

DOE Health Physics Instrumentation Committee Annual Meeting

November 17 – 20, 2003
Flamingo Hotel, Las Vegas

Attendees

Name	Company	Phone Number	E-Mail Address
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Richard Olsher	LANL	505-667-3364	dick@lanl.gov
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Monday, November 17, 2003

Introduction and review of agenda – Peter Chiaro, ORNL

Facility status update – Peter Chiaro, ORNL

Discussion of changes at individual facilities that could be of interest to members

Peter Chiaro operates the Environmental Affects Lab at Oak Ridge. He presented the status of changes to his facility. Basically, his equipment has been relocated to a new facility with more space.

Standards status – Peter Chiaro

Peter is chairperson for several ANSI and IEC Standards Committees. The four new ANSI Standards for Homeland Security radiation instrumentation are nearly final (2 have been published and the other 2 should be published soon, The similar IEC standards are still being discussed.)

Session 1 – General Instrumentation – moderated by Robert Murphy, LANL

Update on Neutron Detector - Dan Dotson, Jefferson National Lab

Dan has been developing some radiation detectors based on a micro-chip with miniature photo-diode arrays. CsI is bonded to each photo-diode. These are commercially available chips. Dan has coated the CsI with neutron target material. The CsI is a charged particle detector and its light output is collected by its photo-diode. This may have some applicability at accelerators.

Update on PRESCILA - Dick Olsher, LANL

WIPP, INEL, SRS, and BNL HPIC members expressed interest in getting some Prescilas for their facilities. The use of electronics packages other than the E-600 was discussed. For some applications SCA meters can be used, in others a two channel analyzer with cross-over correction is desirable. Ludlum has the Prescila production line ready to produce Prescilas.

Energy response of SWENDI, NRD and Anderson-Brown (Braun)- Radoslav Radev, LLNL

Radoslav compared these neutron detectors using a D,T generator. As expected the SWENDI had the best response to the 14.1 MeV neutrons.

Development of a Portable High Energy Neutron Spectrometer - Tom McLean, LANL

The CsI fast neutron spectrometer has a neutron energy response from about 10 MeV to GeV levels and is most applicable to accelerators where really fast neutrons can be found. X-Ray Instrumentation Associates of Newark California and BTI of Canada have participated in the development of the fast neutron spectrometer. XIA has developed a digital signal processor for the detector while BTI developed an analog signal processor. Both approaches use pulse shape discrimination to get

neutron energy information and discriminate out interfering radiations. Tom is planning on using a PDA as the controller for the electronics package. The development work is being done under a TDEA and funding will continue through 2004.

RF Networking of CAMs and ARMs - Fred Ogden & Bryan Arnold, SRS

SRS has DOE approval for the wireless networking of a few hundred locations. They have a few units operating on the wireless network at present. DOE's thinking on security of wireless communications may be different at SRS. Here at the CMR we have changed some of our wireless PCM-2 communications to wired because of signals getting outside of the building, but maybe DOE at SRS is only concerned about signals getting outside the overall site. The SRS contact and SME for wireless networking is DONALD.GREGORY@SRS.GOV phone 803-952-8395.

Display and Computer Upgrade to Eberline PCM-2 - William Martinez, LANL

William gave the specifics on the upgrades and Eberline's approximate cost and time to also do the upgrades. The HPIC representative from INEL, Byron Christiansen stated an interest in PCM-s with better radon rejection. Other HPIC members also seemed to be interested in better radon rejection.

Session 2 – EPDs – moderated by Radoslav Radev

Update on Siemens EPD MK II performance at BNL – Paul Zahra, BNL

Paul says that BNL has a few hundred of these EPDs and two problems were identified, both being total failure of the EPD. One is the battery compatibility (rechargeable vs alkaline). A ribbon cable failure is the second and bigger problem. The EPD failure rate over a two year period was greater than 20%. Siemens initially stated they were not aware of these problems at other facilities even though these problems had been reported and circulated through the HPIC membership. Siemens has now agreed to replace all of the EPD inventory at BNL (for free!!). BNL's acceptance criteria calls for 0% failure rate on initial receipt of all of the EPDs and no more than an annual failure rate of 5%. So far the replacement EPDs are meeting that criteria. Note that Siemens is now owned by ThermoElectron (Eberline).

Test of Siemens EPD-N2 neutron dosimeters - Radoslav Radev

Radoslav tested Siemens neutron EPDs-N2 using the same D,T generator as before. As expected these EPDs over-responded to the D,T generator high energy neutrons.

Neutron EPDs and bubble detectors - Dick Olsher

Dick tested Fuji and Siemens EPDs and bubble dosimeters to moderated and bare neutron sources. The conclusion is that you have to calibrate these things to the approximate neutron energies you expect to encounter in the field.

Open Discussion

Topics:

Expectations for Vendor presentations on Tuesday

Initially we were going to allow the vendors to attend each other's presentations with permission from the vendor doing the presentation. However, one Eberline wanted to address some specific HPIC member problems with Eberline and Siemens instruments separate from their presentation. So, the decision was made to have only the presenting vendor present for their presentation.

Scale non-linearity of Inovision 451 meter - Radoslav Radev

Radoslav reported that a scientist at LLNL had observed that the 451's indication will "jump" when it nears 90% of scale on the 5 and 50 ranges. Edson Wong of LBL said that he had observed the same thing but he feels it has to do with the way the Inovision 451 integrates the readings and is not a problem with getting a true indication. The indication is moving through the top part of the scale and will stabilize at the correct value on the next higher range, so the 90% and higher readings on those ranges are not actual values.

Tuesday, November 18, 2003

Opening remarks and review of agenda - Bill Schaper, West Valley Site

Session 3 – Homeland Security Instrumentation Vendor Presentations – moderated by Bill Schaper

NucSafe LLC

<http://www.nucsafe.com/>

Carter Hall, NucSafe VP and co-founder, talked about their neutron detectors. They have 3 models, a backpack, a suitcase, and a vest, with different arrangements available for each model. Carter builds the glass fibers in a specially built machine which costs more than \$1M, so unless the market for these neutron detectors goes up there will be no competition. The glass fibers are flexible and have Li6 as the detection method. The fibers are coated and can be made longer than 1 meter. The glass fiber acts as the light pipe to the PMTs. The n, alpha reaction causes Ce+3 crystals also embedded in the glass to fluoresce. The PRST (backpack or suitcase detection system) weighs less than 20 kg and is supposed to be able to detect as little as 1 kg WG Pu in a 6 second count. The electronics package does some sophisticated processing of the neutron signal and interfering gamma radiations according to Carter. There are a lot of these backpack and suitcase neutron detectors in the hands of Homeland Security and Emergency Response organizations.

Canberra Industries <http://canberra.com/>

Canberra (AREVA) is many companies, Canberra, Aquila, Aptec-NRC, Eurysis Mesures, Nardeux, Jomar, Nuclear Data, Tennelec, Intertechnique, Panttechnik, Framatone, ANP, Harwell. Canberra had Bud Sielaff, Frederick Meyer, Mick Truitt, and Jim Barstow as their representatives at the meeting. They presented information on the Mini-Radiac gamma EPD, the RadiaGem "smart" portable radiation detection system, and the Inspector 1000, an NaI based portable gamma spectrometer. The Mini-Radiac is the civilian version of the Aptec-NRC UDR-13. The Mini-Radiac sells for around \$600 and has data logging, infrared comm, two levels of dose and dose-rate alarms with buzzer and vibrator. The RadiaGem has several detector types in the lineup at present. The "smart" detectors each have their own HV power supply, electronic discriminators, count boards, etc, so the signal from the detector is all digital and the RadiaGem only tells the detector to turn off or on (the RadiaGem provides a +5V to the detector which is boosted to the desired HV by the detector itself). The RadiaGem has the option of an internal energy-compensated GM gamma detector (which has its own HV, discriminator, count board, etc). Canberra plans on adding a "smart pack" to the detector lineup to be accommodate "dumb" detectors. Canberra says they plan to address the problem of PDA interface compatibility by purchasing discrete components and integrating those components into the instrument.

Thermo - Electron Corporation <http://thermoeberline.com>

Denny Cannon and Barry Wilson were the Eberline representatives. Eberline (ThermoElectron) is several companies, Eberline, Siemens, Bicon, NE Tech, ESM, Harwell TLD, Reactor Experiments, Xetex, Mini Instruments. Eberline presented information on their wireless EPDs and on RADIS (Radiological Information System). The wireless EPD is a two-way comm dosimeter with an interesting feature. A signal light on each EPD indicates that it has two-way comm, so the user can always be aware that their dose is being tracked remotely. The Eberline Alpha7 was discussed also. LLNL has purchased about 50 Alpha7s. Eberline said they would make sure the Siemens EPD problems were corrected.

Ludlum Instruments <http://ludlums.com/>

Ludlum (Ludlum, ADIT, Eljen) was represented by Randal Stevens who is an electronics engineer. Randal and Clyde ??, the area sales rep presented the Model 24 neutron/gamma EPD which will have separate neutron and gamma indications soon. They also presented their emergency response kits, which typically have a GM pancake for contamination, NaI for gamma, and a high range gamma energy-compensated GM detector with a Model 2241-2. Randal Stevens is an engineer and not a salesman so getting information required us to ask technical questions about Ludlums detectors. On the other hand we got technical answers instead of "this product is the best in the world and comes in 5 different colors/flavors". Ludlum has the Prescila production line up and running and can also calibrate the Prescila to their electronics package or to the E-600 using their AmBe source and a new Cf-252 source.

XRF Corporation <http://xrffcorp.com/>

Fidel Camero, the XRF marketing manager, presented the ICS4000 which is a CZT/MCA isotope identifier type of instrument. The ICS4000 has a 4,000 channel MCA and a 10 mm x 10 mm x 2 mm CZT detector. XRF started out as a lead-in-paint monitor. They make the XRF/Pb lead identifier which has an internal Co-57 source for excitation of the element. The ICS-4000 has the lowest cost of any of the isotope identifiers and has pretty much the same features as the others.

Technical Associates /Soltec

<http://www.tech-associates.com/>

[http://www.tech-](http://www.tech-associates.com/)

<http://www.solteccorp.com/>

Bob Goldstein and Greg McMahon presented information on the TA and Soltec products. TA makes a fairly complete line of portable radiation survey instruments that appear to be rugged, simple, and low cost. Soltec is closely associated with TA, same owners. Soltec imports the Fuji EPDs and other Fuji Electric electronics. I believe a lot of TA's components are manufactured by Fuji for TA. The presentation mainly covered TA's cargo container radiation monitors. Bob Goldstein said he was interested in our request that he add a communications port to his line of portable survey instruments. This could lead to a simple survey instrument that also could data log and could be made "smart" if the user wanted those extra features.

MGP

<http://www.mgpi.com/>

Sergio Lopez presented the MGP CAM, wireless networking, and wireless dosimetry. Sergio also spoke about a new instrument based on a PDA with cell phone, GPS, dual range gamma detection, and radiation mapping. MGPs wireless comm for different types of radiation detectors should be looked at.

LANL Vision of future radiation protection portable instruments – Robert Murphy & Tom Voss

Vendor representatives included

Robert Murphy and Tom Voss distributed a hard copy of the new instrument features "wish" list to the HPIC membership and the attending instrument manufacturers. After serious discussion by all we determined that Radoslav Radev (HPIC steering committee) would send an electronic version of the instrument features "wish" list to all of the HPIC members and a separate list to the instrument manufacturers. The HPIC list will rank the different features as "most important, least important, not applicable" while the manufacturers list will rank the different features as "easy to do/cheap" or "hard to do/expensive". The lists will be returned to Radoslav and a summary of the responses provided to the HPIC membership and the instrument manufacturers.

Open Discussion

Vendors' presentations review and report

Wednesday, November 19, 2003

Opening remarks and review of agenda – Radoslav Radev

Session 4 – HPIC Business – moderated by Radoslav Radev

Vendor letter finalization– Bill Schaper

Bill read a draft letter of appreciation to the vendors.

Selection of new steering committee members – Radoslav Radev

Robert Murphy and Byron Christiansen were elected as new members of the steering committee for 2 years.

HPS Activities/Support Discussion– Radoslav Radev

Radoslav opened the discussion by suggesting that we may consider options for financial support (funding) for the HPIC meeting and activities. Some of the HPIC members see the need to increase their funding while others are concerned about losing funding to private calibration labs. ORNL and PNNL do have commercial work going on right now, which seems to be in conflict with the general HPIC position of not competing with private industry. INEL and Rocky Flats have private contractors performing work that DOE groups perform at other DOE sites. These are the people at those locations who have a dual role there, such as The Alpha Group at Rocky Flats and Dale Snowden's company at INEL.

HPIC Funds – Radoslav Radev

The HPIC is in good shape financially. This meeting generated around \$3K from conference fees and the HPIC expenses are pretty much just for a meeting room and coffee and donuts in the mornings. When the DOE HPIC began the anticipation was that DOE would kick in substantial funding to do things like instrument intercomparisons and calibration lab intercomparisons. No DOE funding ever came about.

HPIC Meeting Format – Paul Zahra

The meeting format will remain as it has been. Tom Voss argued for several changes: - ALL sessions to be open to everyone, vendors included. Requesting commercial nuclear power plant and NRC membership, EPA, private, state, local emergency response people, just anyone who uses radiation survey instruments. The HPIC membership decided to keep the sessions closed to non-DOE personnel. Also, HPIC believes nuclear power plant radiation instrumentation and usage is different from DOE.

Future HPIC topics/items – Paul Zahra

Information on candidate locations for future HPIC meetings – Radoslav Radev

The next meeting location was decided to be again in Las Vegas with a date late in October 2004. Future meetings may be in Florida, to be decided later.

Open discussion and action items

Yucca Mountain / Remote Sensing Lab Tour – Scott Hulse, Bechtel Nevada

Session 5 – Calibration Facility Operations, Programs and Support – moderated by Paul Zahra

LANL Characterization of BNL neutron field with spectral comparisons of BNL, PNNL, and LANL neutron facilities - Tom McLean

Tom McLean and other LANL people took the RO-Spec, SWENDI, and the little BTI neutron spec (SSS??) to BNL and PNNL to do an intercomparison/characterization of the neutron calibration facilities. With this intercomparison it is now possible to say how a neutron detector calibrated correctly at one of the facilities may perform when used at a different location.

OSHA/NRC Regulation – Dan Dotson

Jefferson Lab and parts of INEL may soon come under NRC regulation. Most of INEL will remain under DOE regulations. We also may see some of the national labs come under NRC regulation down the road. NRC auditors have already been at both Jefferson and INEL.

Baseline survey of staffing vs. workload – Paul Zahra

Paul wanted information only on calibration lab personnel staffing, workload, and funding.

Open Discussion -Calibration Facility Operations, Programs and Support

Topics:

The future of TBDs – LANL

Robert Murphy and John Elliott presented LANL position on what LANL think the TBD replacement should look like. Robert showed the Instrumentation Manual that John Elliott developed to the HPIC membership.

New Release Limits – SRS, Fred Ogden & Bryan Arnold

DOE has agreed to new unrestricted release limits for SRS. The last page of this document has the SRS unrestricted release table. The expert at SRS who did most to get the new release limits is Dr. Ken Crase kenneth.crase@srs.gov

SRS New Database - Fred Ogden & Bryan Arnold

SRS has 6,000 instruments and Bryan Arnold, who is a programmer, developed a database to keep track of those instruments.

Session 6 – Air Monitoring – moderated by Tom Voss

Calibration of Eberline Alpha-7L CAM w/LANL enhancements - William Martinez

William presentation showed how HSR-4 calibrates the Alpha7L using the Eberline calibration program which reduces calibration time by quite a bit. The additional CAM RF shielding enhancements were also pointed out.

Portable alpha CAM progress report – Tom Voss

There are currently only 2 commercial personal alpha CAMs. Rocky Flats just purchased 10 SabreBZMs (breathing zone monitors) which are PDA controlled CAMs with a 256 channel MCA sampling at 4 LPM in a package that weighs under 3 pounds. Eberline has purchased 2 MyRIAMs (My Radioactivity In Air Monitor) from Sarad but have not received them yet. Eberline will use those two Myriams for evaluation. The Sarad Myriam is manufactured in Germany and has a 92 channel MCA, alpha-numeric LCD, and samples at 0.25 LPM. The Myriam weighs less than 1 pound. Miniature DC-diaphragm type air sample pumps with capacities up to 90 LPM are available from T-Squared Pumps and Sensidyne. These DC pumps need to be evaluated for durability, but cost, size, power consumption, weight, noise level, and heat generation are much less than for our conventional AC rotary vane air sample pumps.

Open Discussion- Air Monitoring

The HPIC membership is mostly not into air monitoring.

Session 7 – Instrument Usage/Applications – moderated by Paul Zahra

Pu239 Assaying with ISOCS - Bill Schaper

Bill described how ISOCS is used to assay drums before they are shipped to WIPP from West Valley. ISOCS uses a Canberra germanium detection system and provides a final assay report. One of the key points in the setup of the assay is to model the contents of the drum before assay. Assumptions have to be made on shielding by the materials in the drum and the homogeneity of the drum contents. If two different assays were made on the same drum using similar equipment but different assumptions, then the two assay reports would be different.

Unique Application of the ADM-600 AMS at Jefferson Lab - Dan Dotson

Dan has set up an Aptec-NRC ADM-600 (area monitor with multiple detector capability) as an area access control device. Using this system experimenters are allowed to go into the beam area without having to wait for an RCT to survey the area after the beam is shut off. The ADM-600 provides adequate monitoring for those situations and savings of several hundred thousands of dollars per year can be realized with an initial cost of less than \$100,000.

Open Discussion - Instrument Usage/Applications

RMS-3 radiosensitivity as a criticality monitor –LANL

Robert Murphy and William Martinez told the HPIC about the failure of RMS-3 micro-processors when exposed to gamma doses greater than 1,000 rads. Those limitations are not stated in the Eberline literature but Eberline is aware of the sensitivity of the RMS-3s, which is certainly not unique to Eberline equipment but is related to the micro-processors. SRS was particularly interested since they have more than 100 RMS-3s.

Development of an air proportional hand and foot monitor –LANL

William Martinez and Robert Murphy told the HPIC about the work HSR-4 has been doing in modifying the HFM-8 to an air proportional alpha detector. This modification addresses problems with the present HFM-8 which is a ZnS detector on a solid plastic light pipe. The present detector has problems with tears in the mylar and neutron and gamma radiation interference. LANL has 67 HFM-8s at TA-55 (and 1 in the CMR). Eberline is working on developing a large area air proportional detector with higher sensitivity than the present detectors in the prototypes.

Interchange (swap ability) issues for E600s and 380 probes – Radoslav Radev

Radoslav described a problem at LLNL with the E-600s not being useable with different SHP-380s even though the smart pack in the SHP-380 is supposed to set the correct HV and discriminator settings. LANL identified and solved this problem in 1996 and William Martinez described how LLNL needs to calibrate the E-600s to fix their problems.

Other

Byron Christiansen from INEL said they have a surcharge to the instrument owners of \$30 on each instrument for replacement of the older inventory. He says they replace 10% of their instrument inventory each year.

Thursday, November 20, 2003

Yucca Mountain / Remote Sensing Lab Tour – Scott Hulse

Yucca Mountain Tour

Remote Sensing Lab Tour

Supplemental Release Limits Approved for Use at the Savannah River Site

Jim Stafford, Manager
Radiological Protection Services
Westinghouse Savannah River Company

On 10/15/2003, DOE-EH approved the WSRC request for supplemental release limits for use in unrestricted radiological release of material at the Savannah River Site in lieu of the criteria in DOE Order 5400.5 and its guidance.

The WSRC supplemental release limits are in the attached table and have the following features:

- Dose-based, and based on the principles and logic of ANSI STD N13.12
- Groupings of radionuclides dose-based
- Apply to all radiological releases of material from all facilities and programs at SRS
- Volumetric criteria and elevated surface tritium criterion limited to release for disposal in an approved on-site landfill (not for use in releases for reuse or recycle)
- Applies the same total surface criterion for Group 1 as does Appendix D of 10CFR835, so that control and release criteria are identical
- Enhances planning for closure projects with known disposition criteria
- Allows dose-consistent decision making for control and release of material
- Is estimated to save over \$50 M at SRS over the next ten years
- WSRC Subject Matter Expert: Dr. Ken Crase, RPS Technical Advisor (kenneth.crase@srs.gov, or telephone (803)952-7892

WSRC Surface and Volume Release Criteria for Unrestricted Release of Materials

These criteria have been approved by the Department of Energy for use at SRS for unrestricted release of material in lieu of the criteria in DOE Order 5400.5 and its guidance. These criteria are implemented in Manual 5Q1.1, Procedure 517, Radiological Release of Material.

Radionuclide Groups ^(a)	Removable ^(b)	Total (Fixed + Removable) ^(c)	Volumetric ^(d)
	Dpm/100 cm ²	dpm/100 cm ²	pCi/g
Group 1 Radium, Thorium, and Transuranics: ²¹⁰ Po, ²¹⁰ Pb, ²²⁶ Ra, ²²⁸ Ra, ²²⁸ Th, ²³⁰ Th, ²³² Th, ²³⁷ Np, ²³⁹ Pu, ²⁴⁰ Pu, ²⁴¹ Am, ²⁴⁴ Cm, and associated decay chains ^(e) , and others ^(a)	20	500	3
Group 2 U-nat, ²³⁴ U, ²³⁵ U, ²³⁸ U, and associated decay products ^(f) : ¹⁴ C, ²² Na, ²⁴ Na, ³² P, ³⁵ S, ³⁶ Cl, ⁴⁵ Ca, ⁵¹ Cr, ⁵⁴ Mn, ⁵⁵ Fe, ⁵⁹ Fe, ⁵⁸ Co, ⁶⁰ Co, ⁶³ Ni, ⁶⁵ Zn, ⁸⁹ Sr, ⁹⁰ Sr, ⁹⁴ Nb, ⁹⁹ Tc, ¹⁰⁶ Ru, ^{110m} Ag, ¹⁰⁹ Cd, ¹¹¹ In, ¹²⁴ Sb, ¹²⁵ I, ¹²⁹ I, ¹³¹ I, ¹³⁴ Cs, ¹³⁷ Cs, ¹⁴⁴ Ce, ¹⁴⁷ Pm, ¹⁵² Eu, ¹⁵⁴ Eu, ¹⁹² Ir, ¹⁹⁸ Au, ²⁴¹ Pu, and others ^(a)	1000	5000	30
Tritium and tritiated compounds ^(g)	10,000/100,000 ^(h)	N/A	2,000

- (a) To determine the specific group for radionuclides not shown, a comparison of the effective dose factors, by exposure pathway, listed in Table A.1 of NCRP Report No. 123I for the radionuclides in question and the radionuclides in the general groups above shall be performed and a determination of the proper group made, based on similarity of the factors.
- (b) The amount of removable radioactive material per 100 cm² of surface area should be determined by swiping the area with dry filter or soft absorbent paper, applying moderate pressure, and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. (Note – The use of dry material may not be appropriate for tritium). When removable contamination on objects of surface area less than 100 cm² is determined, the activity per unit area shall be based on the actual area and the entire surface shall be wiped. It is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.
- (c) The levels may be averaged over one square meter provided the maximum surface activity in any area of 100 cm² is less than three times the value specified. For purpose of averaging, any square meter of surface shall be considered to be above the surface contamination value if: (1) from measurements of a representative number of sections it is determined that the average contamination exceeds the applicable value; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm² area exceeds three times the applicable value.
- (d) Volume criteria will only be applied for the purpose of release of materials for disposal in a state, DOE, permitted or approved on-site landfill.
- (e) For decay chains, the screening levels represent the total activity (i.e., the activity of the parent plus the activity of all progeny) present.
- (f) Alpha component of activity
- (g) Tritium contamination may diffuse into the volume or matrix of materials. Evaluation of surface contamination shall consider the extent to which such contamination may migrate to the surface in order to ensure the surface contamination value is not exceeded. Once this contamination migrates to the surface, it may be removable, not fixed; therefore, a "Total" value does not apply.
- (h) The criterion of 10,000 dpm/100 cm² will be used for release of material for unrestricted use (reuse or recycle). The criterion of 100,000 dpm/100 cm² will be used for the controlled on-site landfill disposal of material. (Note – DOE Suspension (July 2000) for recycle of metals will apply until rescinded). However, WSRC will only implement this more relaxed tritium surface criterion if a future exemption to 10CFR835 is granted.