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Mr. Robert B. Minogue
Director
Office of Standards Development
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Bob:

Enclosed is a copy of my talk from Monday's session of the AIF Conference. I hope the examples will be of some benefit to you, as well as some of our comments on ALARA and its implementation. I would also hope that sometime before a decision is made, you and some of your staff will be able to visit one of our stations. I am extremely troubled that so many of the rules and regulations being imposed on the industry are being written by people with little practical experience, or outdated experience. Last Thursday and Friday, Dr. William Mills from the U.S. EPA visited Dresden Station. Much to my amazement, I found out it was the first time he had ever visited a nuclear power plant. He seemed, to our people, to be a very knowledgeable and practical gentleman, but a nuclear power plant is considerably different than most other radiation facilities.

As I indicated to you at the session, I am also concerned about what our various regulators consider to be reasonable costs. It frightens me to hear them talking about five or ten million dollars as if it was very small. I am sure that the accumulation of all of these very small costs is the reason that the cost of electricity today is double what it was less than ten years ago.

I was pleased to hear you say that you intended to use the experience of good performers as the basis for your standards. My only concern would be that, based on past experience, I see the NRC taking that good experience and establishing a standard one or two notches beyond. This

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is the forcing technology syndrome. I seriously question whether we can afford to force technology any more.

In conclusion, I hope you can recognize my concern for the impact and arbitrary change that the standard will have upon our workers' confidence. The changes in Appendix I were easily accepted, because virtually no one had ever really been measurably affected by the releases. It seemed like a prudent thing to do. These changes will affect thousands of people that have believed in the standard setting process. The average worker is not a careless or reckless individual, but he does place some faith in our system of establishing standards to protect him. I believe we must be extremely careful not to undermine that faith.

Sorry we did not have time to chat on Monday. Hope you can come out this way sometime soon. I would appreciate it if you would send me a copy of your talk, also.

Sincerely,

Byron Lee, Jr.
Vice-President

During our 20 years of operating experience, we have been operating under one set of rules governing exposure to our personnel and to those of contractors who work with us in radiation zones. These are the same rules governing exposure at the national laboratories, hospitals, universities, and in the military program. These rules have served the industry and the workers well. They are based upon a great deal of experience, evidence, and considered judgment by very knowledgeable people.

Scientists and government standard-setters probably have greater knowledge about the nature and magnitude of the health effects of ionizing radiation than about any other factor found in the environment. Similarly, the extensiveness of risk-benefit analyses used in radiation standard-setting is probably unequalled. The present NRC occupational exposure standards for radiation were established on the basis of recommendations by the National Council on Radiation Protection and Measurements (NCRP), and the International Commission on Radiological Protection (ICRP), and remain consistent with those generally in effect worldwide. Although the standards were adopted in 1960, the standards and the underlying analyses and rationale have been subject to frequent reassessment and reaffirmation. For example, the ICRP's Publication 26, adopted as recently as January of 1977, reaffirms the existing annual occupational dose limit of 5 rems and allows the flexibility to go up to 10 rems under special conditions.

Nuclear power plant licensees are required by the NRC to have effective procedures for monitoring and controlling worker exposure to ionizing radiation. Records must be maintained by licensees of radiation exposure incurred at the facility by each worker. Annual summaries of these data must be filed with the NRC and a special report made of any instances where the NRC exposure limits are exceeded. Nuclear power plant workers are given special training concerning these procedures. The NRC further requires that occupational radiation exposures be kept not only within the standards, but also "as low as is reasonably achievable."

Reasonable assurances of safety to nuclear workers are crucial to the viability of this industry. The integrity of the elaborate institutions and processes established to protect workers from potential radiation hazards is vitally important. It is essential, therefore, that governmental assertions and decisions be objective and based on solid data, as well as considered judgment, in order to preserve reasonable stability in the regulatory environment, as well as the credibility of the occupational standards.

Small wonder that we are disturbed to see the urgency related to proposals, including the recent notice in the February 20 Federal Register, calling for even tighter standards.

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Atomic Industrial Forum's
Regulation of Radiation in the
Nuclear Industry Conference

April 2, 1979

Remarks by
Byron Lee, Jr.
Vice-President
Commonwealth Edison

"A Utility's View on Radiation Protection"

I appreciate the opportunity to present Commonwealth Edison's view on occupational radiation protection. Although I do not pretend to speak for the entire industry, I do believe that the experience of other utilities would be similar to ours, and that their position would be very close to ours.

Nuclear power has been good for Commonwealth Edison and its customers. We have been actively involved in nuclear development for nearly three decades, and have been operating nuclear power plants for almost 20 years. We have accumulated 60 reactor years of experience. Currently, we have more nuclear generating capacity in service than any other utility -- over 10% of the U.S. total. In 1978, over 45% of our generation was produced with nuclear power, compared with 42% in 1977. By the mid-1980's, when the nuclear units we now have under construction are completed, 60% or more of our generation is expected to be nuclear.

In 1978, we produced about 30.6 billion kilowatt-hours with our nuclear units. As a result, we saved some $366 million on our 1978 fuel bill, compared with the western low-sulfur coal alternative. If oil had been used instead, Edison's fuel costs would have been about $800 million higher, more than double our total fuel costs incurred in 1978. These higher costs would have been passed on to our customers. In addition to being the most economical producers, our nuclear units have proven to be our most reliable capacity as well, especially during the record setting three winters we have just endured. In 1978, as a group, our six large nuclear units had an availability of 84%.

We are pleased with this performance, and believe nuclear power is important to this country's energy future.

Nevertheless, nuclear power development is stalled in the U.S. because of the regulatory climate and the Administration's ambivalence toward this energy resource. Confidence in the long-term availability of reasonably priced uranium has been undermined by the moratorium on spent fuel reprocessing. Several factors compound the problem, among them the government's failure to meet its responsibilities for radioactive waste disposal, by the unpredictability, extensive requirements, and excessive time required for nuclear licensing.

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Reasonable assurances of safety to nuclear workers are crucial to the viability of this industry. The integrity of the elaborate institutions and processes established to protect workers from potential radiation hazards is vitally important. It is essential, therefore, that governmental assertions and decisions be objective and based on solid data, as well as considered judgment, in order to preserve reasonable stability in the regulatory environment, as well as the credibility of the occupational standards.

Small wonder that we are disturbed to see the urgency related to proposals, including the recent notice in the February 20 Federal Register, calling for even tighter standards.

We are deeply concerned that the rule changes proposed by the NRC and the extensive reports by the HEW and EPA seem to stem from pressures on the agencies by people who are committed to scuttling nuclear power. Although most of the statements of concern are registered about production and laboratory workers and people exp[illegible]mb tests, they tend to focus on and undermine confidence in all nuclear power.

There is ample time for reasoned judgment in reviewing the present standards. For one thing, no new medical evidence has been presented, that we are aware of, which requires immediate adoption of more restrictive standards.

Secondly, current average doses to nuclear power plant workers are low. Average annual individual occupational exposures at NRC licensed nuclear power plants have been a fraction of the 5 rem limit. Moreover, the 5 rem limit is exceeded by very few individuals in any particular year, and these instances for any given individual occur for only a few years of his working life. At Commonwealth Edison in 1978, out of 5250 workers receiving measurable exposure, only 13 exceeded 5 rem, and none exceeded 7 rem. We are not aware of evidence of any power plant licensee exceeding the 5(N-18) limit. Unfortunately, that fact now seems to be working against us.

Thirdly, the nuclear industry is taking NRC's ALARA guidance seriously, and this has been reflected favorably in average dosages. We believe an arbitrary reduction in the allowable exposure levels would restrict the ability of plant management to achieve the objective of the ALARA guideline.

In reviewing the standards, there should be a careful balancing of individual risks and the total exposures against the relative costs and benefits. Any change in occupational standards must be based on medical data that clearly demonstrate the current standards result in an unacceptable risk to workers. Commonwealth Edison Company has little to contribute at this time to the assessment of health effects beyond that available directly from competent medical research. On the other hand, with 20 years' experience in operating and maintaining nuclear power plants, our Company can contribute constructively to the assessment of impact on worker exposure and plant operations resulting from a change in occupational standards.

An increase in total worker population exposure will result from a reduction in the current exposure limits. Indeed, the conservative, non-threshold, linear dose-response hypothesis embraced for standard-setting purposes indicates that health effects, if any, would increase rather then decrease. Estimates based on Commonwealth Edison's experience indicate as much as

a twenty-fold increase in the number of exposed workers, and a ten-fold increase in total worker population exposure could occur if the standards were reduced by a factor of 10. The principal impact would be on a relatively small number of skilled jobs unavoidably involving higher than average dose rates. These jobs very frequently require specialized skills, such as welding and non-destructive testing. The latest ICRP publication indicates the somewhat higher dose rates involved do not entail substantial risks.

Plant operations would also be impacted, in terms of both cost and plant availability, by a reduction in standards. For one thing, the flexibility of plant management to utilize manpower would be reduced, a particularly acute problem in the event of emergencies or other unusual circumstances. In some cases, certain types of work could be rendered altogether unfeasible. In others, inspection and maintenance activities may have to be curtailed. Plants will have more down time because activities such as repairs and inspections will take longer. More people will be required to do the work. They may be less skilled on the average and will consume more startup, changeover, and other non-productive time per job. Also, subdivided jobs will not be performed as efficiently as they were before by fewer people with broader responsibility for the work. These inefficiencies will be reflected in

lowered plant capacity factors, and thus, greater costs per unit of electricity produced. These costs must be balanced against the benefits ascribed to resulting reduction in the occupational radiation exposure limits.

In our view, the best means for minimizing exposures, while preserving reasonable flexibility for management and maximizing operational reliability, is continued reliance on the ALARA policy.

There is a substantial potential for reducing radiation exposure to workers in nuclear power plants through such measures as improved operating and maintenance procedures, better diagnostic techniques, new tools and work methods, innovative designs and plant layouts, as well as improved management information systems, which relate worker exposure to specific tasks and equipment. Many of these improvements can be realized with existing technology and applied to plants already under construction or in operation. There is even greater potential for reduction in plants yet to be designed through research and development. It isn't necessary to force this technology.

The Nuclear Regulatory Commission ALARA policy has already resulted in implementation of many measures to reduce

worker exposure. The following are examples of such measures taken at Commonwealth Edison's three operating nuclear power stations:

Chemical Cleaning -- Over a period of time, occupational exposure levels build up, due to deposition of activation products on various parts of the reactor system. At some point, the levels become high enough to make maintenance operations inefficient, and thereby cause cleaning of the system to become attractive. One of the first such chemical cleaning operations took place on Dresden Unit 1 in 1967. The reactor vessel head was cleaned to facilitate inspection of the cladding on the inside of the head. At a different time, the regenerative heat exchanger in the clean-up system was cleaned to facilitate repair of a leak in the heat exchanger.

Reactor Cavity Wall Washing -- Whenever the reactor cavity (PWR or BWR) is drained after refueling, it is necessary to wash the cavity walls to remove accumulated radioactive material. This material could otherwise become airborne as the walls dried and create an airborne radioactivity problem. In the past, the walls were hand washed (from suspended scaffolds) resulting in unnecessary exposures to those washing the walls. Now a machine has been developed which washes the walls automatically. The only exposure comes from placing the machine at the appropriate cavity locations.

Addition of Flushing Connections -- Radioactive material builds up, particularly in primary system lines that experience low or infrequent water flow. An example is the scram dump tank discharge header at Dresden Units 2 and 3. Dose rates as high as 3 rem/hour were experienced in the area near the header leading to more personnel exposure than necessary whenever maintenance or instrument readings were required in the area. The addition of flushing connections on the header now enables the plant to remove a significant portion of the radioactivity from the header prior to personnel entry to the area.

PWR Steam Generator Eddy Current Training -- NRC requires periodic inspection of steam generator tubes for leaks. The radiation fields inside these steam generators are high and significant exposures can accrue if too much time is spent entering the steam generator and setting up the test equipment. To minimize such exposure from this inspection requirement, a steam generator mock-up was built at Zion Station so that all personnel involved in the inspection can be thoroughly trained before undertaking the job. In addition, the inspection equipment has been automated so that once it is set in place, the inspection is accomplished without additional personnel exposure.

PWR Reactor Coolant Pump Oil -- The oil initially used in the Zion reactor coolant pumps degraded rapidly and had to be replaced an average of three times a refueling cycle. This necessitated a plant shutdown and entry into the containment to change the oil. Working with a vendor, a synthetic oil was developed with a much longer lifetime. Now the oil is changed only during refueling outages, thus eliminating the previous exposure associated with changing the oil during a short outage.

Gallery Addition -- Several galleries have been added to facilitate maintenance on hard-to-reach equipment that has required more frequent than expected maintenance. Addition of the galleries avoids the time and exposure associated with installation and removal of scaffolding.

Radwaste System Improvements -- The radwaste system has caused some of the highest occupational exposures to our employes. This exposure is accumulated throughout the year and comes from a number of activities in the radwaste area. Several modifications have been made to reduce exposure to radwaste workers:

a. Portable shields which can be moved to the work locations and then filled with water to lower dose rates in those locations.

b. Installation of permanent shields in high dose work areas such as off-loading conveyer, truck loading area, and barrel storage bin area.

c. Replacement of manually operated valves with air operated valves. The valves were initially manual because it was felt that they would be operated infrequently. Changing requirements and experience proved otherwise.

d. Development of a plastic skirt to place around 55-gallon drums used for resin solidification. The skirt prevents exterior contamination of the drums and thus eliminates the need for washing prior to shipment.

Pressurizer Valve Relocation -- Sometimes it is necessary to invest rem in order to save future exposure. An example of this is the relocation in 1977 of a valve inside of the pressurizer compartment of our Zion Station. Due to frequent maintenance required on these valves (one on each unit), it was decided to change valve types and to relocate the valve outside of the pressurizer compartment to make access easier. The work was done in high radiation fields (up to 1 rem/hour) and by 18 skilled pipefitters and welders drawn from the limited supply available in northern Illinois and southern Wisconsin. Although the jobs were done at different times (Unit 2 in February-March and Unit 1 in October-November), the same

18 individuals worked on both units. All workers received over 5 rem exposure, with the average being 5.6 rem. The workers receiving the highest exposure were the most skilled welders in the group. The total exposure for the job (2 units) was 100 man-rem, but was justified based on reduced maintenance (and attendant exposure) in the future. Since the valve change and relocation, it has not been necessary to perform maintenance.

All this has been done under present rules. Looking to the future, there is considerable additional potential in the ALARA guideline. Ongoing review of procedures and work practices, development and implementation of new methods for maintenance and inspection, development of new tools, and adoption of improved designs, all have potential for reducing exposure even further. As for the skeptics, they can take solace that in most cases a reduction in exposure also results in economic benefit -- so double incentives are present for improvement.

We do believe improvements can be made in radiation dose accounting. For example, Commonwealth has recently put in place a computerized Radiation Evaluation Program to document, by work group, the dose expenditures resulting from work performed on various plant systems, components, and work tasks.

This program enables us to pinpoint specific sources of occupational exposure that can be reduced through improved procedures, work methods, technical innovations, and plant modifications.

Obviously, there is need for additional research and development. Commonwealth is taking the lead in the chemical cleaning area with two R&D projects. One is the first demonstration chemical cleaning of the entire primary system of a full size nuclear power plant. It is expected to cost approximately $36 million. This will be done using Dresden Unit 1 this year. The project is being jointly funded by Commonwealth and the Department of Energy. It is anticipated that this procedure will result in the savings of several thousand man-rem of exposure during future operation, maintenance, and in-service surveillance activities. Similar techniques have been employed for years by the Navy. The second is the development and demonstration of on-line chemical cleaning and treatment of primary systems to reduce the rate of activation product deposition during operation, and to remove deposited material at the beginning of routine outages. This project is also jointly funded by DOE. Demonstrations such as these should lead to substantial reductions in future exposures throughout the electric power industry.

Studies indicate that substantial worker exposures are being incurred during refueling operations. Technical innovations that reduce refueling time could also result in a reduction in exposure. Commonwealth is involved with Westinghouse and the Department of Energy on rapid refueling R&D studies.

There is considerable potential for reducing worker exposure through engineering design and plant layout. Piping systems can be designed to reduce areas where activated corrosion products are entrapped and to locate valves, pumps, and other components requiring frequent inspection and maintenance in low radiation fields. Other innovations include layout of personnel corridors to minimize ambient radiation levels and further automation of valves and installation of remote instrumentation read-out. What's more, further attention to component reliability can lead to less frequent inspection and maintenance.

A substantial proportion of worker exposure in commercial nuclear power plants is the result, directly or indirectly, of inservice inspection and plant modification backfitted by the NRC on existing plants. While these requirements were imposed to enhance reactor safety, it appears that

often too little consideration was given to the cost in terms of worker exposure. We believe both NRC and its licensees should review the requirements for in-service inspection and backfitting with the aim of balancing benefits versus unnecessary worker exposures.

I hope this will indicate that we do have a real concern for occupational exposure and give you some ideas on where government should spend their time and money.

We believe this subject is important enough that a hearing should be held and all the evidence available heard. We have petitioned the NRC for such a hearing. We would be pleased to work with NRC in preparing rules, because these rules must be practical for ALARA to work. Nothing could have a more chilling effect on initiative and creativity than to replace the ALARA challenge with specific rules, inspection against them, and enforcement action.

In conclusion, Commonwealth's experience keeps saying that ALARA works. And for it to be most effective, a licensee must have the flexibility to plan jobs prudently and efficiently. Experience has shown that through better planning and training, exposures have consistently been reduced. To take that flexibility away from the industry and replace it with hard rules at a time

this nation is again facing an energy crisis and is desperate for alternatives to foreign petroleum would be criminal. The nuclear industry is offering an alternative source of energy production. We have proven our reliability and successfully demonstrated our ability to reduce occupational and public exposures. The vast majority of the scientific community continually verifies these levels to be safe. The International Brotherhood of Electrical Workers, the major labor union involved in energy production, supports our contention. A letter to the NRC signed by Ralph Pillard, President, dated May 24, 1978, in response to the NRC's request for public comments on the proposal by the NRDC to lower the occupational exposure dose limits by a factor of 10 said, and I quote:

> "The IBEW's rejection of the NRDC proposal is based on our own experience gained through more than 20 years of having members build, operate, and maintain power reactors...As electrical workers, we understand risk. Unfortunately, on an average 50 of our members are electrocuted in job related accidents each year. In spite of our tragic loss, we do not advocate that the use of electricity be stopped because it is a lethal product. We do advocate the use of better control and methods, better material, better engineering

and better training for our members...Ionizing and non-ionizing radiation are two of the almost endless risks that we workers face. To date there is no evidence to indicate that they are the most serious in relation to possible somatic or genetic damage to the worker. The philosophical concept of ALARA...makes it unnecessary to change existing...occupational radiation exposure limits. Changes to these limits should only be made on definitive proof of increased risk to the worker." (End of quote)

If after a thorough hearing, and I believe it is the NRC's responsibility to be sure it is a complete hearing, the evidence strongly supports a need for a change, we will accept it. If it does not, the industry must strongly resist the promulgation of an unjustified regulation.