My Fellow RRPTs,

Working side by side with the Chairman this last year has been both exciting and educational for me. Just what are the “Robert’s Rules of Order,” anyway?

Following the protocol of the great NRRPT leaders in the past, we are continuing to forge into new frontiers with the Registry. Recently, an ad hoc committee was established to take the Registry to an international standing. Two Canadian citizens have joined in to help the Registry build a stronger relationship with the RPTs in Canada. One of them, Dave Tucker, is now on the Panel of Examiners. The ad hoc committee has been working non-stop to build a bank of questions focused on Canadian regulations and practices, and converting English units to SI units in existing questions. At the pace this committee is keeping now, we expect to have the Canadian version of the exam ready by August 2005. You can read more on this subject on Page 10.

I want to congratulate our newest members who passed the NRRPT exam this past February and encourage the others that came so close to hang in there and sit for the next exam while it’s still fresh in your minds. It’s a lot of hard work, but well worth the effort. We are 4,777 RRPT members strong now and continuing to grow stronger every year. Thank you all!

I would like to remind all of you to actively participate in the Registry by keeping the lines of communications open. The easiest way to communicate with the Registry is to use the NRRPT web site at www.nrrpt.org. The NRRPT Forum is just the place to send your ideas and comments. We appreciate all your ideas and welcome suggestions regarding the betterment of the Registry.

Continued on Page 6
The purpose of this paper is to reacquaint ourselves with and to remind ourselves how to apply a simple method from health physics' radio-analytical notes to determine the resolving time of a Geiger-Mueller detector.

Briefly, a Geiger-Mueller (G/M) detector becomes insensitive to ionizing events immediately following the initial event. The elapsed time during which the detector is insensitive is referred to as the resolving time and also the end of that time marks the beginning of the next pulse that exceeds the triggering height limit. The dead time is defined as the elapsed time that marks the beginning of the first avalanche of ions and the beginning of the next avalanche of ions; during this period, only the first pulse is counted. The recovery time is the period during which the output pulse grows larger resulting from the avalanche of ions caused by another ionizing event. The resolving time of a G/M detector is usually 100 microseconds or more. Depending on the triggering height discriminator setting in a unit, the resolving time can be less than or equal to the sum of the dead time plus the recovery time, as illustrated below:

Descriptive Mechanism of How Geiger-Mueller Counters Work

In the Geiger-Muller region of the graph of Collected Charge vs. Applied Voltage, secondary ions produced by energetic electron collisions with the counter gas molecules cause discharges along the surface of the anode. Subsequently, electrons are collected leaving a cloud of positive ion sheath that migrates toward the cathode. This positive ion cloud lowers the effective electrical potential of the anode and thus renders the detector inoperative for a brief period until this cloud reaches the cathode. Positive charges upon contact with the negative cathode cause
an emission of photoelectrons that initiates the undesirable pulses. To inhibit these undesirable secondary events, quenching gas in the detector absorbs the excitation energy that is produced by the charge neutralization at the cathode.

The time required for the positive ion cloud to move to the cathode for charge neutralization leads to a dead time after the initial pulse, during which no further pulses can be immediately counted.

**Experimental Procedure for Measuring the Resolving Time Using a Split Source.**

1. Operate the GM unit (at the proper voltage) with the detector connected to it with the coaxial cable
2. Mount the detector above the source holder at a fixed distance that is geometrically optimal for your detector.
3. Put both halves of the split source, e.g., 2 x 5 mCi of Tl-204 on the source holder.
4. Count the split source for one minute:
   \[ R_{(source \ 1 + \ source \ 2)} = \ ] \ cpm
5. Carefully remove source 1 without disturbing source 2 placement from the holder.
6. Count the source 2 for one minute:
   \[ R_{(source \ 2)} = \ ] \ cpm
7. Carefully replace source 1 to its original position next to source 2.
8. Carefully remove source 2 without disturbing source 1 placement from the holder.
9. Count the source 1 for one minute:
   \[ R_{(source \ 1)} = \ ] \ cpm
10. There will be some statistical variations (typically less than 1% if the initial combined sources yield a count rate greater than 50,000 cpm); however, they can be ignored without having any serious impact on our calculations.
11. If the procedures are properly performed, the results show that the sum of the count rates from the individual sources will be greater than the count rate from the combined sources. The difference represents counts that were lost during the dead time plus part of recovery time. Again, this time period occurs when the tube is unable to produce a subsequent pulse sufficiently large to reach above the triggering height (see above diagram).
12. Calculate the approximate resolving time, T, using the following equation:
   \[ T = \frac{[R_{(source \ 1)} + R_{(source \ 2)}] - R_{(sources \ 1+2)}}{2 \cdot R_{(source \ 1)} \cdot R_{(source \ 2)}} \]

   \[ T = \ ] \ minutes per count
13. Calculate the TRUE counting rate from the OBSERVED counting rate of a sample by using the resolving time, T:

$$ R = \frac{R_{\text{observed}}}{1 - R_{\text{observed}} \times T} $$

Where,

- $R$ = true counting rate (cpm)
- $R_{\text{observed}}$ = observed counting rate (cpm)
- $T$ = resolving time (minutes per count)

14. The sum of the true count rate for $R$ (source 1) + $R$ (source 2) should be nearly equal to the calculated true count rate $R$.

In summary, the counting losses depend upon the instrument’s resolving time and upon the observed count rate. If your G/M field instrument registers counts above 10,000 cpm, you should calculate the true count rate by factoring in the counting losses. Counting losses are probably not serious problems for scintillation counting system until count rates exceed 50,000 cpm.

Reference


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**NRRPT Board of Directors / Membership Meeting**

**Special Invitation to all NRRPT Members!**

The 63rd NRRPT Board of Directors and Panel of Examiners meeting, along with an NRRPT Membership meeting, will be held at the Westin in Ft. Lauderdale, FL. The meeting is in conjunction with the International ALARA Symposium. The NRRPT Board and Panel begin meeting on Saturday, January 8 and continue through Tuesday, January 11, 2005. Members and/or visitors are encouraged and welcome to attend Board meetings on Saturday and Tuesday.

The meeting is co-sponsored by the North American Technical Center (NATC), Information System on Occupational Exposures (ISOE), the International Atomic Energy Agency (IAEA- Vienna), the OCED/Nuclear Energy Agency (NEA-Paris), the Electric Power Research Institute (EPRI), and the National Registry of Radiation Protection Technologists. The symposium is also held in conjunction with other industry meetings including the CANDU ALARA Committee, NEI/INPO/EPRI RP 2020 Working Group, and US NRC Region III RPM Meeting. The Nuclear Suppliers Association will make arrangements for vendors to exhibit in the Exhibition Hall located on the same floor as the symposium ballroom. Please contact Rosann Travis (703-451-1912) for more information.

Registration Maintenance Points -- NRRPT registered members will receive 2 points for attending the 4 day conference and .25 point(s) for each PEP course attended.

PEP Courses -- Information and Registration form can be found on Page 7 of this newsletter
Meeting Registration Form

2005 International ISOE / EPRI ALARA Symposium
Sunday, January 09 - Wednesday, January 12, 2005
Fort Lauderdale Westin Hotel
400 Corporate Drive
Ft. Lauderdale, Florida 33334
Phone: (954) 772-1331 Fax: (954) 491-9087
www.westin.com/fortlauderdale

Registration fees cover attendance at all sessions of the symposium. A CD ROM containing presentations from the International ISOE ALARA Symposium will also be provided. Please register on the electronic registration form located at NATCISOE.org or HPS.NE.UIUC.EDU. Or complete the following form:

Please Fill Out Completely

Name: ________________________________________________________________________________________
Last Name                                       First Name                                           Middle Initial
Title:  ______________________________________   Organization:______________________________________
Address: ______________________________________________________________________________________
City:  ___________________________________    State/Country: ______________  Zip Code:________________
Phone: _______________________   Fax: _______________________  Email:_____________________________

Registration Fees Paid by January 5, 2005                                     $375.00

Registration Fees Paid on or after January 6, 2005                      $450.00

[   ] NRRPT Registered

Walk-In Registrants are Welcome if Symposium Space is Available
Please make checks payable to NATC ISOE.
Mail Registration Forms to:
  David W. Miller, North American Technical Center, ISOE, Department of Nuclear, Plasma, and Radiological Engineering, College of Engineering, University of Illinois at Urbana-Champaign, 103 S. Goodwin Ave, 206 NEL, Urbana, Illinois 61801 USA

You are encouraged to register electronically on the NATC website at NATCISOE.org. Payment by Visa, wire transfer, check or money order must accompany registration. Make check payable to NATC ISOE in U.S. funds and mail to: David W. Miller, North American Technical Center, ISOE, Department of Nuclear, Plasma, and Radiological Engineering, College of Engineering, University of Illinois at Urbana-Champaign, 103 S. Goodwin Ave, 206 NEL, Urbana, Illinois 61801 USA Fax: (217) 333-2906. Phone number: (217) 333-1098.

Registrants Name: ____________________________________________
Welcome New Members

Congratulations to the following individuals who successfully passed the NRRPT August 14, 2004 examination:

Daniel M. Bacon       Philip R. Hayde       Shannon C. Peterkin
Jack S. Barnette      George H. Hoskison    Jason R. Prats
Michael Broadhurst    Stevan J. Huddleston  Paul Prichard
Lucius W. Burkett, Jr. Barbara Hunter       Laura W. Pring
Bethany K. Cecere     Robert L. Johnson     Helen R. Redmon
Jamie E. Coffey       Amy Robin Jones      Mark T. Reed
Janet A. Cope         Shaun W. Kelley      Raymond L. Rouse
Jeffrey S. Day        William J. Lambson    Steven J. Rupp
Donald W. Del Core, Jr. Wallace W. Lien     Mark D. Skeath
Eustace A. Douglas, Jr. Latresia D. Lightfoot Joseph A. Sorcic
Delbert C. Elkinton   David B. Malsbury     Ricardo Sosa
Douglas J. Ervin      Bryan M. Mason       Timothy S. Steele
Larry M. Flynn        Edward S. McClain     Kenneth R. Stone
Joe W. Galloway       Janet R. McCrary      Craig D. Sutton
Sheila R. Godfrey     Joyce A. McCready     Crystal J. Taylor
John E. Hardin        Janel D. Mikhail     Thomas E. Tucker
Sean K. Harling       Michael D. O'Donnell  Edward K. Tucker
Donald R. Harris      Tom O'Dou

New Members: If you do not have access to the private side of the web page please contact the Executive Secretary (nrpt@nrrpt.org). She must have your email address on file in order for you to gain access.

Continued from Page 1

In closing, I would like to personally invite all of you to attend the next membership meeting that will be held in Fort Lauderdale, Florida. See the details on Pages 4 and 5.

Respectfully,
Steve Lancaster
NRRPT
Vice-Chairman of the Board
PEP Courses
Offered by the NRRPT

During the 2005 ISOE International ALARA Symposium, the NRRPT will provide three PEP courses for your enrichment.

PEP #1 – A Straight-Forward Approach to Radioactive Material Shipping

The International Atomic Energy Agency estimates that between 18 and 38 million packages containing radioactive materials are transported each year throughout the world. This material may be radioactive waste, medical isotopes, industrial radiography sources, well logging sources, research materials, and of course nuclear fuel cycle materials. These shipments are made by land transport, air, or by sea.

There are various agencies that regulate the commercial movement of radioactive materials with minor variations primarily related to how a shipment is documented. For the control of exposure to radiation, the requirements are consistent between the International Civil Aviation Organization (ICAO) as implemented through the International Air Transport Association (IATA) regulations, the International Maritime Organization (IMO) as implemented through the International Maritime Dangerous Goods (IMDG) Code, and specific country regulations that address the ground transportation of radioactive materials such as the United States Department of Transportation (USDOT). Each agency has adopted requirements for the control of package contents and external radiation levels based on the criteria presented in IAEA Safety Standards Series, Requirements, No. TS-R-1 (ST-1 Revised) and it is the basis of these Regulations that will be discussed in this presentation.

Prior to 1959 the United States Interstate Commerce Commission regulations served as the basis for the various national and international controls for the transport of radioactive materials. The rapid growth of the nuclear industry made the development of controls for the transport of all types and quantities of radioactive materials the highest priority of the IAEA shortly after its formation.

This session will address how to:

- Properly identify the material to be shipped
- Properly classify a package containing radioactive material
- Properly label and mark a radioactive materials package for shipment
- Properly prepare shipping documentation

Dwaine Brown, Global Lead Radiation Safety Officer for Halliburton Energy Services will present this session

PEP#2 – Laboratory Quality Requirements for NRC Licensees

This course will address the requirements of the NRC regarding waste characterization for final status survey support in license termination. We will look at the requirements of NRC Reg Guide 4.15 (Environmental Monitoring Programs), MARLAP (what it is), and MARSSIM and how it effects survey requirements.

Robert Will, Manager of Nuclear Industry Programs at General Engineering Laboratories will present this session.
PEP#3 – Basic Whole Body Counting and Internal Dosimetry for the HP Technician

This course will cover the basics of a whole body counter and then will go into the basics of internal dosimetry. A stand-up type whole body counter will be briefly described including the artifacts that are found in a typical whole body counter spectrum and errors associated with the spectra. Inputs into internal dosimetry calculations will be outlined (no calculations will be performed) and the uses/misuses of the same. The use of transuranics and hard-to-detect radionuclides will also be covered. Human relations as it applies to internal dose and body counting will also be discussed.

Tim Kirkham, Principal Health Physicist at Calvert Cliffs Nuclear Power Plant will be the presenter.

Each course costs $40.00 if advanced registration is received prior to January 2, 2005. After that time the cost will be $50.00. Questions about each course should be directed to:

Tim Kirkham  
Calvert Cliffs Nuclear Power Plant  
410-495-6885  
timothy.j.kirkham@constellation.com

Send Registration to:

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To pay by credit card (Visa or MasterCard), please call the NRRPT office.

Nothing in the world can take the place of persistence.

Talent will not; the world is full of unsuccessful men with talent.
Genius will not; unrewarded genius is almost a proverb.
Education will not; the world is full of educated derelicts.
Persistence and determination alone are omnipotent.
The slogan “Press On” has solved and always will solve the problems of the human race.

~ Calvin Coolidge
Finding and Achieving Your Own Level of Success

By Wade Miller, RRPT
Radiological Engineer, Los Alamos National Lab

While the Marines may be looking for a few good men and women, management and staff at facilities throughout the country are looking for a few good RPTs – and if they’re RRPTs, that’s even better.

What’s that you say? There are lots of places hiring right now? You know, I really don’t know. Frankly, I’m not quite sure what the market is like right now. What I do know is that wherever you are, if you’re a good tech, there are people in your organization who are in need of your skills. And if you look around where you are, you will probably realize you are in the best position to identify just where you can contribute the most good.

So what does it take to be one of those techs that management and staff respect and even admire? How do you get to the point in your professional career where you’re the go-to guy or gal? Well, there are some essentials I’d like to go over here. These aren’t all encompassing, but these are some biggies that will definitely help you to help your organization and ultimately benefit yourself.

The basic ingredients for finding your own level of success are: (1) know and do your job better than you have to, (2) develop some interpersonal and communication skills past where they are now, and (3) develop your knowledge of subject with your eye on where you’d like to be in the future. These skills are like the legs on a three-legged stool. You’ll be out of balance if any one of them is longer or shorter than the others. Developing one or two while neglecting the others will cause you to fall short of your goals.

First of all, know and do your job better than you have to. When you have shown, to yourself and to management, that you can be trusted to excel in the small things, you will be entrusted with bigger things. Sure we’ve all seen this happen backwards in our experience, but your aim should be to approach every job and assignment with an attitude of excellence. Get into the habit of excelling. Review that survey for a third time to eliminate errors. Check the postings again. Read that RWP with a critical eye. Look for the audit trap. Don’t think that because you’ve done it a million times there’s no room for improvement. Maybe, that’s what needs fixing – it doesn’t need to be done a million times. Can the requirements be met doing it quarterly instead of weekly? Ask questions. Why are we doing it that way? This can actually be fun, believe it or not. One of my favorite things is to ask, “So what does that acronym stand for anyway?” I just like seeing the looks as folks try to come up with an answer. However, as with most things there is a proper time and place and a proper way to go about things. This is where the second skill comes into play.

Develop your interpersonal and communication skills past where they are now. Let’s face it, we all need to work on this one. When you see that something needs fixing or when some new policy is getting mired down in the process, there’s a right way and a wrong way – sometimes several of each – to go about remedi ing the situation. A good idea and a better way of doing business can be lost in a “failure to communicate.” So what do you do if you’re not so good at expressing yourself or explaining something that seems obvious to you? How can you improve how you talk to and get along with others? This is a skill that has to be developed just like your expertise at surveying a room. The keys here are a willingness to learn, to admit when you’ve made a mistake, and above all, to develop the skill of listening. It is distressing to hear a co-worker say, “I’m tired of trying to get people to see things my way. I’m just gonna quit trying.” Unfortunately, he fails to see that he is not the only person hurt by that attitude. He will ultimately not be viewed as a team player, which can hurt when job assignments and promotions are handed out. But the team loses, too, because, in spite of his curmudgeonly attitude, he might have something good to contribute.
Stephen Covey, “The art of communication is understanding that it’s not what you say, but what the other person hears.” Remember, it’s important that your good idea gets communicated. It may save money, time, or dose and others will find value in what you have to contribute. There are a number of books that will get you thinking in the right frame of mind but it also requires that you practice these communication skills. One of the best ways to develop the confidence to communicate effectively is to surround yourself with those who will encourage you. You also need to get around those who have “fruit on the tree”, that is, seek out those people who you respect from a knowledge, communication, or leadership perspective and bounce your ideas off of them and see how they might try to advance your ideas and suggestions. One of the best forums I’ve discovered for encouraging and developing the art of communication is Toastmasters. You’ll learn interpersonal skills, communication skills, self-confidence, and leadership skills. As your abilities and interpersonal skills develop, you will need to determine where you want to go with them.

This leads us to the third skill - develop your knowledge of subject with your eye on where you’d like to be in the future. Well, that’s what the NRRPT is all about now, isn’t it? Pursuing certification, advanced training, and degrees are all part of your professional development. As you develop your skills and improve your ability to communicate effectively, people will look to you for input, guidance, advice – and yes, leadership. Again, seek out those who possess the attributes you seek to develop in yourself. You may be able to develop a mentor/student relationship with a person or several people. Minimize the time you have to spend with the grumblers – those who find the negative in everything before they’ve had the chance to see the good. There’s a little test you can perform to see if certain people will benefit your professional development. Ask yourself, “Is that where I want to be or the attitude I want to have in 5 to 10 years?” If the answer is “no”, then minimize the time with those people. Look for opportunities to excel. Sure, maybe no one wants to take on the D&D for that waste site. But, might that be an opportunity for you to learn something new? Might it require your attending some additional training or obtaining another certification? Taking on this sort of task may allow you to be the only one in a long list of job candidates who can put on your resume that you have experience in that field and are therefore qualified for that promotion.

Keep in mind that “from the tiny acorn, the mighty oak has grown.” The three skills I’ve gone over briefly here actually take time to develop – depending on where you are, some longer than others. You can’t get frustrated – well, actually, you can – just don’t let it consume you. Keep your goals out in front of you. Write down your short, midrange, and long-term goals and look at them every day. It will keep you focused on achieving that success you desire and, ultimately, deserve.

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**Canadian Exam Update**

During the Health Physics Society annual meeting in Washington, D.C. the Panel of Examiners and the Board of Directors met with Jeff Shafer and Dave Tucker to discuss the viability of developing and administering the registration examination in Canada. As a result of this meeting, a Canadian representative, Mr. Dave Tucker, was admitted to the Panel of Examiners for the purpose of making the necessary changes to the exam bank to accurately represent those areas that are unique to Canada. The primary areas where differences existed were in the area of regulations, radiological units, and transportation.

The Canadians are presently revising the affected questions and making all preparations for the administration of the exam in August 2005. The revised questions will undergo the same level of scrutiny by Exam Panel representatives as the existing exam bank to ensure that the examination standard is maintained. As we progress through this expansion I believe that we will witness a strengthened registry as well as international recognition of what we already know is a strong registration program.

Dwaine Brown, Committee Member
Advantages of Nuclear Power
by Donald W. Miller, Jr., MD

Artemus Ward, Mark Twain’s predecessor, once said: “It ain’t the things we don’t know that gets us into trouble. It’s the things we know that just ain’t so.” Regulators know that exposure to ionizing radiation, even in very low doses, is harmful. They say that no amount of radiation can be proclaimed safe. There is no threshold below which the deleterious effects of radiation cease to appear. This “knowledge” has, indeed, caused us a lot of trouble, and it turns out not to be true. The actual truth is this: Not only are low to moderate doses of ionizing radiation not harmful, low doses of radiation are good for you. It stimulates the immune system and checks oxidation of DNA through a process known as “radiation hormesis” – and thereby prevents cancer. And irradiated mothers bear children that have a reduced incidence of congenital deformities. (See my article Afraid of Radiation? Low Doses are Good for You.)

Owing to the public’s fear of radiation, abetted by the nuclear protection industry and the media, nuclear power in the United States is at a standstill, just when we most need it. Construction on all nuclear power plants ordered after 1974 has stopped, and no orders have been placed for any since 1978. In the last 15 years, 8 nuclear power plants in the U.S. have been shut down because of escalating regulatory costs and public fears about radiation (103 remain).

The U.S. uses fossil fuels, mainly coal and natural gas, to produce 70 percent of its electricity. Nuclear power generates 19 percent and hydroelectric dams the other 11 percent. (Energy obtained directly from the sun, gathered by mirrors or photovoltaic cells, and from wind turbines generates less than one-tenth of one percent of our electricity.) Production of electricity consumes 36 percent of the energy we use.

Oil is now used primarily for transportation – to run our automobiles, trucks, airplanes, ships, and most buses and railroad trains. Overall, the U.S. obtains 85 percent of its energy from fossil fuels – about half from oil and the other half equally from coal and natural gas. (Before drilling for oil began in the 1800s, humans had just two main sources of energy, other than their own manual labor: wood and animals. Today, rather than ride horses, teenagers compare the horsepower of their automobiles.)
Compared to coal and hydroelectric dams, nuclear power is the safest and cleanest way, from an environmental standpoint, to produce electricity. And the fuel it uses, uranium, is more abundant than fossil fuels (or rivers left to be dammed). In contrast to the U.S., other countries do recognize the advantages of nuclear power. France uses nuclear power to generate 77 percent of its electricity, and 35 nuclear power plants are currently under construction around the world, 24 of them in Asia.

With 442 nuclear power plants operating in 32 countries for a cumulative 10,000 reactor-years of commercial operation, Chernobyl, in the former Soviet Union, is the only accident in the history of nuclear power where any radiation-related fatalities have occurred. In that accident (in 1986) radioactivity from part of the reactor’s overheated core escaped into the atmosphere. Acute radiation sickness affected 134 employees and 28 died. An estimated 70 extra cases of thyroid cancer occurred in children as a result of the accident, which could have been prevented by timely ingestion of potassium iodide. Otherwise, no increase in the incidence of other cancers occurred (despite dire predictions, based on the linear no-threshold hypothesis, that 110,000 new cancers would occur due to radioactive fallout from the accident). Chernobyl’s real victims were 200,000 pregnant women in Europe who, caught up in a wave of radiophobic hysteria, feared that their fetuses would be damaged by radiation from the fallout and had their pregnancies terminated. Low dose radiation does not cause genetic defects, and fetuses exposed to radiation from Chernobyl that were not aborted developed normally and did not have any increased incidence of congenital abnormalities or genetic defects.

Chernobyl is unique. That kind of accident will not happen in any other nuclear power plants because all the reactors currently in operation around the world are placed inside a containment building (Chernobyl was not). The reactor core meltdown at Three Mile Island in 1979, which happened when its core cooling system failed, also produced a lot of radiation; but the containment building the reactor was housed in kept it from being released into the atmosphere, and there were no injuries or deaths.

All the nuclear power plants in the U.S. are second-generation reactors, based on designs derived from those made for naval use. Third generation reactors, with an output of 600 MW, are simpler, smaller, more rugged, and reduce substantially the possibility of a core meltdown accident, from a likelihood of 1 in 20,000 to 1 in 800,000 per reactor year. (Third generation reactors have, for example, 80 percent fewer control cables and 60 percent less piping.) They are standardized to expedite licensing and reduce construction time. Fourth generation fusion reactors are being developed that should be in operation fairly soon.

On the Columbia River System, in my part of the world, 75 people died building the Grand Coulee Dam. Failure of the Teton Dam on a tributary of the Snake River near Idaho Falls (in 1976) killed 14 people, obliterated one town (Wilford), severely damaged several others, and caused $3 billion (2002 dollars) in property damage. The energy released when this dam ruptured was the equivalent of ten (20-kiloton) atom bombs, and it caused the greatest flood in North America since the last ice age. (Fortunately, the dam failed during the daytime, which saved thousands of lives because workers were there to warn the populace downstream to evacuate, before phone lines went down.) The St. Francis Dam in Santa Paula, California collapsed (in 1928) and killed 450 people. The Machu Dam in India killed 2,500 people when it ruptured in 1979.

Compared to nuclear power, coal is a much less safe source of energy. In addition to the pollutants and carcinogens coal delivers into the atmosphere when burned, 100 coal miners are killed each year in the U.S. in coal mine accidents and another 100 die transporting it. Per amount of electricity produced, hydropower causes 110 fold, coal, 45 fold, and natural gas, 10 fold more deaths than nuclear power. As Petr Beckmann, founding editor of Access to Energy, shows in his book The Health Hazards of Not Going Nuclear, nuclear power is the safest source of energy in all aspects, not excluding terrorism and sabotage, major accidents, and waste disposal.

From an environmental standpoint, nuclear power is far superior to coal or hydropower.

In the U.S., coal is strip-mined (the way we get 60 percent of it) at a rate of more than 65,000 acres per year, with over
a million acres awaiting reclamation. Of the 8 million acres that overlie underground mines (to obtain the other 40 percent), one-fourth of that acreage has subsided. When burned, the carbon in coal combines with oxygen to form carbon dioxide (CO₂) and carbon monoxide (CO). A large coal-burning plant that produces as much electricity as a nuclear power plant burns 3 million tons of coal annually, which generates 11 million tons of CO₂ (700 lbs. per second). Coal contains sulfur, 0.5 to 3 percent by weight, which combines with oxygen to form sulfur dioxide, the principal cause of acid rain; and the nitrogen in it produces nitrous oxide, a major pollutant (a 1,000 megawatt coal plant produces as much nitrous oxide as 200,000 automobiles). It contains health-damaging heavy metals like lead, mercury, arsenic, cadmium, and beryllium. Coal also has uranium in it in a concentration of 1 to 2 parts per million. As a result, a coal-fired plant releases up to 50 times more radioactivity than a nuclear plant, where the radiation emitted by uranium and its byproducts is contained. (The EPA ignores this fact.)

Hydropower is even worse. Hydroelectric dams generate 85 percent of the electricity produced in my state (Washington). The dams in the Columbia River Basin have had a devastating impact on its ecosystem. It began with the New Deal, in 1932, when the Army Corps of Engineers submitted a study of the river to President Roosevelt identifying ten promising locations for dams. Beginning with the Bonneville Dam, built by the Corps of Engineers, and the Grand Coulee Dam, built by the Bureau of Reclamation, over the next 40 years these two federal agencies built 30 major dams on the Columbia and Snake River system. Its largest, the Grand Coulee Dam, blocks salmon access to more than 1,000 miles of productive river. Called the “cesspool of the New Deal” (by a New York newspaper), its 125 square mile reservoir inundated 12 towns with 1,200 buildings.

The hydroelectric dams in the Columbia River Basin (along with hatcheries that the Bureau established to mitigate their effects on fish) have been instrumental in
reducing the number of wild salmon that come back up the Columbia River each year to spawn, from 10 to 16 million to less than 200,000 now, a 98 percent decline. Eliminating the nutrients (obtained eating crustaceans and plant life in the ocean) that salmon provide for the Basin has had a major impact on its ecosystem. Salmon gain 90 percent of their body weight at sea and carry the nutrients obtained there back to their home stream. Grizzly bears, for example, obtain up to 90 percent of the nitrogen in their bones and hair from the salmon they eat. The environmental impact of the decline of salmon is reflected in these Washington Department of Fish and Wildlife estimates: the Basin’s population of fur-bearing mammals has declined from 13,000 to 500; game birds dependent on this landscape, from 120,000 to 2,000; and winter songbirds, from 95,000 to 3,000. Twelve second-generation nuclear power plants would produce as much electricity as all the hydroelectric dams that have been built in this Basin, at a negligible environmental cost.

Nuclear energy (that uranium 235 and uranium 238-derived plutonium produce) emits no harmful gases or toxic metals into the environment. And, unlike hydroelectric dams, it does not alter a region’s ecosystem. Furthermore, despite what activists and the media say, the wastes nuclear power create are far less of a problem than those produced by coal, or the silt that builds up behind dams. One pound of uranium produces 20,000 times more energy than one pound of coal. A nuclear power plant generates (high-level) radioactive wastes the size of one aspirin tablet per person per year (a plant’s yearly wastes fit comfortably under a dining room table). Coal-fired plants generate 320 lbs. of ash and other poisons per person per year, of which 10 percent is spewed into the atmosphere. Disposal personnel encapsulate nuclear waste in (fireproof, water-proof, and earthquake-proof) boron-silicate glass or ceramic and then bury these now effectively non-radioactive artificial rocks. In the U.S., these “rocks” will (in 2010) be buried deep in extremely arid ground in a remote part of Nevada, in a repository at Yucca Mountain (where nuclear weapons tests were once conducted). The chance that this encapsulated waste will ever harm anyone is virtually zero (especially given that the linear no-threshold hypothesis now disproved). Waste disposal is not a disadvantage of nuclear power; it is one of its advantages. Yet another advantage of nuclear power is the relative abundance of its fuel, as this illustration, put together by Petr Beckmann, shows. Uranium is the heaviest of all naturally occurring elements and is present in most of the earth’s crust. There is enough uranium 235 (box C), the fuel for current-day U.S. nuclear reactors, to keep them operating through most of this century. But uranium 238 (99 percent of natural uranium), fuels breeder reactors. Breeder reactors turn uranium-238 into plutonium. As Bernard Cohen points out in his book, The Nuclear Energy Option (in Chapter 13, which is available online), the supply of uranium 238 on the planet to run breeder reactors will last thousands of years.

Oil is dwindling fast in the U.S. In 1950 America produced one-half of the world’s oil and consumed 6 million barrels per day (MBPD), which was more oil than all the rest of the world consumed. Today the U.S. produces 4 percent of the world’s oil and consumes 20 MBPD, and the rest of the world consumes close to 60 MBPD. (China, with its 1.2 billion people, leads the race in growing oil consumption, and it has to import an increasing percentage of the oil that it consumes. India, with one billion people, is close behind.)
Sixty percent of the known oil in the world lies within this “golden triangle” in the Middle East. Oil wells there pump 10,000 barrels per day, compared with wells in the U.S that pump 300 barrels per day. U.S. oil reserves have now dropped to the point that if we were not able to import any oil, at the current rate of consumption, we would exhaust our 22-billion barrel reserve and run out of oil in three years.
Iraq has 11 percent of the world's oil, five times as much as the U.S. now has. The only country with more is Saudi Arabia. This map, prepared by the National Energy Policy Development Group, chaired by Vice-President Cheney (obtained by Judicial Watch through the Freedom of Information Act) shows the location and extent of Iraq's known oilfields and divides the western part of the country into nine exploration blocks.

Central Asia is another important source of oil and natural gas. (America's natural gas wells now produce only one-third the amount of gas they did 30 years ago.) The problem is how to get it out.

There is another way to get oil for our automobiles and airplanes, which would eliminate the need for the United States to import any Middle Eastern or Central Asian oil. American entrepreneurs are marketing a new technology called a "thermal conversion process" that can make oil out of various agricultural, industrial, and municipal wastes; and nuclear power is the best source of electricity to run it. The process employs a technique known as thermal depolymerization, which in essence mimics the geothermal process that created our fossil fuels, notably oil. Wastes subjected to temperatures of 500 degrees F and pressures of 600 pounds per square inch, under controlled conditions, will produce light oil that is half diesel and half gasoline.
You can put most anything in it – sewage sludge, plastic bottles, old tires, turkey offal, wet bandages and needles. If a 175 lb. person accidentally got caught in the process, it would turn him into 38 pounds of oil, 7 pounds of purified minerals, 7 pounds of methane gas, and 123 pounds of water. Putting all the country’s agricultural wastes through this process would produce 4 billion barrels of oil, the amount we currently import from OPEC each year.

What about solar power and windmills as an alternative source of energy? California is the leader in developing solar power. Its Solar Two Plant in the Mojave Desert has a peak output of 10 megawatts. In order to produce as much energy as a 1,000-megawatt nuclear reactor, its mirrors would have to occupy 127 square miles of land. The Solar Electric Generating System in Kramer Junction, CA has a higher output – 100 megawatts. This system currently generates 90 percent of the world’s direct solar electricity. (It has rows of mirror-like shiny surfaces that focus sunlight onto tubes filled with therminol fluid running along the top of the array, which turns water into steam to power the turbines.) Its mirrors have to be washed every five to ten days to maintain a reasonable (70 percent) optical efficiency. It requires 33 square miles of mirrors for this system to produce as much electricity as one nuclear power plant. Also, solar plants require substantial government subsidies and tax credits to make the electricity they produce economically feasible.

The Nine Canyon Wind Project in my state completed its Phase II expansion last year, adding 12 new wind turbines to the previously existing 37. With the wind blowing hard, they have a peak output of 64 megawatts. Based on the average wind speed there it would take 50,000 wind turbines of this size, in a 300 square mile area, to generate the same amount of electricity one nuclear power plant produces. (If they were made to the height of a 20-story building, it would take only 1,000 windmills to produce that amount of power.)

Windmills kill a lot of birds. They act as bait and executioner for birds because rodent populations multiply rapidly at their base, and the birds get killed trying to get at them. The windmills on Altamont Pass east of San Francisco, for example, kill eight times as many bald eagles each year as those that died in the one-time Valdez oil spill in Alaska. This is also a problem with solar energy. Bird deaths per megawatt of electricity generated by solar plants are higher than at Altamont Pass, a result of their flying into its mirror-like surfaces. Despite the enthusiasm politicians and the media exhibit for solar and wind power, these sources of energy, compared with nuclear power, produce tiny amounts electricity; and they harm the environment. They cannot replace fossil fuels, or nuclear power.

This is perhaps the greatest advantage of nuclear power, coupled with new technologies like thermal depolymerization. It will better enable our country to follow the advice its first President gave us in his Farewell Address – to conduct dealings with other nations in the marketplace, not on the battlefield. Building nuclear power plants can help end the War on Terror, in addition to keeping our lights and computers on.

April 14, 2004

Donald Miller is a cardiac surgeon and Professor of Surgery at the University of Washington in Seattle and a member of Doctors for Disaster Preparedness and writes articles on a variety of subjects for LewRockwell.com, including bioterrorism. His web site is www.donaldmiller.com.

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Steve Lancaster

Steve started his career in radiation safety working as an HP Tech in the commercial nuclear power industry and, in the 25 years since, he’s covered a lot of ground working his way up through the ranks. His gone from field technician to Project Manager in which he oversaw up to 250 technical and professional employees. In recent years, Steve has taken his wide range of technical, managerial, administrative, and professional experience and applied it in support of several DOE facilities. He is currently subcontracted through Bartlett Services as a Project Manager and Senior Radiological Engineer at ORNL.

In 1991, Steve became a Registered Radiation Protection Technologist and has served as Vice Chairman of the Panel of Examiners of the NRRPT and is currently serving the Board of Directors as the Vice Chairman of the Board.

A family man with wife Julie and four children – two in college, one in high school, and one in middle school – Steve balances work and business travel with his home life. When he’s not on the road, he enjoys hiking and camping with the family and especially watching the kids compete in tennis and softball.

NRRPT Member on the Advanced Technology Center Nuclear Technology Degree Program Advisory Council

The Advisory Council for the Advanced Technology Center Nuclear Technology degree program has been constituted. David Anderson, NRRPT, is one of the members of the ten person council which provides advice and assistance to the ATC AASNT degree program. Dave has been a member of NRRPT since 1989. Dave began his career as a Navy ELT and has been a Radiation Protection technician, Training Supervisor and (currently) Senior Training Supervisor at the Callaway Plant. Dave is responsible for training in the Radiation Protection, Chemistry, Rad Waste, Engineering, and Emergency Preparedness areas.

The Advanced Technology Center, located in Mexico, MO, began the Associate of Applied Science in Nuclear Technology program in response to the looming national shortage of Radiation Protection technicians. The first class began this fall, with graduation scheduled for May, 2006. More information about the program is available on the web at www.atc.org,

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In the interest of keeping 'Zoomies' topical, Wade would like to ask the membership to send him any "real life stories" or "you'll never believe anecdotes" that would make for good material. Keep in mind, nothing mean-spirited or malicious - we all want to be able to laugh at ourselves and some of our workplace insanity. Please send your stories and anecdotes to Wade at wmiller@lanl.gov. Rest assured that authorship will remain confidential.
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<td>Jerzee Polo</td>
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<td>Denim Long Sleeve</td>
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<td>Denim Short Sleeve</td>
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<td>Blue Fleece Vest</td>
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<td>Khaki Nylon Vest</td>
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<td>Blue Nylon/Fleece Jacket</td>
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<td>Black Nylon/Microfiber Jacket</td>
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<td>Khaki/Navy Hat</td>
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<td>Khaki/Black Hat</td>
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**Order Form**

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</tbody>
</table>

Orders with less than 5 items — add $5.00 for shipping

**Total:**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Price</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td>$27.00</td>
<td></td>
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</tbody>
</table>

**Book**

"Problem Solving in Preparation for the NRRPT Exam"
by David Waite, Ph.D. and James Mayberry Ph.D.
$27 Each

**Total Amount Enclosed:**

$ _____________

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Send order form with payment to:

NRRPT
P.O. Box 6974
Kennewick, WA 99336

**Check, Money Order, Visa & MasterCard Accepted**

Visa or Mastercard

Card#:____________________
Exp Date:__________________
Billing Address:____________________
CHANGE OF ADDRESS FORM:

NAME: _________________________________________________________________________________________________

OLD ADDRESS: ________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

NEW ADDRESS: ________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

EFFECTIVE DATE: _____________________    NEW PHONE NUMBER: ________________________________________

EMAIL ADDRESS: _______________________________________________________________________________________