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REACTIONS

FROM THE AMERICAN NUCLEAR SOCIETY TO TEACHERS INTERESTED IN THE NUCLEAR SCIENCES

ANS Offers New Teaching Resources

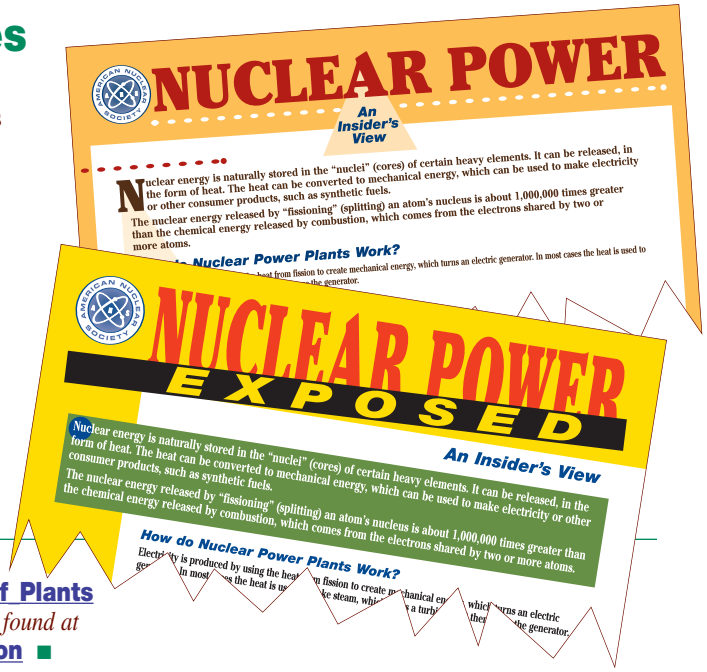
-Nuclear Power: An Insiders View

The American Nuclear Society (ANS) Public Information Committee has created a convenient, two page, four color graphic presentation that explains how nuclear power plants work and why they are important to us. This new resource provides a clear, colorful and easily understood graphic depiction of the key parts of a nuclear power plant. It is available at **http://www.ans.org/pi/insiders/docs/power-pro-v.pdf**

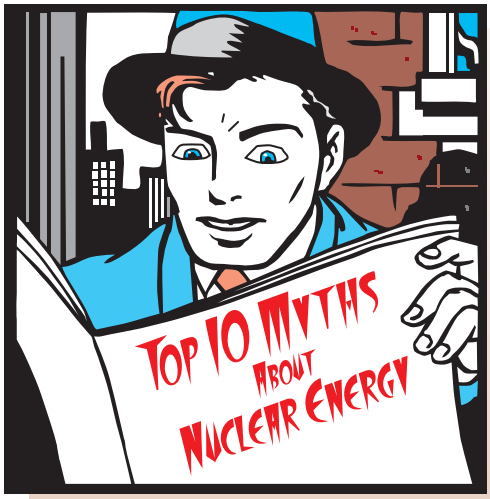
For more bold presentation of the same information, also in a two page, four color format, check out "Nuclear Power EXPOSED" at **http://www.ans.org/pi/insiders/docs/power-bold-v.pdf**

Animated Graphic: Boiling Water Reactor

Action gets more attention than a still image. So, an animated diagram of a boiling water reactor is available for your classroom use. This new resource is located at **http://www.ans.org/pi/insiders/anim/**



More information about types of reactors can be found at
http://www.aboutnuclear.org/view.cgi?fC=Electricity,Types_of_Plants
Additional information about the operation of a nuclear power reactor can be found at
http://www.aboutnuclear.org/view.cgi?fC=Electricity,Operation ■



Get the Facts – Dispel Myths

Myths are invented stories, ideas, or concepts; imaginary or fictitious things; or an unproved or false collective belief that is used to justify a social institution or practice. Myths may entertain us, charm us, frighten us, confuse us or even mislead us.

Many myths exist about nuclear energy. Often, those unsubstantiated and inaccurate myths lead people to fear or oppose nuclear energy. With that in mind, the Public Information Committee of the American Nuclear Society collected the TOP 10 MYTHS about Nuclear Energy and provided the truths to dispel the myths.

The TOP 10 MYTHS and the truths are presented in a colorful, appealing and "retro" graphic manner, at **http://www.ans.org/pi/resources/myths.pdf** The document prints as two pages. You can use this four color presentation as you teach about the energy applications of nuclear science and technology.

One myth is that Nuclear energy is bad for the environment.

MYTH #3

Nuclear energy is bad for the environment.

Truth: Nuclear reactors emit no greenhouse gasses during operation. Over their full lifetimes, they result in comparable emissions to renewable forms of energy such as wind and solar[3]. Nuclear energy requires less land use than most other forms of energy.

A single page "text only" version of the list, without the colorful graphics, is available at **http://www.ans.org/pi/resources/myths/** ■

Recent Developments Support a Nuclear Renaissance

Nuclear power plants offer significant advantages over other energy sources for electrical generation. Here are a few frequently cited advantages:

- Nuclear power plants require far less land area than other non-fossil fueled options for generating electricity
- Waste materials from nuclear power plants are contained
- Supplies of uranium for nuclear fuel are relatively plentiful
- A nuclear plant has the capacity to be a large provider of ***baseload power*** (day and night) and is not subject to changes in availability of wind or sunlight
- Cost per Kilowatt hour for electricity produced with nuclear is lower than fossil fuel sources

Power uprates at some plants have increased total capacity for America's fleet of nuclear power plants. The nuclear industry has, over a number of years, increased its electricity output at existing plants by shortening the length of outages required for refueling and maintenance.

Supporters of nuclear energy have long monitored the growing demand for electricity and wondered how long it might take before America's utilities would recognize the advantages of nuclear power and begin in earnest to build new nuclear plants. Many factors seemed to get in the way of progress. It appeared that no company was willing to be "first" to begin construction. And, there were concerns about obtaining financing for construction.

Observers are now encouraged by signs that suggest we may soon see construction of a new nuclear plant.

- Some environmentalists who were previously anti-nuclear have become pro-nuclear
- Politicians, including some who have been slow to embrace the technology, have made statements about the need for nuclear to be part of the energy mix
- A recent announcement of government loan guarantees for nuclear plant construction
- Staff additions have been made by the U.S. Nuclear Regulatory Commission, in part to establish an office devoted to overseeing construction of new plants
- NRC has received applications for 17 new projects and plans have been announced for additional applications to be filed
- Contracts have been signed for the construction of four plants
- Electrical utilities are funding programs for training and retraining nuclear workers

baseload - the minimum amount of power that a utility or distribution company must make available to its customers; baseload values vary from hour to hour in most commercial and industrial areas.

power uprate - a change in allowed heat output at a reactor resulting in the capacity to produce more electricity; changes are subject to NRC approval of requests for an amended license; uprates may require changes or modifications to the plant, all under the oversight of NRC ■

Argonne Exhibit Features Unique Artifacts

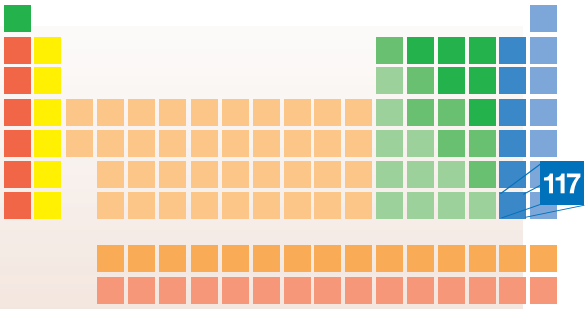
Argonne National Lab (ANL), 25 miles southwest of Chicago, IL, is the site of an interesting Nuclear Energy Exhibit, which offers a wealth of historical information.

The exhibit, which was refurbished and re-opened in December 2008, features artifacts from the early days of nuclear energy, including items from the Chicago Pile-1 (CP-1), site of the first sustained chain reaction controlled by humankind. One display case features items used by Enrico Fermi in his lab from 1944 to 1947. Other parts of the exhibit highlight ANL's unique role in development of reactor types.

More information about the exhibit and photos from its reopening, as published in *NUCLEAR NEWS*, are available at **http://www.new.ans.org/pubs/magazines/download/a_622**

The exhibit is inside the gated area of the lab, so advance arrangements are required to visit. Group tours of the Nuclear Energy Exhibit and other laboratory facilities are offered for school classes and others with an interest. For information about scheduling group tours, visit **http://www.anl.gov/Administration/visit.html** or contact Pat Canady at canaday@anl.gov or phone her at 630-252-5562. ■

Superheavy Element 117 Synthesized



Scientists from Russia and the United States collaborated to produce element 117. Element 117 had been the only missing element in row seven of the periodic table. The successful synthesis of just six atoms of the material was reported early in April 2010. Radioactive berkelium was bombarded with calcium ions to synthesize the new element 117.

Scientists from two Russian research facilities collaborated with two American universities and two U.S. national laboratories for the two-year project.

The project brought together the capabilities of Oak Ridge National Laboratory, Lawrence Livermore National Laboratory, the Joint Institute of Nuclear Research (Dubna, Russia) the Research Institute for Advanced Reactors (Dimitrovgrad, Russia) and researchers from Vanderbilt University (Nashville, TN) and the University of Nevada, Las Vegas.

Details of the collaboration and synthesis are provided in a news release from Lawrence Livermore National Laboratory. The release, located at **https://publicaffairs.llnl.gov/news/news_releases/2010/NR-10-04-02.html** includes a link to an animated video.

Additional information about the collaborative effort was reported at **http://www.sciencenews.org/view/generic/id/57964/title/BREAKING_NEWS_Superheavy_element_117_makes_debut** at **http://physicsworld.com/cws/article/news/42272** and in other locations. To find other references to this discovery, enter the phrase - element 117 - in your browser. ■

Albuquerque Museum Focuses on Nuclear Science and Its History

The National Museum of Nuclear Science & History, Albuquerque, NM, provides visitors a unique opportunity to learn about early research in nuclear science and technology, to view interesting artifacts, to learn about some of the pioneers in the nuclear field, to explore today's applications and to glimpse projections into the future. Nuclear power, medicine, X-Ray history, uranium mining, weapons, and radiation are featured in major exhibits.

The museum had its beginnings in 1969. In 1973, as the only public museum preserving the history of the nuclear industry, it became the National Atomic Museum. In 1991, it was chartered by Congress as the official Atomic Museum of the United States.

In April 2009, the recently renamed National Museum of Nuclear Science & History moved into a new 30,000 sq. ft. facility on a 12-acre site near Kirtland Air Force Base in southeast Albuquerque, NM. The grounds outside the museum include planes, rockets, and missiles.

The National Museum of Nuclear Science & History is open daily (except New Year's Day, Easter, Thanksgiving, and Christmas Day). For more information about current exhibits, museum location, and admission fees, visit **http://www.nuclearmuseum.org/**

The June 2009 issue of *NUCLEAR NEWS* (an ANS publication) included an article about the museum's reopening in its new location. The article includes additional information and photos. The article can be viewed at **http://www.new.ans.org/pubs/magazines/download/a_633** ■

Nuclear Sciences

Project #75 — *Activity:*

Using New Resources in Your Classroom

On page one of this issue, we've introduced you to two new printed resources, TOP 10 MYTHS about NUCLEAR ENERGY and NUCLEAR POWER: AN INSIDERS VIEW (the alternate, bold version is Nuclear Power EXPOSED), and an animated graphic of a boiling water reactor. In this activity, we'll provide you with some help in utilizing those resources.

However you teach about the function of a nuclear power plant, students can always benefit from reinforcement. You can print out copies of the two resources for use by students. Then, provide them with the TRUE or FALSE checklist shown below. Allow them to use the printouts as a resource while they answer the questions.

TOP 10 MYTHS

_____ 1. It is safer to work in a nuclear power plant than an office.
_____ 2. A nuclear power plant uses less land area than most other forms of energy.
_____ 3. A significant portion of an average American's radiation dose comes from nuclear power plants.
_____ 4. American nuclear reactors could explode like a bomb.
_____ 5. The majority of used nuclear fuel can be recycled.
_____ 6. According to surveys, very few Americans support nuclear power.
_____ 7. No shipments of used fuel have ever occurred in the U.S.
_____ 8. Some U.S. transportation is already powered by nuclear-generated electricity.
_____ 9. The risk of a Chernobyl-type accident is high in the U.S.
_____10. A large percentage of used nuclear fuel remains highly radioactive for 10,000 years.

Continued next page

ANS at Workshops and Exhibits

*Scheduled as of April 30, 2010**

June 12, 2010, San Diego, CA

ANS will hold a full-day workshop for teachers, *Detecting Radiation in Our Radioactive World*. Registration deadline is May 27.
Complete workshop information is available at
http://www.ans.org/pi/edu/teachers/workshops/

August 1-5, 2010, Denton, TX

ANS will be an exhibitor during BCCE 2010, the 21st Biennial Conference on Chemical Education, to be held at University of North Texas. ANS will also present a session at this conference. Information about the BCCE 2010 conference is available at **http://www.bcce2010.org/**

October 30-Nov 2, 2010, Kansas City, MO

NSTA Regional Conference
ANS will be an exhibitor at the NSTA regional and will hold a workshop (date and time TBA). No charge for workshop; must register for NSTA conference.
For information about the NSTA conference in Kansas City, go to
http://www.nsta.org/conferences/2010kan/?lid=hp

November 11-13, 2010, Baltimore, MD

NSTA Regional Conference
ANS will be an exhibitor at the NSTA regional and will hold a workshop (date and time TBA). No charge for workshop; must register for NSTA conference.
For information about the NSTA conference in Baltimore, go to
http://www.nsta.org/conferences/2010bal/?lid=hp

November 13, 2010, Las Vegas, NV

ANS will hold a full-day workshop, *Detecting Radiation in Our Radioactive World*. When available, additional information will be posted at **http://www.ans.org/pi/edu/teachers/workshops/**

December 2-4, 2010, Nashville, TN

NSTA Regional Conference
ANS will be an exhibitor at the NSTA regional and will hold a workshop (date and time TBA). No charge for workshop; must register for NSTA conference
For information about the NSTA conference in Nashville, go to
http://www.nsta.org/conferences/2010nas/?lid=hp

*Workshop and Exhibit list is subject to change. New events are added periodically.
Visit our web site at **www.ans.org/pi/edu/teachers/workshops** to see if something has been added or changed. ■

Nuclear Sciences

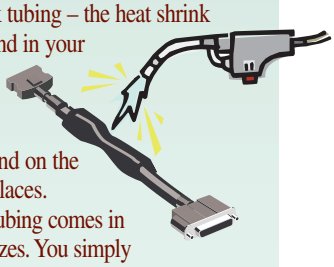
Continued from page 3.

Nuclear Power: Insiders View/EXPOSED

_____ 1. Nuclear power plants can be easily recognized because they all have a large cooling tower.
_____ 2. The purpose of a cooling tower is to release excess radioactive material.
_____ 3. In combustion, chemical energy comes from the electrons and combustion produces more energy than fission of an atom.
_____ 4. The job of a turbine is to spin a generator.
_____ 5. In a nuclear reactor, mechanical energy is converted into heat energy.
_____ 6. The job of the condenser in a boiling water nuclear power plant is to change steam into water.
_____ 7. In a boiling water reactor (BWR), the steam from the reactor goes directly to the generator to make electricity.
_____ 8. After passing through a turbine, steam from the reactor goes to the condenser where it is cooled to liquid water before returning to the reactor.
_____ 9. The job of control rods in the reactor is to absorb electrons.
_____10. Nuclear energy is stored in the nuclei of certain heavy elements.
_____11. A reactor core contains fuel rods filled with ceramic-based fuel pellets containing uranium.
_____12. Nuclear power plants have near-zero carbon emissions.
_____13. A uranium fuel pellet has about as much energy as one barrel of oil.
_____14. Control rods in the reactor can stop a nuclear chain reaction.
_____15. Electricity is produced inside the reactor vessel. ■

Answer Key for TOP 10 MYTHS: 1T, 2T, 3F, 4F, 5T, 6F, 7F, 8T, 9F, 10F
Answer Key for NUCLEAR POWER: 1F, 2F, 3F, 4T, 5F, 6T, 7F, 8T, 9F, 10T, 11T, 12T, 13F, 14T, 15F

How does a particle accelerator impact your daily life?



An electron accelerator is used to make heat shrink tubing – the heat shrink tubing found in your car, in your VCR, in airplanes, in computers, on telephone cables and on the ends of some shoelaces.

Heat shrink tubing comes in many colors and sizes. You simply wrap it or slip it around cables or wires. Then, you wave a heat gun over it and the product shrinks to form a tight seal. Varieties of this material prevent wear, keep water out, keep electricity in, etc.

When normal polyethylene is heated it simply melts into a mess of goo, but heat shrink tubing behaves far differently.

During manufacture, polymer pellets are melted. This material flows through an extruder and into cool water where the material solidifies into tubes. The tubing passes though an opening in a six-foot-thick wall and through the beam of an electron accelerator. Exposure to the beam changes the chemical structure of the material. As a result, the molecules "remember" their positions even after they are stretched apart.

Next, the manufacturing process heats the material and uses air to inflate it like a balloon. The tubing is now a larger diameter than before and it "sets up" at the larger size – until it is heated again. Then, it shrinks to its original size and forms a tight seal.

To read more, go to
http://www.symmetrymagazine.org/pdfs/201004/april_2010.pdf
and look for "A wiry protector" on page 32. ■

Want to Avoid Typing URLs?

This issue of ***ReActions* is available online** with all URLs "hot linked" for easy access to resources without typing detailed web addresses. Go to
http://www.ans.org/pi/teachers/reactions
While there, sign up for email notification of future online issues of *ReActions*. ■

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The Future is in the Atom

In This Issue:

Details Inside!

ReActions
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