIENCE	
■ ENVIRONMENTAL SCIENCE	
■ GEOLOGY	
■ PHYSICAL SCIENCE	

BACKGROUND

Earth's core has been a fiery furnace since our planet's beginning. It is still unbelievably hot. Surrounding the core is the mantle, a hot stew of minerals about 2,900 kilometers thick. The mantle's molten matter, or magma, rises toward the surface, carrying heat toward the earth's crust. This magma heats rocks and rainwater that has seeped into the crust.

Some of this superheated water travels back up through faults and cracks in the crust and reaches earth's surface as hot springs and geysers. The heated water that remains underground forms geothermal reservoirs that can be tapped as a source of power, providing that conditions are right to efficiently drill below the earth's crust and bring the hot water and steam to the surface where it can be channeled to generate geothermal power.

Lying above some of these geothermal reservoirs are hot dry rocks, common granites that floated to the top of the molten planet billions of years ago. Scientists have found a way to force cold water at high pressure into tiny fractures in these granites. The water, superheated by the granites, will turn into steam and gush to the surface with enough force to drive a turbine.

However, before this can happen, the natural fractures in the rock have to be widened sufficiently so that water can be forced through the impermeable underground granites. The pressures employed must also be strong enough to overcome the weight of miles of earth on top of the rock.

Hot dry rock technology was tested in New Mexico where, after seventeen years, it was determined to be inefficient because the granite there fractured vertically rather than horizontally, and the amount of energy needed to bring the water and steam up above ground was too costly.

However, in Australia, a geologically stable continent, scientists are using the latest technologies in geology and computer imaging to locate granite bodies that will fracture horizontally. The goal is to develop a multi-level geothermal power plant that can provide clean, renewable power for many, many years.

CAREER POSSIBILITIES

- CARTOGRAPHER
- EARTH SCIENTIST
- ENGINEER
- ENVIRONMENTALIST
- GEOLOGIST
- LAND/RESOURCES MANAGER
- MINING ENGINEER
- SEISMOLOGIST

VOCABULARY

Biomass: . . . . . plant material or animal waste used as a source of fuel
Density: . . . . . being close, thick or compact; the ratio of mass or quantity of matter to an object's bulk or volume
Element: . . . . . a substance that is not separable by ordinary chemical means
Fusion reaction: . . the union of atomic nuclei that causes the release of huge quantities of energy
Geothermal: . . . relating to the internal heat of the earth
Geyser: . . . . . a natural hot spring that ejects a column of water and steam into the air
Granite: . . . . . a hard igneous rock
Hydroelectricity: . the production of electricity from water power
Ignite: . . . . . to set on fire or catch fire
Inefficient: . . . . . not producing the desired effect; wasteful
Interstellar: . . . . located or taking place among the stars
Magma: . . . . . molten rock under the earth's crust
Mineral: . . . . . naturally occurring substances usually obtained from the ground; ore
Network: . . . . . an interconnected chain, group, or system
Pressure: . . . . . the application of force by direct contact with something else
Radioactivity: . . . the property of some elements to give off energy, caused by the breakdown of their nuclei or core
Renewable: . . . . able to be made new, fresh, or strong again
Reservoir: . . . . . a place where something is kept for use when wanted
Solar system: . . . a system of planets or other celestial bodies orbiting another star
Theory: . . . . . a statement or principle that explains an accepted group of facts

CRITICAL THINKING EXERCISES

1. After showing the video, ask your students the following:
   a| Why do we need to find renewable sources of power?
   b| How do we know that the interior of the earth is hot?
   c| What are geothermal reservoirs and how are they created?
   d| What are hot dry rocks and how were they created?
   e| How do scientists locate hot dry rocks?
2. Have students talk about magma, lava, and volcanoes.
3. Discuss the comforts of civilization and the corresponding cost in energy.
4. Discuss turbines and how they generate energy.
5. Have students research other renewable energy sources (solar, wind, hydroelectric) and discuss the pros and cons of each.
6. Arrange a visit to a nearby power plant to see electricity being made.