Volume 17 • April 2001

REACTIONS

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

Electricity Crisis Catches Attention of Americans

Rolling Blackouts Hit California

Our dependence on electricity is pervasive and almost totally complete.

Electricity awakens us, entertains and informs us, makes our coffee, cooks our food (unless we use increasingly expensive natural gas), dries our hair, washes our dishes. It lights our garage, opens the garage door, regulates traffic flow (for convenience and safety), hoists us to the top of tall buildings, cools our workspace, connects us to the internet, downloads music and data files, copies our documents, prints our newspapers and magazines, and captures digital images.

The magical rush of electrons powers medical equipment for diagnosis, surgery and ongoing treatment. It protects our homes against intruders and informs us of danger. It connects us to friends and business associates, records their messages, orders products, manufactures clothing, processes and preserves food, tracks inventories, speeds order fill in restaurants and warehouses.

Relatively few Americans "take a pass" on its convenience. We use it from morning until night and often depend upon it even during our sleeping hours. Yet, we take electricity for granted and don't appreciate it until it is missing.

A mixture of appreciation and apprehension has welled up in the minds of thousands of Californians who have missed their electricity lately, even if for only an hour at a time. Californian's are appreciative when the electrons flow. And, they are apprehensive about when the flow may stop again. They disdain inconvenience, fear danger, worry about business disruption, and dread economic consequences of electrical shortages

Politicians and pundits, individual citizens and interest groups have all voiced opinions and taken positions on what got California into the electricity crisis it faces. Opinions differ. Some people allege a conspiracy among energy suppliers. Some take a position which almost makes it seem that access to electricity is a "right" or a public service that should be provided by power companies without regard to changing costs for generation and distribution.

Media outlets report rolling blackouts, urgent calls for energy conservation, and complicated legislative efforts to resolve the crisis. We all wonder, "Can this crisis happen in my state?"

What Happened in California?

Many factors converged to produce this crisis. Here is some background.

Partly because of very stringent restrictions on the construction of new generating plants, there were no *significant* additions to generating capacity in the state in over a decade. Yet, California's population and demand for electricity continued to grow. Current demand for electricity in California is greater than the available supply. Electricity available for

Continued page 2

Workshops Provide Knowledge and Tools

Here are some comments from a recent survey of the teachers who attended workshops in 2000:

"This was an excellent workshop...."

"Your workshop was great....The thoroughness and scientific depth was impressive. It should really help new science teachers."

"Thank you for your efforts!"

"I go to a number of science-related workshops each year. This one was the best I've been to in recent memory."

Each year, ANS conducts, sponsors or supports many teacher workshops, providing information about nuclear science and technology and its impact on our lives. Last year, more than 1,000 teachers attended one of the 40 ANS workshops and received a surplus civil defense Geiger counter for their classroom.

Many teachers have attended the 90-minute introductory sessions (Detecting Radiation in Our Radioactive World) that ANS conducts at NSTA regional meetings each year. Others have benefitted from full-day (6-hour) workshops conducted by ANS members. At these full-day events, more information is covered in greater depth and there is time for more hands-on activities.

Visit the ANS web site www.ans.org for more information. The workshop schedule is posted at www.ans.org/pi/teachers/workshops/schedule.cgi. If a workshop isn't listed in your area, check again in a few weeks! The schedule is updated periodically. ■

Rolling Blackout... continued from page 1.

purchase from neighboring states is, at times, insufficient to "make up" for California's shortfall in supply. An aging electrical grid may complicate the process of transferring electricity long distances in the state. In addition, there is limited transmission capacity between California and points East of the Rocky Mountains.

What about Deregulation?

California instituted a deregulation plan in 1996. The plan required investor-owned electrical utility companies to divest of much of their generating capacity and to sell the power they generated with their remaining facilities through the California Power Exchange. Any power that utilities needed for distribution to retail customers would be purchased through the California Power Exchange.

The theory was that this plan would increase competition and reduce prices for electricity. It was thought that outside companies would be interested in selling power on a "wholesale" basis to the "retail" power providers.

Under the deregulation plan, rates charged to consumers were "fixed" or limited. But there was no limit on what utilities would have to pay for the electricity they bought on the wholesale market. Utilities were forced to purchase power on a daily "spot" market; the plan did not allow any long-term contracts between electrical "retailers" and the "wholesalers" who generated the power.

Other Factors?

A significant portion of the generating capacity in California consists of older plants. These plants require maintenance which leads to periodic and sometimes unexpected "downtime." This had the effect of reducing available supply.

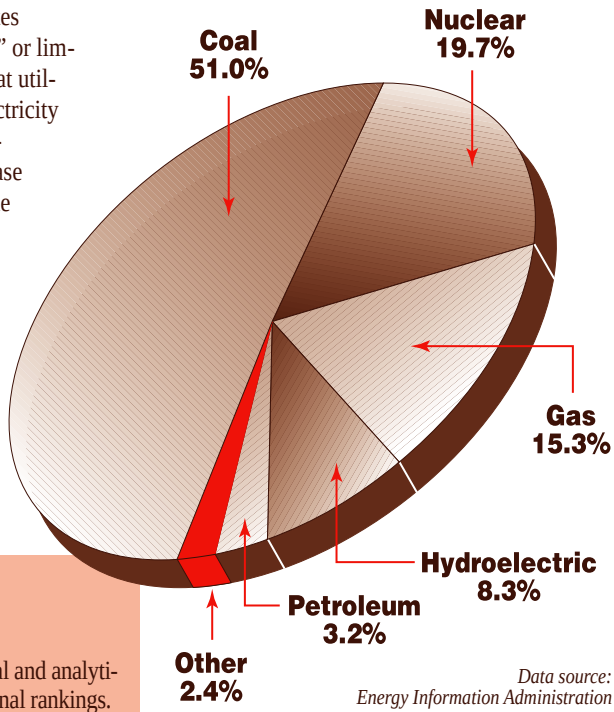
Increasing demand and limited supply raised wholesale "spot" prices dramatically. Major investor-owned utilities like Pacific Gas and Electric (PG&E) and Southern California Edison (SCE) were forced to keep supplying electricity to consumers. But, they weren't able to pass along the increased costs. They were paying more for the electricity than they could charge. As a result, they piled up huge debts and teetered near bankruptcy.

California's situation led to a variety of emergency actions by state officials. Efforts to solve the problem are ongoing.

Meanwhile, some smaller generating companies, because they aren't being paid, have stopped generating power. This exacerbated the power shortage. Then, in mid-March, rising temperatures increased demand for electricity to run air conditioners. In order to avoid "crashing" the entire electrical grid, the Independent System Operator (ISO) ordered utilities to cut power usage. Rolling blackouts followed — for the second time in 2001. This round of blackouts affected southern California, which had been spared in earlier blackouts. As a result, thousands more people began to take the

Continued page 3

Electricity Generation, 1999
Energy Source



Data source: Energy Information Administration

For Additional Information

http://www.eia.doe.gov/cneaf/electricity/st_profiles/toc.html
State electricity profiles from Energy Information Administration, the independent statistical and analytical agency within the U.S. Department of Energy. Contains state-by-state profiles and national rankings.

http://www.eia.doe.gov/cneaf/electricity/epav1/intro.html
The "Introduction" to Electric Power Annual (1999) includes a map with summary information on the status of electricity deregulation.

http://www.eia.doe.gov/cneaf/electricity/epav1/state.html
Detailed information the status of deregulation of electricity in all states.

http://www.eia.doe.gov/cneaf/electricity/page/restructure.html
Information on restructuring (a list of resources).

http://www.eia.doe.gov/cneaf/electricity/epav1/elecprod.html
This section from the Electric Power Annual (1999) provides summary information about electricity production in the U.S., including "Net Generation by Energy Source."

ftp://ftp.eia.doe.gov/pub/pdf/international/0484(2001).pdf
International Energy Outlook

http://www.eia.doe.gov/cneaf/electricity/california/california.html
Information on the California Electricity Situation, provided by Energy Information Administration of DOE.

Http://www.eia.doe.gov/oiaf/aeo/index.html#preface
Annual Energy Outlook (2001 with projections to 2020) as prepared by Energy Information Administration of DOE (page contains the preface, with access to other portions of the report).

http://www.eia.doe.gov/cneaf/electricity/page/fact_sheets/supply&demand.html
Information about supply and demand for electricity; shows capacity margin and offers links to other documents.

http://www.naruc.org/Stateweb.htm
A list of web sites for state public utility commissions, provided by National Association of Regulatory Utility Commissioners (NARUC) on their web site.

http://www.energy.ca.gov/index.html
Homepage of the California Energy Commission

http://www.consumerenergycenter.org/index.html
Consumer Energy Center from California Energy Commission

http://www.energy.ca.gov/education/index.html
Energy Education information from California Energy Commission

http://www.energy.ca.gov/reports/2000-07-14_200-00-002.PDF
Report from California Energy Commission on Energy Demand 2000-2010 ■

Rolling Blackout...

electricity shortage seriously.

People in some remote areas of the world are accustomed to having electricity for only an hour or two of the day — if at all. Californians affected by the blackouts have had difficulty dealing with just an hour without electricity. And, in all probability, most of us would have difficulty in the same circumstances.

Yet, despite our nation's dependence upon electrical energy — and other energy sources, for that matter — America lacks a coherent energy policy. And, while there have been calls for such a policy, there has been little political will to develop one. The California crisis seems to be changing that.

You and your students will probably see and hear more about that process in the months ahead. America is, perhaps, more energy conscious now that it has been at any time since the oil crisis of the 70's. In this issue, we've included a special activity to help you and your students explore this issue and how it applies to your own state. (See activity at right.) ■

Project 64 – Activity

The Electricity Crisis...Can It Happen Here?

An Activity for Research and Classroom Discussion

Could the California situation happen in your state? Answering that question demands gathering information about many things. In the process, you'll become better-informed.

Supply vs. demand

What is the average demand for electricity here?
What is the peak demand?
During what times of day and what times of year is demand highest?
What is the amount of generating capacity in my state?
Can it meet peak demand?
Is my state an energy importer or exporter?
What is the projected need for energy in the years ahead? What time frame?
Is more generating capacity needed? Is it being built? Why or why not?

Energy mix for electrical generation

What are the percentages of electricity generated using: nuclear, coal, hydro, oil, natural gas, other sources (solar, wind, etc)
What impact will this mix have on electricity costs and availability? (consider price trends, market volatility, other demand for the energy source, generation costs using various energy sources, etc.)

Continued next page

Careers

Nuclear Science and Technology: Career Opportunities for Non-Scientists

Additional Photos

Many of the news stories reported in *REACTIONS* refer to physicists, nuclear engineers, chemists, biologists and people in other scientific fields. But, not everyone who contributes to or utilizes nuclear science and technology is a university-trained scientist.

Nuclear science and technology fields, like other scientific disciplines, require the services of non-scientists. In fact, without the highly developed skills of these non-scientists, progress in scientific research could be delayed or prevented.

In our January issue (full-color and posted on our website at www.ans.org/pi/teachers/reactions/) we gave readers information about exciting new research into the nature of matter. That research is being done at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Lab.

The services of highly skilled tradespeople were required to build the complex equipment. These people have extensive experience and skill in metal working, electronics, and other areas. Without them, RHIC couldn't have been constructed as quickly and efficiently.

Students who want to contribute to scientific disciplines but prefer a less intensely academic training or those who like hands-on or manual work might be encouraged to explore skilled trade options. Opportunities exist for electronics technicians, metal workers, plumbers, and many other specialists. ■

Chris Cleary of the Central Shops Division at Brookhaven National Laboratory makes measurements on a snake magnet coil form. Each coil form is made from an aluminum tube with grooves machined into it in a spiral fashion. After additional parts and insulation are installed, the coil forms are incorporated into helical magnets to be used in BNL's Relativistic Heavy Ion Collider (RHIC). The magnets are integral to parts of the research conducted in the RHIC. Courtesy of Brookhaven National Laboratory.

Nuclear Sciences

Continued from page 3.

Deregulation

What is "regulation" as applied to utilities like electricity, natural gas, telephone service, etc.?
Is our state preparing for deregulation?
If so, is the plan like California's? What is different? Is that good?
Other states (like Texas and Pennsylvania) have deregulated and aren't having the problems that California is experiencing.
Why is that? What did those states do differently? Were the circumstances different?

What other energy issues should we be concerned about in our state?

How do environmental concerns relate to our energy needs and choices? Are some energy sources more environmentally friendly than others? How?

How should concerns about sustainability (sustainable development) impact our energy choices?

What impact can we make with energy conservation measures? Can we solve the entire supply problem this way?

Some Web based Information Resources

www.ans.org
www.ans.org/pi/energyaction
www.nei.org
www.iaea.org/worldatom/
www.doe.gov
www.eia.doe.gov
www.nrc.gov

For additional web sites, see the sidebar story on page 2 or utilize your web browser.

Looking to the Future — Power from Small Nuclear Generating Installations

The view of many nuclear engineers is that the future of nuclear power generation is in small reactors. An overview of that possibility is found in "Alternative Nuclear Power," an article in the April edition of *The World & I*, a monthly publication of *The Washington Times*.

The online edition is available at http://www.worldandi.com. The April issue online contains the article with information about new or "alternative" ways to generate power using nuclear technology. The article is found at http://www.worldandi.com/public/2001/April/nuclear.html

(Access to some portions of the site is restricted to subscribers.) ■

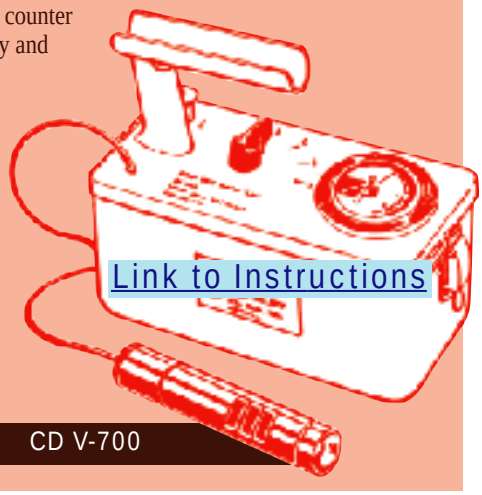
Connecting a Speaker to Your Geiger Counter

Simple Solution Works Well

Making your bright-yellow, CD V-700 Geiger counter audible for classroom demonstrations is easy and inexpensive. The only tough part has been attaching wires to the "phone" connector on the Geiger counter. We believe we have a simple and easy solution!

For complete instructions and photos, go to the on-line version of *REACTIONS* at www.ans.org/pi/teachers/reactions/ and click on the April issue. Locate this article and you will find a link to the instructions.

And, while visiting the *REACTIONS* page, be sure to register for e-mail notification of future web-only issues. ■



CD V-700

Go Go ... Science News on the Web

Looking for an on-line source of interesting news from the world of science? Want information on topics from biology to physics to chemistry? Intrigued by interactions of mind and body? Like to read about everything from science textbooks to space transportation to chronic fatigue syndrome to the nature of water?

The web site www.scienceagogo.com might become a favorite place for you.

In mid-March, the site carried promotional messages with links to 20 stories. All had been posted within the last three months. At least one was a story which had been distributed only a few weeks before as a press release and which appeared as a news story in a publication from a well-known national laboratory.

As a plus, there were several articles about nuclear physics, uranium, and related topics.

Site visitors may be disappointed to find that articles don't contain references for further research. But, this more "popular" or casual approach may be just the ticket in convincing students to use the web for science learning.

The site also offers a searchable News Archive, a discussion forum, and book recommendations. ■

The next REACTIONS will be a WEB-ONLY edition!

- Don't miss it!
- Get Email notification when it is posted...
- Sign up today! <www.ans.org/pi/teachers/reactions/>