

P U B L I C H E A R I N G

before

SUBCOMMITTEE OF

ASSEMBLY TRANSPORTATION AND COMMUNICATIONS COMMITTEE

To Investigate the Transportation of Radioactive Cargo
On Highways Within New Jersey

(Created pursuant to Assembly Resolution 3003)

Held:

August 21, 1979

Freeholders' Chambers

Bergen County Administration Building

Hackensack, New Jersey

MEMBERS OF SUBCOMMITTEE PRESENT:

Assemblyman Robert Burns, (Chairman)

Assemblyman Walter M.D. Kern, Jr.

ALSO:

Laurence A. Gurman, Research Associate
Office of Legislative Services

Aide, Assembly Transportation and Communications Committee

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ASSEMBLYMAN ROBERT BURNS (Chairman): My name is Robert Burns, Vice Chairman of the Assembly Transportation Committee and I'm Chairman of the Transportation Subcommittee for looking into the transportation of radioactive and toxic wastes over the highways of New Jersey. On my right is Assemblyman Walter Kern from here in Bergen County and he will make a statement after I am finished. The Speaker of the House, Christopher Jackman, has directed us to establish a Sub-committee to investigate the transportation of radioactive and toxic wastes over the highways of New Jersey. This Sub-committee is empowered to take hearings in New Jersey and in Bergen County on this very problem. The purpose of these hearings is to look into the need for further legislation or control of the transportation of radioactive and toxic wastes over the highways of New Jersey. With that I will get on with the hearing. Do you have a statement to make Mr. Kern?

A S S E M B L Y M A N W A L T E R M.D. K E R N, JR.: Thank you very much, Mr. Chairman. I am delighted to see that this meeting has come about. As you know, I was the original sponsor of the resolution that established this Sub-committee and have actively sought an investigation of the transportation of radioactive cargo in hopes that present precautions can be evaluated, and if found to be wanting, further protective legislation can be developed. New Jersey has all major highways which traverse the east coast; Routes 80 and 95 are the most widely travelled. New Jersey has become a corridor state for radioactive waste. Trucks carrying radioactive material and by-products travel Routes 17, 80, 95, and the New Jersey Turnpike, on their way to waste dumps in South Carolina. These trucks pass over dangerous routes such as the 4 and 17 intersection. It is approximated that there have been 200,000 nuclear trips through New Jersey. In the past ten years, the number of radioactive shipments has tripled and will triple again in the next ten years. There were 2.5 million shipments of radioactive material in 1975 in the nation. In 1985 there will be an estimated 5.6 million. Thirty percent of nuclear shipments do not comply presently with federal regulations. There are 200,000 nuclear trips through New Jersey. There have been several hundred truckloads of radioactive materials through Bergen County and its highways each month. Truckers of radioactive material choose their route as they go. If Route 17 is blocked, the driver will go down Van Emburgh Avenue or any other road that he can find. New Jersey is a major source of radio-pharmaceuticals. Trucks must leave here and travel the roads out of New Jersey. Thousands of shipments of radioactive materials leave for industrial and medical use. Rockland County adjacent to New Jersey is the source of many radioactive shipments through New Jersey. Nationally there have been over 300 accidents involving radioactive material. In one third of the radioactive accidents, material escaped. It costs \$2.7 million to clean up one percent of a truckload. It costs over \$2 billion to clean up after one truck accident. Shippers' insurance coverage is inadequate to cover the damage caused to communities and individual residents--about \$120 a house or \$10 a car, if that much. According to Sandia Labs in a study for the Nuclear Regulatory Commission, trucks carry up to 7 million curies of radiation. The release of 64,000 curies will cost \$2.7 million to clean up and result in the death of thousands and the evacuation of millions of people. The area of Ridgewood to Mahwah on Route 17 is but eight miles. Last year alone there were 558 accidents, 247 injuries, and 5 deaths for that area. Bergen County is too densely populated to allow radioactive transportation. There are approximately 3,760 people per square mile. Essex County has 6,788 people per square mile. Staten Island has banned trucks containing radioactive material because it is too close to Manhattan. I submit, so is most of New Jersey. A one percent leak of spent fuel could kill as many as 10,000 people and cause millions of cases of latent

cancers. Low radiation does cause cancer. Even minute portions of yellow cake causes lesions of the kidney and the liver. Radioactive shipments emit low levels of radiation and even the smallest amounts cause leukemia and genetic damage. The Nuclear Regulatory Commission predicted a spill of six pounds of yellow cake in a typical accident could happen. But 10,000 pounds of yellow cake was spilled in an accident on a highway in Colorado in 1977. The substance lay in foot-deep drifts for three days while state officials and two companies responsible for the shipment argued over who should clean it up. Vessels are designed not to rupture on impact, but twenty drums broke in this particular Colorado accident. Casks can't withstand prolonged fire or immersion in water. The Association of American Railroads has petitioned to be allowed to refuse to carry radioactive material. One third of all radioactive cargo is mislabelled in containers not meeting specifications or otherwise mishandled. There have been cases of truck drivers storing radioactive materials unsafely, sometimes in their own garages while waiting for full loads. Even though the lab reports are impressive, there are questions as to what a fuel cask can withstand. This issue is important because of tentative federal plans to make the State a major route for radioactive waste from reactors throughout the Northeast. Waste will increase from two to six billion by 1986. A 1953 federal law makes it a misdemeanor to kill one million people. Does a major accident have to happen before something is done about this? Mr. Chairman, I'm sure the public hearings and the investigation conducted by this Sub-committee will be a definite benefit to the public and will generate a greater understanding of the status of this cargo. Thank you very much.

ASSEMBLYMAN BURNS: Thank you very much, Mr. Kern. I just hope your statement doesn't precipitate an exodus from Bergen County. We are using the Freeholder Chambers of the Bergen County Board of Chosen Freeholders and we have Freeholder Bennett Mazur present with us. I'd like to ask him to say a few words.

B E N N E T T M A Z U R: Assemblyman Burns, Assemblyman Kern, I'd like to welcome you here to our chambers, to thank you for coming, and to commend the State Assembly for addressing this problem. We have been grappling with it here on the Board of Freeholders with our very limited jurisdiction and we are extremely concerned about this great amount of radioactive material that is being transported through our county, on State highways, and possibly on county roads. I have had the displeasure of sitting in traffic on Route 17 next to a large green and white truck transporting nuclear waste and I say with extreme discomfort that the roads in this county, our State highways, many of them, are first-generation or second-generation highways, their engineering tolerances are low compared to interstate systems, certainly if there is trouble or construction on a State highway and these vehicles leave and go onto the county roads, the mathematical possibilities of accidents occurring progress by geometric dimensions. The county roads certainly are not engineered for that type of vehicle. The intersections are not that adequate; some of them are not controlled. The roads themselves are narrow compared to State highways and many of them have rather high crowns. Most of them are residential in nature and their residences are very close to the road. Traffic traditionally seems to come down 17 to Route 80 or rather 95, and then down to the New Jersey Turnpike. In so doing it passes really through the very densely populated areas of this county and our neighboring counties to the south. I think that such transportation of such dangerous materials should be prohibited from densely populated areas such as Bergen County and should be prohibited from the entire northeastern section of this State. There is no reason why nuclear waste specifically emanating from Indian Point or some other point in New England should not go west over

the interstate system to some point out toward Port Jervis and then turn south and bypass this entire area. I testified at the hearing that was held by the Department of Environmental Protection on the comprehensive rules that they were promulgating and though they were very comprehensive I believe Assemblyman Byron Baer had many suggested additions to them. I understand he has a very fine bill in committee on this particular subject. Certainly the transportation of such material should be made over carefully specified rules and that some index of population density should be used to determine what routes are acceptable and what routes are not. Some consideration should be made in addition to density as to the engineering and geographic conditions and circumstances of where those trucks are going to go. I would hate to see one winding down a narrow mountain hill that might turn over very easily. These are very serious problems. There certainly is a growing public awareness of the potential danger of having this material go through this county and through other counties. Something really has to be done. I don't want to chide but I think a lot of time is being spent deciding who is responsible, whether it is the county, or a city, or the federal government, or the NRC, or the State. Something really has to be done. It must be expedited and put into effect. I'd rather be safe than be sorry. That's the sort of thing that we face. There is a secondary underlying problem and that relates to the transportation of less dramatic amounts of radiological materials designed for medicinal purposes--for hospitals and doctors' offices. We would like to see some kind of direction to come from the State as to how we can route that material and how we can regulate the quantities of those materials that will, by necessity, have to travel over county roads to our hospitals and doctors' offices. That is something that I have nothing specific to offer you about. I think that the amounts should be regulated and certain criteria by which those materials are transported made. I believe in the figure Assemblyman Kern used of 200 or 1,000 that includes radiological materials meant for medicinal purposes. So there are two basic problems: One, of course, is the dramatic problem which everyone is focusing on which is really the transportation of nuclear wastes, and the other is the more general category of radiological materials. We are concerned about both of them. We are very perplexed. We have tried to do what we can to ban them but we are told we don't have jurisdiction. And we are told that there is a Supreme Court case between the city of New York versus the NRC as to whether or not New York City can ban from their streets radiological materials in excess of 20 curie shipments of that and that the NRC is challenging that right. They have pre-empted that particular area. I don't know who is right. I'm not even a lawyer. All I know is that I am a public official who is charged with the responsibility of what happens on 450 miles of county roads and also very much concerned about the safety and the welfare of close to a million people who live in this county. I know you share those concerns so I wish you good luck and urge you great speed. Thank you very much for being here tonight.

ASSEMBLYMAN BURNS: Thank you very much Freeholder Mazur. Do you have any questions of the Freeholder?

ASSEMBLYMAN KERN : No. I very much appreciate his speaking and demonstrating the concern of the Board. I know that they have been very energetic in pursuing this problem in bringing it to my attention and the other members of the General Assembly. I think that where we are located, we are feeling the brunt of this particular problem. I am very glad that the Freeholder has come here and addressed this Committee.

ASSEMBLYMAN BURNS: Thank you. We are fortunate to have with us a man who has just been mentioned: Assemblyman Byron Baer. He has been very active in consumer

affairs and in this area of radioactive waste. As a matter of fact, he has filed Assembly Bill 3553 on July 19th covering this aspect of transportation of radioactive waste. He has asked to come before us and give us some input in behalf of his feeling on this subject. Now I'd like him to come forward and testify.

A S S E M B L Y M A N B Y R O N M. B A E R: Thank you very much, Assemblyman Burns. First of all I want to commend you and the Committee for holding this hearing and for coming to Bergen County to get input from people on the hearing. At a time when legislative activity in the State is at a very low ebb, I think it is very much commendable that you are here to convene this Sub-committee to hear this matter because of the urgent public interest involved even though many of our colleagues are spending their time at this time out campaigning instead. So I want to commend you very much for that and the Committee members who have come here.

I think this area is one of really extraordinary importance. There are many types of hazardous cargoes that travel on our highways that have the capacity to kill people--even a number of people--whether it is toxic chemicals or a gasoline truck exploding or a wide variety of cargoes having that capacity. But there is virtually no type of cargo that has the potential for creating a regional disaster that could result in death to hundreds of thousands of people and also even result in the virtual extended evacuation of a large area such as these types of radioactive cargoes. So I think it is very appropriate that we give this type of special attention to it. I'm not going to dwell here particularly on descriptions of the types of damage that can occur and some of the past incidents, because I know many of the witnesses here today will go into this at some length. I would like to focus my testimony on practical means that we can use to try to do something about this very urgent problem. It was with that in mind that I drafted and introduced Assembly 3553. This provides for the State the necessary mechanism--and as a matter of fact mandates that it be used--so that people in this State will have very substantial protection from these types of risks.

The first question that might come to many people's minds who have been fairly close to this area would be: "Why do we need to do anything about this? hasn't the federal government recently taken action?" The federal government did adopt some regulations not too long ago on the physical protection of shipments of irradiated reactor fuel. But this was very limited in its effectiveness and it cannot possibly provide full and adequate coverage for us. First of all, the restriction in this regulation only applies to spent or irradiated nuclear fuel. No other type of very dangerous nuclear cargo is covered. The legislation in 3553 covers a variety of other very dangerous types of cargoes other than this type covered: plutonium isotopes in any substantial quantity, enriched uranium, and any of the actinides which are your isotopes with atomic numbers 89 or more. These are the most dangerous types of radioactive materials. We will show other indications that will point out why we have to cover the irradiated fuel also. Of course, we can have nuclear waste that comes from either research sources or nuclear plants quite beyond the waste fuel itself. As a matter of fact, recently many of us read about the hundreds of truckloads that they were proposing to take from Three Mile Island if they go ahead with the tentative plans that they have. Although I have no knowledge that their routes would necessarily take them through here, I don't think we want to wait until adopting legislation when we have an immediate situation like that before us in view of the extensive time period it normally takes for the legislative process. So it is important that we have legislation that covers a broader scope of materials. In addition to which, the areas that are defined in the federal regulations--the urbanized areas--are very limited in their scope. They don't

take in as broad an area as they should. I'll develop that in a minute. And they also have a characteristic about them that makes enforcement extremely difficult. That characteristic is the extremely ragged borderline that is included in the definition of urbanized areas. That's a definition taken from the United States Census. This is the shaded areas. (Demonstrating) There are two types of shaded. Either one is part of the urbanized Northeast New Jersey urbanized area. Presumably there would be an urbanized area other maps might cover around Camden maybe and Trenton. But if you look at this closely you will see that there are long strings and chains of municipalities, a borderline that probably is three or four times as long as it needs to be to enclose an area compactly and would be a nightmare either for an enforcement agency in terms of keeping track of where the trucks should stay out and where they should go in and also in terms of the efforts of a shipper that's trying to comply with the requirements.

Before I go into a couple of the other deficiencies, since we are talking about areas, I want to read a little bit from my testimony because it is relevant here also--the testimony at the time the hearings were held by the State on the regulations. I proposed then that by regulation they extend the ban over quite an area. And I must say that I was very disappointed to find that after these hearings and after these expressions of urgency, the only definite response from the State Division was that it would be many, many months before they would have any kind of a report at all. I think this requires more urgent action than that. As a matter of fact, we don't even have from them a clear response in terms of some of the jurisdictional questions that were raised that could at least indicate their feeling as to what action others might take if they fear the jurisdictional question one way or the other.

Since I am reading from the middle just to put this in context, I made reference to the fact that New York City had adopted a very strict ban on the transportation of these types of materials and that this ban covered the entire city including Staten Island and that action of New York City had already undergone legal challenge and had passed with flying colors. That is particularly important in terms of jurisdictional questions some people might raise. "New York City has enacted just such a ban severely restricting especially hazardous shipments from the city. It has held up under legal test. We are not pre-empted by federal law from taking the same action. The ban includes all five boroughs." Is it logical to ban shipments from the Staten Island communities of Arden Heights and Rossville, twenty two miles from Times Square, and St. Albans in Queens, fifteen miles away, and to, at the same time, allow shipments to roll by the Hackensack Courthouse, nine miles from Times Square or to roll on Route 17, eight miles from Times Square? What about the New Jersey Turnpike, four miles away from Times Square and Cliffside Park, just three and a half miles from Times Square? I know that these words will echo in the chambers until the next time our Freeholder, who is from Cliffside Park, will come to a meeting. I know he is very much concerned about this. A circular arc with Times Square in the center drawn with the minimum necessary to just include all of New York City would also include all of Hudson and Essex County, and ninety percent of the population of Bergen County, Union, and Passaic Counties, and even include parts of Morris and Middlesex Counties. This would include about three and a half million New Jersey residents, or about 50% of the State's entire population. What magic is there in the mile-wide Hudson that separates Fort Lee from New York, or the mere one-eighth-of-a-mile-wide Arthur Kill that separates Staten Island from Elizabeth? And people in Elizabeth are very concerned about this issue. Shouldn't the people living in densely populated areas in New Jersey enjoy at

least the same protection as those in New York? New York City's population density in Staten Island is about 5,300 per square mile. Fifteen legislative districts in New Jersey, including Bergen's thirty sixth, thirty seventh, and thirty eighth--that's the majority of the districts in Bergen--have greater population density. My district, the thirty seventh, has a density a full thirty three percent higher. District thirty three in Hudson County has a population density over six times higher than Staten Island. Four New Jersey counties, Hudson, Essex, Union, and Bergen, have densities greater than or equal to the density of New York's Staten Island. Hackensack, where this hearing is being conducted, has a density sixty seven percent higher. There are a lot of other towns that have densities higher--Dumont, Lodi, Garfield, North Bergen, Fort Lee. West New York and Union City in Hudson County have densities seven to eight times greater even than the density of every borough in New York except Manhattan. Obviously it is senseless to ban ultra-hazardous radioactive shipments from New York and Staten Island highways, and allow them to rumble instead through just as intensely populated areas in New Jersey. This must stop. Neither does it make sense to ban such air shipments from JFK in New York, but allow them to fly out of New York when the federal moratorium on air shipment ends. Other routes must be found to divert these lethal substances away from New Jersey's densely populated areas. The convenience and economic considerations of the shippers of these dangerous substances must not be permitted to govern the health and safety of the residents of New Jersey.

This bill mandatorily includes in the ban all counties with a population density of 1,000 persons or more. If we look at areas of 1,000 persons per square mile or more in the United States, we find we are talking, really, about a very small part of the continental United States. I have these maps here that were included in material published by the Regional Plan Association that show in these darkly shaded areas parts of the United States that have population densities of 1,000 persons per square mile or more. Certainly we ought to be able to, as a minimum, ban these shipments from these areas where if an accident were to occur, and there were to be a discharge, the toll would be so many times higher and where the complications in terms of being able to do something about it would be compounded. In addition, because we have communities in this State that have population densities that are quite high, we permit the Department of Environmental Protection by regulation to include in the ban other areas where they feel the public interest lies. We have standards for that so they could consider that, hold hearings on that, and include other areas of other communities wanting to be included. But, presumably, it would be based on some logical system and not just include areas based on some statistical chance of population whether a community was included or not creating a topographical monstrosity that would be very difficult to enforce. With county lines, I think we have something that adds greatly to the enforcement because I know that where there is such a ban there will be a need to post signs at the principal entry areas of the counties.

Another area where the federal regulations fall short and where we need to take action lies in the exceptions that are permitted under the federal regulations. I don't know that this has been finalized and so we don't have examples of exemptions granted yet. It says that "you can have an exception where alternate routes would result in excessive increase in transit time." That makes no sense at all because here we are talking about a very modest economic consideration for the shipper which is in turn an infinitesimal part of the cost of operating whatever type of nuclear facility is involved. That is just no basis for allowing penetration into the areas that would otherwise be denied under the federal requirements. Someone could, under that, go

practically anywhere. The federal exceptions also cover where there are no alternate routes along which a vehicle would be allowed on the basis of size or weight. Now at first blush that might seem very reasonable. Certainly it is legitimate that some of these cargoes require massive lead shielding which is a lot of weight. You don't want to require them to be on a road that won't carry them. I think the effect of this legislation would be, by the way, to keep them on the inter-states which have maximum road-bearing capacity. But the loophole in this is that there is no reference whatsoever as to whether that cargo could actually be divided into smaller cargoes that could be carried on separate trucks that would be within the weight limit. I just don't see this as being a reason for penetrating a highly populated area unless there is no way around. That caveat or condition is missing from the requirements with the federal law. I submit that the State should not leave that out.

There is one other thing in the federal regulations that I find very interesting. The federal regulations, unlike many that deal with the nuclear area, do not preempt local action. Quite on the contrary, let me read you this other exception: "There are no alternate routes because laws, ordinances, or regulations of local jurisdictions embargo such shipments." To me, that's an invitation for us to put into effect the restrictions that will protect this area and an indication that if we have these restrictions, in effect, the federal government will give added weight in requiring respect for them. That's on page 8 of the "Physical Protections in Shipments of Eradiated Nuclear Fuel, Interim Guidance, 2B."

So I will submit that we want to adopt this as rapidly as possible. This legislation has been carefully drafted so that it also gives the Department of Environmental Protection the authority to include additional categories of materials beyond those that we spell out in the ban, upon a hearing and appropriate determination in accordance with the standards. The exception to that is radio-pharmaceuticals. They can't ban radio-pharmaceuticals but they do have the authority under Assembly 1953 of a few years ago under which the present regulations were adopted and of which I was a co-sponsor, to apply more restrictions to the radio-pharmaceuticals. So that in using this additional authority they not only include additional categories within the area we have mandatorily banned, they could also include categories in areas that are up to them--optional to ban.

Now, just one comment about the excellent remarks that Mr. Mazur made. He spoke about the need for special action in relation to certain types of cargoes that would not want to be banned. Of course, the most hazardous here are the mass radio-pharmaceuticals--not the kind of thing where someone is making a delivery to a doctor which is not any great quantity--but more likely, a large amount of supplies going to a company that actually provides radio-pharmaceuticals, that actually works with them. Even more important and perhaps more appropriate as far as those of us who are here from Bergen County are concerned is the question of radio-graphic materials, for instance, the materials to recharge a cobalt machine in a hospital. Obviously nobody wants to stop this. The hospital in Hackensack needs it. But there may be some serious question as to whether there needs to be a greater amount of coordination with local officials so they know when it is coming and can work along with the shipment to insure that there are adequate safeguards.

In summation, I want to come back to the point at the opening that since you are taking this extraordinary action to have the Sub-committee function during the summer period when the Legislature is semi-dormant, I would urge you to report this bill out as rapidly as possible so we can act on it. I hope that this bill can be

reported out so that in the very near future we will be able to vote on it in the Legislature and have the authority to provide these protections. It is the kind of legislation that really deserves that type of emergency action. Thank you very much. I apologize to all of you for taking so much time.

ASSEMBLYMAN BURNS: Don't go away, Mr. Baer. Your bill uses the one thousand persons per square mile as a criterion for eliminating the transport of radioactive materials through population densities of that number, right?

ASSEMBLYMAN BAER: On a mandatory basis, yes.

ASSEMBLYMAN BURNS: Right. That completely puts it out. Do you also feel that we should put into the upcoming legislation some proviso for the necessary transportation of radioactive materials to hospitals?

ASSEMBLYMAN BAER: I would suggest a small change in my bill. My bill provides the authority to ban additional categories of materials. I would suggest that that be amended to say "ban or restrict", or perhaps--I'm not trying to figure out the precise wording here--or "provide conditions for", so that the Department is not just given the authority--either yes you can let it go through or no you can't--but they have the authority if they want to have a wide range of authority in terms of restrictions. There were things in my testimony, and I'll leave a copy of this with you, before the Department of Environmental Protection in which I suggested areas of regulation that they were not presently getting into--areas where there were some questions on some of them of jurisdiction, for instance, driver safety, driver training, driver rest periods, procedures for an alternate driver next to the original driver in case he has a heart attack. I got into questions of in-transit storage. It was one of the areas in those regulations. I got into the requirements for security guards for that in-transit storage, the requirements for the physical protection--security--the locks, or the security standards of a building, or guards or the training requirements of the guards, or what are the eligibility requirements for hiring the guards. By the way, the eligibility would also go into the drivers. There were a number of additional areas that I went into: coordination with local officials, letting local officials know in advance when certain things are going through, perhaps even more importantly, letting local officials know in general what types of things to go through from time to time so they can look up the technology that they need to be prepared with in terms of dealing with a mishap so their people are trained for that, they have the specialized equipment if necessary and the specialized counter measures. Because just tipping them off at the last minute of what is going through isn't sufficient if they haven't had a chance to know what the hell that means. These are all additional areas. I think it is important if there is any question whatsoever that the Department of Environmental Protection doesn't have this authority. In my testimony, I made a case that they could bring those things under the authority to require other information. But if there is any question whatsoever that they don't have that authority then I think this ought to be the vehicle to insure that they do have that authority. One other thing that just occurred to me that I wanted to mention: One thing that this legislation does that does not exist elsewhere is where a shipper is in violation in terms of the type of ban we are talking about--I'm not talking about a violation of some trivial requirement so that when he fills out a form there is some technical thing that is inaccurate, maybe a date or something--but a shipper that goes into an area that is embargoed, in addition to the misdemeanor penalties that presently are provided statutorily by law, which for a corporation is a fine that is a slap on the wrist, this provides the authority to put them out of the nuclear shipping business for three years

in New Jersey which time was chosen to coincide with the time of the misdemeanor or someone is jailed. I think that type of strong sanction is necessary so that we don't find shippers gambling with getting away with this kind of thing. Excuse me for being so long in responding. Do you have another question?

ASSEMBLYMAN BURNS: You have a very strict bill here yet in the way of penalty it is only the revoking of their eligibility to handle radioactive material. Is that the only penalty you feel would be adequate?

ASSEMBLYMAN BAER: No, not at all. This bill, if you look at it, is a supplement to the existing legislation. I think if you look at the title to it you will see it is a supplement to the existing legislation.

ASSEMBLYMAN BURNS: "Supplementing the Radiation Protection Act of 1977."
O.K.

ASSEMBLYMAN BAER: That's right. That is drawn up specifically so that it is a supplement to the one that we adopted in 1977 which was, in fact, a supplement of the prior one. The reason for that is that the one that we adopted in 1977 was the one that included those misdemeanor penalties. Therefore, anything that is a violation here also is a violation misdemeanor and they have the option of going in that direction if they want to too, plus the sanctions that were proposed in the regulations themselves.

So you do have a range of penalties. But the penalty for actually violating Section one and two of this Act--- Section one is to bring these types of materials into a county that exceeds 1,000 persons per square mile--and I might enumerate, by the way, that means, Bergen County, Passaic County, Hudson County, Essex County, Union County, Middlesex County, Monmouth County, Mercer County, and Camden County--that would result in putting them out of business for three years, the nuclear transportation business. The same is true so far as their violating the ban in Section two which is the optional ban that the Department of Environmental Protection could adopt. Now I would suggest to you that you amend Section two so that the Department has authority to do other things. An outright ban requires certain types of authority for informing local officials or other things of the sort I was describing before. I would not propose that you automatically apply that three-year, putting out of business to any violation of that sort, nor am I suggesting that there be no instance where such a penalty would apply. I think you would have to examine the nature of the authority that you would be giving there and what type of violations under that permissive authority, other than a ban, you would want to provide that type of sanction for. I'm not sure I really expressed that clearly.

ASSEMBLYMAN BURNS: That's clear. I have no more questions. I think that Assemblyman Kern would like to ask you a few questions if you permit it.

ASSEMBLYMAN KERN: I understand from your testimony, Assemblyman Baer, that you feel that the federal regulations are very difficult to enforce--the recently proposed regulations. That is because of a definitional problem so far as an urban area goes?

ASSEMBLYMAN BAER: There are a number of things. First of all, their restriction applies to urban areas. It also covers more than urban areas. It covers cities, I think, of over a hundred or a hundred and fifty thousand population, which we don't have any of in Bergen County. It covers a couple different categories. But for us in Bergen County, since we don't have those large cities, the only thing that would apply would be the urbanized areas. Although most of Bergen County, if not all of Bergen County, is covered in an urbanized area--I'd have to take a look at the map again--when you get to some of the other counties that leave that coverage--- As a

matter of fact, the part of Bergen County that is not included, you happen to be representing, sir.

ASSEMBLYMAN KERN: Of course. We are also getting the trucks.

ASSEMBLYMAN BAER: That just happens to be the town of Mahwah. I'll pass this up temporarily for you to take a look at. If you look you can see how jagged that is. There are large parts of Monmouth County, Passaic County, Middlesex, and some of the other counties I have mentioned that are not included that ought to have that protection. As I say, it creates a severe difficulty in terms of enforcement or compliance by a company that wants to comply. How do they inform their shipper? They have a long list of towns. They have to keep track of what town they go through. Some of those are very tiny little towns.

ASSEMBLYMAN KERN: One of the problems then is the density problem of the federal regulations. Another one is, you said, an escape hatch on the federal regulations where the proposed route would necessitate unnecessary time delay, or something to that effect?

ASSEMBLYMAN BAER: That's right. In this it says, "Shipments made transit areas defined in criteria one," that is areas supposed to be restricted from.

ASSEMBLYMAN BURNS: What are you reading from, Byron?

ASSEMBLYMAN BAER: I'm reading from page 8 of Physical Protection of Shipments of Eradiated Reactor Fuel which was provided to us at the same time they published their proposed action. This is supposed to be their proposed action. The areas excluded are urbanized areas in excess of a million persons. By the way, that might raise some question as to whether the urbanized areas surrounding Trenton or Camden might be included. They may not come up to that; we do..."urbanized areas containing any single city with a population in excess of 500,000 persons". Nothing in New Jersey covers that. ..."the boundary of any city other than those included in any of the..." "...excluding the rural part of the extended city with a population in excess of 100,000 persons..." In other words, a city with a hundred thousand persons--- By the way, I forgot to point out that those urbanized areas aren't even based on cities. They are based on census tracts. If you look closely you will see there are towns divided with census tracts, part of the town included and part not, which makes even more apparent how impossible they would be for enforcement.

Now, getting back to your question, "Shipments made transit areas defined in criteria one," those are the ones they are not supposed to go through. And by the way, "...criteria one routes should avoid movement through or within three miles of..." It doesn't even use the words "absolutely not transit areas." It says, "avoid." Now here are the exceptions: There are no alternate routes along which the vehicle would be allowed on the basis of size, weight, or cargo description. (B) There are no alternate routes because laws, ordinances, or regulations of local jurisdictions embargo such shipments. (C) Alternate routes would (1) result in an increase in transit time, (2) require additional overnight stops or extended layovers, or (3) constitute a significant safety hazard due to road or environmental conditions. I have no quarrel with three. But I would point out that all of these three in (C) need only any one of them to apply and it is the basis. So there are five reasons given for an exception and those reasons could, in the hands of a lenient administrator, result in all kinds of mischief and in the hands of a very conscientious administrator result in all kinds of grief through litigation.

ASSEMBLYMAN KERN: And you see no problem so far as a federal enforcement goes. The locality or the State can come in; there is no federal pre-emption?

ASSEMBLYMAN BAER: That's right. There is no federal pre-emption. First of all, that's indicated in these very regulations by the recognition of local restrictions. Secondly, we got in touch with the NRC on this because there was something published in a publication that contradicted this. They explained that this was not pre-empted. Furthermore, I don't want to mention the publication but we got in touch with them later--it may be one that you saw as a legislator--we got in touch with them and they told us that they were in error. Also, I have here...

ASSEMBLYMAN KERN: I'm familiar with that.

ASSEMBLYMAN BAER: (continuing) ...another newspaper article in which it states specifically that new rules do not pre-empt local and State laws regulating or banning spent fuel shipments. O.K.?

ASSEMBLYMAN KERN: Thank you very much, Mr. Chairman.

ASSEMBLYMAN BURNS: Thank you very much, Mr. Baer.

Those of you who have the agenda, I think we have to deviate from the original agenda. The next people we will have to hear from will be the New Jersey Motor Truck Association. We are making reference to trucking, types of trucks, transportation, roads and I think it is important that we hear from them in order to get a proper perspective and a balance on this situation. We have Mr. Paul Stalknecht, of the New Jersey Motor Truck Association.

P A U L T. S T A L K N E C H T: Good evening. My name is Paul T. Stalknecht, Assistant Managing Director of the New Jersey Motor Truck Association (NJMTA). I am here tonight to present that organization's comments on the overall transportation of radioactive materials in the State of New Jersey.

NJMTA, headquartered in East Brunswick, is a non-profit trade association numbering some 1,300 member companies involved in the highway transportation of freight both in intra and interstate commerce. Virtually since its inception in 1914, NJMTA has been widely recognized throughout this State as the authoritative voice of New Jersey's trucking industry.

To get right to the point, New Jersey's regulations governing the transportation of radioactive materials are in a state of total chaos. The regulations of the New Jersey Department of Environmental Protection, Bureau of Radiation Protection, to control radioactive material transportation are an abysmal failure and do not adequately address themselves to modern day shipping technology. They were promulgated into law on September 26, 1977, with the passage and subsequent signing of Assembly Bill No. 1953. Recent legislation introduced by Assemblymen Baer and Cali--Bill No. 3553--on July 19, 1979 to ban the transport and storage of radioactive materials in certain New Jersey counties will only complex this issue.

An example of the problems DEP regulations have on motor carriers is best exemplified by the seven "business" day advance notification and other miscellaneous reporting requirements as set forth in Section 7:28-12.4(c). I emphasize the phrase "business" day. Since business days are Monday through Friday, in actuality, the regulations are calling for a minimum of nine days and possibly eleven days advance notification dependent upon what day of the week the notification process is initiated.

As a service industry, especially as concerns trucking companies involved in the general freight arena, trucking operations are dictated by the daily wants and needs of the shipping community. In today's super competitive economy, the speed and efficiency with which a person or business responds to customers often spells the difference between success or failure. This high-pressure business climate places a demand on motor carriers to provide immediate availability of transportation services.

Motor carriers have little or no control as to when freight is offered for transportation. Due to the nature of their business, truck operators must provide their services to shippers within a few hours' notice.

On interstate shipments, it is virtually impossible to accurately predict even as little as one day in advance most of the information that is required by the regulations and by the latest DEP proposals (Docket No. DEP 022-79-04). To ask that this be accomplished nine days or eleven days in advance is preposterous. Weather, labor difficulties, mechanical breakdowns, traffic delays, etc., are but a few of the imponderables which can derail the best-laid plans.

As NJMTA warned the DEP in earlier comments, the cumbersome and complex reporting and record-keeping requirements could work to open the gates to illegal radioactive materials transportation by fly-by-night truckers. NJMTA believes this is already happening in New Jersey. Many of the qualified and respected intrastate motor carriers in New Jersey have stopped hauling radioactive material shipments. Knowing that they cannot comply with the regulations and not wishing to violate the law, they are refusing to handle these materials.

Since the initial regulations went into effect over a year and a half ago, less than one hundred radioactive material shipments have been reported to the State Police as required by the initial regulations. While NJMTA agrees that 20 curie radioactive material shipments are limited, it nevertheless finds it difficult to believe that so few have actually been conducted during this period. Could it be that the radioactive material shipments have gone underground? If so, the regulations obviously are self-defeating.

The concept of these regulations as NJMTA sees it is akin to "putting the cart before the horse." The total emphasis and responsibility of radioactive material transportation are being placed on motor carrier shoulders while the DEP completely ignores the shipping public. I must emphasize that the motor carrier industry only performs a service to the shipping public, namely, picking up freight at one location and delivering it to another in accordance with applicable transportation regulations. The trucking industry therefore has no control over where this shipping public chooses to locate.

The trucking company and its driver are placed at the mercy of the shipper. It is the shipper's responsibility to properly identify, package, label and mark radioactive material shipments. If the shipper chooses to ignore these necessary and important transportation safeguards, he can do so unbeknownst to the motor carrier. Please let me explain.

(Demonstrating) Here are two radioactive material packages. Both have the appropriate outside federal regulation markings and labeling identifying their contents as radioactive material. In one of these boxes, the inside radioactive material packaging complies with the applicable federal rules and is safe for transportation; the other contains serious safety violations. Which box is the violator?

ASSEMBLYMAN BURNS: Hold the box up. From the outside appearance they are exactly alike. Is that what you are saying?

MR. STALKNECHT: Exactly alike--a typical regulations' fault.

Of course, they are empty.

ASSEMBLYMAN BURNS: I was hoping they would be or we are going to start to glow in the dark.

MR. STALKNECHT: What about these two packages? Neither has any outside markings or labels to identify it as a hazardous material. For all intent and purposes,

each is classified and shipped as general freight. However, one box contains a radioactive material shipment. Which box is it?

These examples are cited to illustrate a point. There are many people present here today who are better educated and more versed in transportation regulation than the average truck driver. Yet, I have serious doubts whether they could answer the question, "Which box is it?" without guessing. Truck drivers are not chemists, engineers or lawyers, they are truck drivers. They, like their employers, depend upon shippers to comply with applicable transportation regulations.

As you have witnessed, it is very easy for a shipper to camouflage a radioactive material shipment or to take packaging shortcuts. In states where unrealistic or no intrastate transportation regulations exist, shippers may elect to go this route. Without a truly practicable and effective body of regulations to prevent or discourage this activity, it may very well happen in New Jersey. It is ironic that although the DEP acknowledges that this shipper problem exists, it fails to address shipper requirements in its regulations. Although NJMTA believes such shipping practices are certainly in the minority, it is our opinion that if New Jersey wishes to regulate radioactive material, it must do so to all segments within the transportation framework as does the federal rules.

Should Assembly Bill 3553 be enacted, the underground transportation of radioactive material will increase as more and more motor carriers stop hauling these products. Radioactive material is a minute amount in the overall freight mix. The cost of doing business to satisfy one radioactive material shipment by taking circuitous routes, complying with notification requirements and obtaining special permits would be prohibitive. You can be assured that the legitimate intra and interstate general freight carriers will soon avoid radioactive material like the plague.

I have referred throughout my comments to regulations of the federal government concerning hazardous materials transportation. For many years the U. S. Department of Transportation has regulated such shipments including radioactive materials and during this period an effective body of applicable regulations has been developed. NJMTA believes that these regulations have proven themselves adequate as evidenced by the excellent safety record in highway transportation of all classes of hazardous materials. Since the federal rules apply to all interstate shipments but do not apply to certain intrastate shipments, legislation has been introduced in New Jersey--Assembly Bill No. 1566--requiring the State to adopt the U.S. DOT regulations.

ASSEMBLYMAN BURNS: U.S. DOT? What does that stand for?

MR. STALKNECHT: U. S. Department of Transportation.

To further development of effective, uniform and well-understood regulations, states and their political subdivisions cannot be permitted to enact conflicting, confusing or needlessly stringent regulations governing the transportation of hazardous materials into or within their borders. This type of activity was acknowledged in a N.J. Department of Transportation memorandum from Martin E. Robbins, Office of Policy Analysis to Commissioner Louis J. Gambaccini dated December 28, 1978. Page 5 of that memorandum reads as follows:

"Probably, the most important issue affecting state action on hazardous materials is the scope of federal pre-emption. The relevant provision of the Hazardous Materials Transportation Act, 49 of the U.S. Code reads as follows:"...any requirement of a State or political subdivision thereof, which is inconsistent with any requirement set forth in this chapter, or in a regulation issued under this chapter is pre-empted." A study "Transportation of Hazardous Materials by Highway in Illinois" (1977) prepared by Lawrence Bierlein, Esq. states that all state action is not precluded by the

Hazardous Materials Transportation Act but is severely curtailed. In the absence of court interpretation, it is Mr. Bierlein's opinion that the following kind of state regulations would be pre-empted by the Act:

These are found in Sections 3 and 4.

3. Any requirement that is sufficiently at variance with DOT regulations as to stimulate confusion among people trying to comply with the federal rules.
4. Any requirement that is substantially more stringent than a DOT regulation on the same subject.

Based upon this interpretation, it appears that the legality of the DEP proposals and existing radioactive material regulations is suspect.

NJMTA and its members are not opposed to regulation and fully share the concern about radioactive material transportation. We are not only truck operators; we are also citizens desirous of safeguarding the environment. We are also parents opposed to anything that jeopardizes the health and safety of our loved ones and neighbors. NJMTA repeats its off-stated policy of standing ready and willing to cooperate with State government in developing radioactive material transportation control standards that not only will effectuate the State goal of protecting the environment and citizens but will be sufficiently rational, practical and enforceable so they can be accepted by our industry.

In summary, NJMTA vehemently objects to existing and proposed State regulations on radioactive material transportation. The regulations impose an intolerable burden on interstate commerce, do not clearly address themselves to many areas of radioactive material transportation, are confusing and ambiguous, and in all likelihood are pre-empted by the federal rules. For these reasons, NJMTA requests that these regulations be abandoned and that this Committee join with other State agencies in seeking enactment of Assembly Bill No. 1566. Passage of this legislation will provide a set of uniform hazardous materials transportation regulations for all parties, encourage compliance through well-understood and workable standards and afford New Jersey a reasonable level of safety.

It is further recommended that should it be New Jersey's desire to identify radioactive material transporters, regulations should be adopted requiring these companies to register with the appropriate State agency. Annual performance reports could be required thus providing the necessary information gathering tools to determine the amount, location and nature of radioactive material transportation in New Jersey. This data can be useful to the DEP and other State agencies to effectively evaluate the radioactive material transportation activity in New Jersey. Thank you.

ASSEMBLYMAN BURNS: Thank you very much. I just want to get a few things cleared up. You seem to feel that you are afraid of overregulation. Is that the general theme of what you have to say?

MR. STALKNECHT: That is correct.

ASSEMBLYMAN BURNS: That we could get into an abyss of rules and regulations that would be more detrimental?

MR. STALKNECHT: That is correct.

ASSEMBLYMAN BURNS: And actually create a black market in shipping?

MR. STALKNECHT: That is correct.

ASSEMBLYMAN BURNS: And in a black market there would be no regulations.

MR. STALKNECHT: You wouldn't know about it.

ASSEMBLYMAN BURNS: The risk to the public would be horrendous.

MR. STALKNECHT: That is correct.

ASSEMBLYMAN BURNS: What has been the safety record in the transportation of radioactive materials? Do you have any statistics or any safety record you know of?

MR. STALKNECHT: I do not have them offhand but I could get them for another day.

ASSEMBLYMAN BURNS: Have there been any deaths in the transportation of radioactive material?

MR. STALKNECHT: There may have been some but none to my recollection. Again, I would have to research that.

ASSEMBLYMAN BURNS: So you don't have any idea of any deaths or any injuries or anything like that?

MR. STALKNECHT: They would be very negligible because the transportation of radioactive materials is very minute. Someone before mentioned a truck carrying 64,000 curies of radioactive material; that is absurd. Because in the Transportation Index they have a rule they call a "50-unit rule." A truck cannot carry more than 50 units of radioactive material. For example, this box of radioactive three which are the most dangerous type I have marked Plutonium Nitrate Solution which is a radioactive material, a 20 curie package. It would have a transportation index nationally of perhaps 20. Once you reach 50 on the transportation index, it can no longer be carried on a vehicle. So there are controls limiting the total amount of a radioactive material that may be carried on a vehicle in the present rules.

ASSEMBLYMAN BURNS: Mr. Kern, do you have any questions?

ASSEMBLYMAN KERN: You have been mainly concerning yourself with the radioactive isotopes that are used in pharmaceuticals, radiology, and things of that nature.

MR. STALKNECHT: That's correct.

ASSEMBLYMAN KERN: Do you have any expertise with respect to transportation of nuclear waste fuel?

MR. STALKNECHT: No, I do not.

ASSEMBLYMAN KERN: Because as I understand it, it is those casks that have the heavy concentration of radiation in the thousands of curies. This type of situation looks like it needs addressing.

MR. STALKNECHT: It certainly does. Another thing is that if the State of New Jersey in its nine northern counties adopts the ban on radioactive materials transportation, what if all these prohibited areas like Allentown, Pennsylvania, Philadelphia, Harrisburg, all across the country adopt the regulations? If they did that it would take three years to get to the west coast.

ASSEMBLYMAN BURNS: I think the purpose of this Committee is to avoid a complete lopsided approach to this subject. We do want to get a proper mix. We do appreciate the fact that materials have to be transported. They have to be treated. They are part of our economy. Your statement was very clear and we will take it under advisement and see what we can incorporate into our upcoming legislation. Thank you very much. Do we have a Mr. Dennis Hirschfelder here?

D E N N I S H I R S C H F E L D E R: Good evening. I have a few very brief comments to make. I will be submitting rather detailed testimony to you.

I think the State of New Jersey has a definite moral obligation and responsibility to regulate the transportation of radioactive materials. The federal government has just recently begun to get involved in this area. It is long overdue but their efforts fall far short as Assemblyman Baer indicated. There are very clear indications

that the federal government has, at least up until now, given the states and the local communities the right to pre-empt the federal regulations. I would hope that one of the things that your Sub-committee would do and that the State Assembly would press for is that in any regulation the federal government enacts that included in it is the right for a state to enact a stricter, more stringent regulation. I think that is very, very important.

The number of shipments of radioactive materials is going to dramatically increase over the next five or ten years. I'm referring specifically to the materials emanating from your power plants. As more power plants now under construction come on line, the number of shipments of low-level and, more importantly, high-level waste materials will increase.

One thing that comes to mind and is of particular concern is West Valley, New York, the probable site as a regional storage location. The federal government has a plan---

ASSEMBLYMAN BURNS: Excuse me, West Valley, New York?

MR. HIRSCHFELDER: West Valley, New York.

ASSEMBLYMAN BURNS: Where is that located?

MR. HIRSCHFELDER: It is up near Buffalo. It is about 30 miles south of Buffalo.

The government has no permanent method in hand for storing high-level radioactive materials. Their plan at the present time is to develop regional sites around the country where they can hold these lethal materials temporarily until they can figure out what to do with them on a permanent basis. You may have noted in the paper this week that they are thinking of buying an island in the South Pacific to store them. But in any way, if West Valley, New York opens up as a regional site, instead of the traffic flowing from New England down to South Carolina, presumably, it will turn around and come up to West Valley, New York through New Jersey the other way. So this is a great concern to many people around here and should be.

There are specifically three areas which should be better regulated by the State of New Jersey: One has to do with the ban on shipments of high-level radioactive waste in spent fuel rods. This has been covered admirably in the bill that Assemblyman Baer has introduced into the Transportation Committee. I hope it is passed out of the Committee very quickly. Secondly, some planning has got to be done to prepare for accidents when they happen, whether they involve low-level or high-level materials. There have been hundreds of accidents, as stated before, involving radioactive materials throughout this country. A large percentage of these accidents have resulted in the release of radiation. And in many of these accidents there has been mass confusion among the agencies responsible for supposedly cleaning up. No one knows who has jurisdiction. No one knows who is going to pay for the cleanup. This is not spelled out and it has got to be. There have been enormous time delays. In the accident that was referred to by Assemblyman Kern that took place in Colorado, there were three or four days delay in figuring out who was going to clean up the mess--10,000 tons, some ungodly amount, of yellow cake spread all over the roadway. So this has to be dealt with at the State level. Because if an accident happens and cleanup does not take place quickly, you have a potentially serious situation in your back yard. Thirdly, another area that must be dealt with is the monitoring of shipments. There are devices available to measure radioactivity emanating from trucks or trains that carry the material. There should be visual inspections of these trucks as they come through. Just as you see trucks being inspected at the tunnels or the

bridges, something should be inspecting these trucks as they enter New Jersey from Route 17 up in New York, and they should be monitored periodically as they go through the State. They could be releasing radioactivity. They have had all sorts of mishaps occur. There have been cases where some of the material had leaked out and no one found out about it until the truck had a flat tire or an accident. Then someone finally discovered that something was wrong that should have been caught before the truck got into trouble. So these are three specific areas which I would hope the State of New Jersey would take action on: the banning of high-level radioactive material from our highways altogether, the area of monitoring, the area of planning for accidents, the evaluation plan. Particularly, accident planning should involve testing. There should be simulated accidents. There have to be simulated evacuations if you don't expect mass confusion to occur. If they had had to evacuate the area around Three Mile Island, it would have been an absolute catastrophe. No one would have known what to do simply because of poor planning ahead of time. I think this is one of the reasons they decided not to do it. With these few brief comments, I will be glad to answer any questions that you have. I have studied the issue for a long time; I feel strongly about it.

ASSEMBLYMAN BURNS: Thank you very much, Dennis. I don't have any questions. I do agree with many of the points you made. Do you have any questions, Walter?

ASSEMBLYMAN KERN: No, I don't but I think you really capsulized what has to be done so far as future legislation goes.

ASSEMBLYMAN BURNS: Incidentally, Dennis, SANE is an acronym for what?

MR. HIRSCHFELDER: It's really not an acronym. It's National Committee for a Sane Nuclear World. It is a national organization and I represent the New Jersey and Bergen County Chapter

ASSEMBLYMAN KERN: They have been very active in alerting the governmental authorities to the dangers that we presently are facing.

ASSEMBLYMAN BURNS: Thank you very much.

Because of the Jersey Central Power and Light Company's notoriety in the last few months, they would like to present a movie explaining their side of the argument. I think we should look at that now.

K E N N E T H G O D D A R D: I'd like to make just a few remarks in introducing this film.

I have read Assembly Resolution No. 3003, which created this Sub-committee, and it is clear that one of the major concerns of the authors was the element Plutonium.

As the resolution states, plutonium is a toxic long-lived man-made element. Some of its isotopes are fissionable and are capable of being manufactured into atomic weapons. But it should be made clear that very few shipments of radioactive materials in New Jersey or in the nation as a whole contain plutonium. Because of the nature of plutonium, these shipments receive very special handling.

In the nuclear power industry, significant quantities of plutonium are found only in spent nuclear fuel. In spent fuel, a small portion of the uranium, on the order of 1%, has been converted into plutonium. It is in solid form, an oxide, encased in the fuel rods which are zirconium alloy tubes.

When spent nuclear fuel is shipped from a power reactor or some storage site, one or more of those bundles of fuel are carried in a shipping cask which weighs from 30 to 100 tons. The shipping casks are designed to withstand a variety of serious accidents. For example, they have to maintain their integrity after being dropped 30 feet onto a flat, hard surface, after being dropped 40 inches onto the end of a six inch in diameter steel spike, after being exposed for 30 minutes to a fire of

1475 degrees Fahrenheit, and after being submerged in water for 8 hours--all of those occurring in sequence.

Studies have been carried out at Sandia Laboratories in New Mexico on safeguarding spent nuclear fuel in transport. Now we have a film that is about three minutes long that shows some of those studies.

(FILM SHOWN)

I have been reminded that I didn't identify myself for the record. My name is Kenneth Goddard. I am a Senior Engineer in Nuclear Safety and Licensing for the Jersey Central Power and Light Company. I think the film that we have just seen demonstrates quite adequately how well designed spent fuel shipping casks are. In fact, these were older versions of casks that have been taken out of service. The new ones are even better.

I haven't prepared an additional statement. We heard quite a bit this evening. I am speaking now as an individual who is a Nuclear Engineer and who knows a bit about nuclear materials. Some of what I heard made me a little angry. Because I think we have heard things talked about as fact when, in fact, they are more in the nature of fantasy or science fiction. We heard someone talk about thousands of people being killed by a transportation accident and a minute later the "thousands" became "ten thousands". Then the next speaker came up and it became "hundreds of thousands." We have heard people talk about accidents in which incredibly large numbers of curies were released. I think that a couple of things have to be borne in mind. One is that no one has been killed or seriously injured in the transportation of nuclear materials in the United States. That is despite the fact that there have already been millions of shipments. On the contrary, the record for conventional hazardous materials is not nearly as good. Thousands of people are killed by flammable materials and by toxic materials. In addition, over the years, hundreds of communities have had to be evacuated due to accidental releases during transportation of toxic and flammable materials. I think that considering the relative safety record, the Legislature may find it worthwhile to give a little more effort to those materials which have demonstrated a greater potential for damage rather than to nuclear materials which have actually shown themselves to be rather safe in transportation. I could go on further but I don't want to bore the Committee. I will give you a chance to ask questions that you might have.

ASSEMBLYMAN BURNS: The source of the film we saw--it may have been mentioned in the sound track--but who made that film?

MR. GODDARD: It was made by Sandia Laboratories in New Mexico. They are a large national laboratory something like Brookhaven Laboratories on Long Island.

ASSEMBLYMAN BURNS: Who set up the specifications that they should go to those lengths?

MR. GODDARD: They were paid to do the test by the Department of Energy which gave them guidelines on the sort of tests that they wanted to see done. The strange numbers like 81 and 84 just came out that way because that was the actual measure of speed which was achieved by rockets that they were using.

ASSEMBLYMAN BURNS: You said you were a nuclear engineer?

MR. GODDARD: That's right.

ASSEMBLYMAN BURNS: You have a degree in the field?

MR. GODDARD: That's right. I have a bachelor's and a masters degree from New York University. I have been working for seven years in Nuclear Safety and Licensing.

ASSEMBLYMAN BURNS: In the nuclear field?

MR. GODDARD: Strictly in the nuclear field, that's right.

ASSEMBLYMAN BURNS: Give me an honest opinion. You know we have a lot of public concern on this matter of radioactive material. The publicity hasn't been the best over the last few months. The heat is on to come up with something concrete to safeguard the public. That's what we are interested in. Could you give me a quick analysis of whether the transportation of this material is safe?

MR. GODDARD: I think the transportation of nuclear materials in the United States is safe. I think the record bears that out. I think it is going to become safer because accidents such as the one that was referred to that took place in Colorado with the yellow cake--which incidentally is a material that is more dangerous due to its chemical toxicity than due to its radioactive content--I think accidents like that have been learning experiences for the people involved. I think we are going to see transportation containers for materials like that improved and I think we are going to see improved response plans for accidents like that. But I don't think the State of New Jersey, or any state, has the capability to regulate that sort of nitty-gritty detail--things like transportation containers, things like response plans for accidents. I think that is up to the federal government. I think the State should direct some effort towards getting together with the other states and telling the federal government what they want in those regards. But I really don't think that any additional State regulations on shipping, even ones that have been talked about such as regulating shipping through densely populated areas, are going to have any significant benefit on the public health and safety. In fact, I think they are going to cause a lot of problems because they are going to hold up the shipments of needed radio-pharmaceuticals. They are going to hold up the shipment of radiographic devices which often are very important. I just think they are going to be counter productive.

ASSEMBLYMAN BURNS: You mentioned Byron Baer's bill 3553. Would you object if Mr. Baer asked you a few questions? He's not a member of the Committee.

MR. GODDARD: I certainly wouldn't.

ASSEMBLYMAN BAER: In regard to the tests that you just showed us, the test with the truck in a headon collision into the large concrete block: Didn't the impact on the truck and the crushing of the cab and the front part of the body of the trailer serve somewhat to cushion the shock and reduce on that particular test a good bit of the impact which was transmitted to the container?

MR. GODDARD: I think you will find that it reduced some of the impact. In particular, as you probably saw, there is a crushable shield placed over the cask which is intended to dissipate some of the impact. I don't think, however, that the cab of the truck served that function because of the weight of the 25 ton cask behind it, it just crumbled like an eggshell.

ASSEMBLYMAN BAER: Isn't it a feature of design in passenger vehicles to have the front part of the car crush to absorb some of the shock so that the cargo, namely the people, receive less impact?

MR. GODDARD: I think that's true and it works very well when you are talking about 200 pound people. But when you are talking about a 25 ton cask, the cask has so much more momentum than the rest of the vehicle put together that as soon as the vehicle starts to accelerate the cask breaks loose from its moorings and goes right through the rest of the vehicle like it wasn't there.

ASSEMBLYMAN BAER: But then the energy it takes to deform the heavy frame of the cab and the front part of the trailer also is much greater than the conventional

passenger car.

MR. GODDARD: That's right but it is insignificant compared to the energy that is contained in the cask. In any case, I think this is all off the point. I don't think you are worried about shipments that are not on trucks because they are not on trucks. They are not on your roads so I don't really see the point of your question. I think what we saw was a realistic demonstration of what could happen to a cask in a high speed crash.

ASSEMBLYMAN BAER: I assume if there is a point to showing the picture, there is a point to asking a question about the picture. Isn't there?

MR. GODDARD: I think that the point is that since that demonstrated a realistic situation, I think a technical discussion of the crushed properties of the cab of the vehicle is a little inconsequential. But please go on.

ASSEMBLYMAN BAER: Perhaps the relevance is for the Committee to decide and not us. In the instance with the impact with the tree where the train impacted on the side of the container, we had a situation where the container was able to, relatively speaking, bounce free from the impact. So the crushing force on it was considerably reduced to the container itself. Let me ask you this: If you had a situation where you had a truck going the same speed as the first test shown where it went headon into concrete, and instead as a result of jackknifing or skidding or something, that truck landed sideways, went into a spin and without losing any significant speed hit sideways right into that concrete block so that you had neither whatever debatable cushioning effect would occur from the crushing of the cab, whatever debatable cushioning effect might occur from the crushing of the frame in the front part of the trailer, and the absence of the cushioning of the crushing of the front part of the container which is designed to absorb crashing, wouldn't you have far greater forces on that container while at the same time the container not being able to just bounce free in the direction of the acceleration? Wouldn't you have much greater forces and, therefore, what happened in these experiments would not predict what would necessarily happen in that situation?

MR. GODDARD: I don't think that from a technical standpoint what you said is really correct. If a truck jackknifes or turns sideways, that very act reduces its velocity considerably. And then the other point to consider is that if the cask gets sideways on the wall that you are distributing the impact over a much larger area, including those cooling fins that you saw on the side some of which were crushed by the impact of the train. That provides additional impact absorption capability. From that point of view I really can't see getting any more serious. I think another point to consider too is that they said in the beginning that they had done model studies, they had done computer simulations, and then they did these full sized tests to confirm that their models and their computers were able to tell them what would happen in the tests. The result of that technique is that you don't have to crash a cask in every possible configuration, and every time somebody comes up with a new idea you don't have to crash another cask. You've got computer models and they have demonstrated that they can do those tests.

ASSEMBLYMAN BAER: The computer program and that evidence isn't before the Committee. You just tell us about it that there was something done. But I assume that the desire of these demonstrations is to approach what might seem to be a worst case situation. Now let me ask you this: If you had that same type of hypothesis that I described where the impact is sideways--- By the way, I would suggest that the Committee might have a physicist look at this testimony so far as the assertion that hitting flatside has less impact because I'm not sure that---

MR. GODDARD: It has less impact per unit.

ASSEMBLYMAN BAER: (Continuing) ---necessarily anyone that ever bellywopped into the water would agree on that. But I'd rather leave that to physicists to analyze. But if at the same time you hypothesize this situation, instead of a flat concrete block we have an overpass abutment so that the container is subject to the shearing effect of being hit by the corner or edge of that, would you agree that the forces that were impacting on the container would be greater and more destructive than what you have shown here?

MR. GODDARD: Potentially so, I can't really guarantee that. However, I did see that train crash which was at 80 some miles an hour which is a lot faster than trucks are supposed to be going on our highways and I think that test may very well envelope the situation that you presented.

ASSEMBLYMAN BAER: Right. Except that in the train crash the container had a chance to bounce free and there is some degree of crushing of the front of the train. Maybe a foot wouldn't look like very much to us when we look at the picture on a fifty or a seventy foot or however long those locomotives are.

MR. GODDARD: If you look at that again you will see that the locomotive was totally demolished by the cask. The entire flat end of the locomotive is flattened out.

ASSEMBLYMAN BAER: If that's the case then that absorbs a lot of the energy through the give of that, the cushioning, that wouldn't occur with the---

MR. GODDARD: That's what was transporting the energy to the cask.

ASSEMBLYMAN BAER: Right. Now the last thing I wanted to ask you is apropos of the experience of Three Mile Island and a lot of other circumstances: Is it really possible for the best analysis to really anticipate all the circumstances that are likely to occur in subjecting a container to stress? Aren't we still likely to have things that nobody thinks about? We had terrorists put bazooka shots over to the U.N. A bazooka with a shaped charge of explosives which terrorists get hold of has tremendous penetrating power. Is it really possible for tests of this sort or analyses of this sort to confidently predict that all the circumstances that are likely to occur are planned for and the cargo is truly safe and won't be breached and people thereby endangered.

MR. GODDARD: I think you hit on one of my favorite subjects. The reason I say that is if what you are talking about is how much safety you want to demand, it is true that we can't think of every possible situation. We can only think of those things that we reasonably think might happen. We can analyze those and we can design for them. But the fact is, and all agree, nobody, no industry, not even an Assemblyman is perfect. Realistically speaking, I think we have done an excellent job of shipping, storing, and making use of radioactive materials. There will, on occasion, be accidents. But experience today has demonstrated that none of those accidents have been particularly severe--and as a personal opinion, I include Three Mile Island in that. Realistically speaking as I said in a statement a while ago, we are picking on a subject which has demonstrated very little potential danger to the public and ignoring things which have demonstrated much greater potential dangers to the public. Now, perhaps, that's being done because the public in some quarters is demonstrating what I might call a radiation paranoia. Radiation has become a popular subject. It is politically popular to propose bills dealing with radiation but I don't necessarily think that makes them technically correct or makes it in the public interest just because it is popular and because it is a hot topic. I think the record speaks for itself. I think radioactive

materials can be handled, transported, contained, and used in a very safe fashion.

ASSEMBLYMAN BAER: I'd like to ask one last question, Mr. Chairman. You are representing Public Service?

MR. GODDARD: I'm from Jersey Central Power and Light.

ASSEMBLYMAN BAER: Jersey Central Power, very good.

MR. GODDARD: I'd like to comment that as soon as I departed from my prepared statement, none of these statements are necessarily to be construed as the opinion of Jersey Central.

ASSEMBLYMAN BAER: O.K. The last question I'd like to ask you particularly because you do have some connection with them is: Isn't it a fact--and I can perhaps bring out a map that might help if necessary--that if a bill such as the one that I described--3553--were put into effect prohibiting transportation in the counties that are named--and I'll be glad to repeat them if you wish--that would not prevent transportation access for either the Oyster Creek or the Salem nuclear plants and that in fact this type of restriction, although keeping these cargoes from highly populated areas, allows means for radioactive cargoes to leave the State? Is that not a fact? If you want any assistance, I'll get the map out.

MR. GODDARD: No, I don't need to see the map because I think you are correct. For that reason I'd like to comment that I'm not speaking out of some selfish interest on the part of Jersey Central. We're not necessarily going to be hurt by the bill that you proposed. But I think that the public as a whole may be hurt if there are unnecessary restrictions that are not well thought out. I just think that this whole thing should be done in a climate of quiet reflection taking the best technical information into account and that you should not allow yourselves to be caught up in this paranoia of nuclear power that we are hearing so much about today.

ASSEMBLYMAN BAER: I want to thank you, Mr. Chairman, for the opportunity to ask the questions. And thank you for your responses, sir.

ASSEMBLYMAN BURNS: Kenneth, the container in the movie, that was the final container for the radioactive rods? The intent never was to open that container. It was on its way to its storage place. Is that---

MR. GODDARD: No, that isn't true. That is only a shipping container. When they get to their final disposition, it will be opened.

ASSEMBLYMAN BURNS: Was there any examination of the cargo? In other words, was it portable, could you handle it after that impact, or was it more dangerous?

MR. GODDARD: That contained simulated--- Actually it contained fresh fuel rather than used fuel at that time. They did examine it and the fuel was intact enough to be handled.

ASSEMBLYMAN BURNS: Upon opening it wouldn't cause any additional breakage or powdering or pulverization?

MR. GODDARD: No, not any form of damage to that degree.

ASSEMBLYMAN BURNS: The movie that we just saw was under the auspices or direction of the Department of Energy. Now did they promulgate any rules as a result of this, or any regulations as a result of those tests?

MR. GODDARD: Not that I am aware of.

ASSEMBLYMAN BURNS: In other words, they seemed to be satisfied with the containerization of the nuclear fuel?

MR. GODDARD: I would have to say that I believe they were since those casks were designed to their existing standards and the standards have not changed.

ASSEMBLYMAN BURNS: And there were no additional regulations after the test?

MR. GODDARD: That's correct.

ASSEMBLYMAN BURNS: Assemblyman Kern, do you have any questions?

ASSEMBLYMAN KERN: Yes, I do, Mr. Chairman. I take it your position basically is that private enterprise is doing a good job and that no further legislation is required in the State of New Jersey. Is that the gist of your position?

MR. GODDARD: I think that is largely an accurate summary.

ASSEMBLYMAN BURNS: We should relegate ourselves to telling the federal government to exert a more coordinated plan or program in this area and leave it to that?

MR. GODDARD: I think that would be an excellent idea.

ASSEMBLYMAN KERN: Now, if that is the case, are you aware that there was an accident in Hightstown this year with a nuclear cargo in the State of New Jersey?

MR. GODDARD: I seem to remember something. I seem to remember there was a flap made about it. On further reflection, it turned out to be pretty minor.

ASSEMBLYMAN KERN: But, the accident did occur.

MR. GODDARD: Nobody would deny that there have been, presumably, a couple hundred accidents.

ASSEMBLYMAN KERN: You don't think that the Colorado incident was of significant severity to merit any sort of coordinated legislative plan so far as cleanup goes or evacuation or anything of that nature?

MR. GODDARD: As I said, as a result of that I think that people have learned things and I think that may be an area where the states should provide some input to the federal government. If I can make another comment on that particular accident: The way yellow cake is shipped is by no way similar to the fashion that other radioactive materials are shipped. It is simply put in drums. As I said, that is because its radioactive content is very, very low.

ASSEMBLYMAN KERN: What is yellow cake?

MR. GODDARD: Yellow cake is a uranium oxide. It comes from mills out west and it goes to plants where they fabricate--- Well it goes first to the federal government where it has to be enriched and is later fabricated into nuclear fuel.

ASSEMBLYMAN KERN: It is the basic source material for making rods. Is it not?

MR. GODDARD: That's right. It's the basic source of nuclear fuel.

ASSEMBLYMAN KERN: Do you see any harm in monitoring shipments, having the State monitor shipments?

MR. GODDARD: I don't see any harm. I don't necessarily see any benefit either.

ASSEMBLYMAN KERN: Now you contend that along with the Hightstown situation and what transpired in Colorado that the Three Mile incident is not of really great significance because nothing severe happened?

MR. GODDARD: Speaking as an individual, I think that the Three Mile Island incident had very minor consequences.

ASSEMBLYMAN KERN: Is it not true that that particular incident resulted in a lot of contaminated matter like water?

MR. GODDARD: That's correct.

ASSEMBLYMAN KERN: Can you tell me the quantity of contaminated materials?

MR. GODDARD: No, I can't.

ASSEMBLYMAN KERN: What does your company propose to do with that material?

MR. GODDARD: I'm not involved in that operation but I think that if you are

interested you can talk to the Nuclear Regulatory Commission who has to approve each and every step of getting rid of that material.

ASSEMBLYMAN KERN: Do you envision there is going to be some transport of that material some day?

MR. GODDARD: I'm sure there will be if it is permitted.

ASSEMBLYMAN KERN: With respect to spent fuel rods, what is being done with them today at the present time?

MR. GODDARD: Most plants today are simply storing the spent fuel in pools on site.

ASSEMBLYMAN KERN: Is there any chemical deterioration of those rods?

MR. GODDARD: Some fuel rods have been stored for as long as twenty years and there has been no evidence that the rods degraded in any way with that storage.

ASSEMBLYMAN KERN: I don't mean the radiation. I mean chemical dissolving or changing in form.

MR. GODDARD: I said, there has been no evidence that the rods degraded in any way. They don't dissolve; they don't melt; they don't fall apart.

ASSEMBLYMAN KERN: There are going to be, obviously, more nuclear plants because more are being constructed at the present time. Do you have any proposal or do you envision any plan whereby there will be a perpetual storage or entombment of these things?

MR. GODDARD: Depending on what you mean by storage or entombment: I'd say yes. I think the government's programs which are aimed at deep burial--and by "deep" I mean thousands of feet--will represent a form of permanent entombment, unless of course policy changes and we are allowed to recycle that fuel instead of getting rid of it.

ASSEMBLYMAN KERN: Are you familiar with vitrification?

MR. GODDARD: Yes. Vitrification is a process of making glass.

ASSEMBLYMAN KERN: All right. You are familiar with its use so far as spent fuel goes?

MR. GODDARD: It is not used directly with spent fuel. It is used with high level liquid wastes that result from the dissolution of spent fuel which is being recycled. That high level waste can be mixed with glassmaking materials such as basically ordinary sand and turned into something very much like pyrex. I have a sample. I'm sorry I didn't bring it with me.

ASSEMBLYMAN KERN: Do you consider that a safe mode of getting rid of such materials?

MR. GODDARD: I guess I'm not a materials expert but I think that on the basis of the research programs that are going on, either vitrification or calcination, or there is one other process which basically means making synthetic rock or sedrock, if one of those will be selected I'm sure it will be adequately safe for the purpose.

ASSEMBLYMAN KERN: Are you aware that they have been doing this in Europe for some time?

MR. GODDARD: Yes, I'm aware that the Europeans--the French in particular--have a commercial scale vitrification process going on right now.

ASSEMBLYMAN KERN: If this is the way to go, why is it that we haven't done it?

MR. GODDARD: I think there are a couple of reasons. I think one is that up until recently the people in the government haven't seen this as a problem needing to be solved right away. There is no point in going into a big project until you have

accumulated sufficient amounts of waste to keep a large plant in operation for a period of time. But since it has become such an item of public concern, it has, therefore, become a must item on the federal research calendar. I think it is getting the attention that it deserved, perhaps, ten years ago.

ASSEMBLYMAN KERN: Thank you.

ASSEMBLYMAN BURNS: Kenneth, thank you very much.

Shifting from industry to the public sector, we'll hear from the Department of Environmental Protection, Mr. Frank Cosolito. Mr. Cosolito will be followed by Mr. McGovern if he is still here

F R A N K C O S O L I T O: Assemblyman Burns and Assemblyman Kern, Mr. Gurman, my name is Frank Cosolito and I am pleased to be here this evening representing the New Jersey Department of Environmental Protection. The agency charged with the primary responsibility of establishing the radiological health program in New Jersey State is the New Jersey State Department of Environmental Protection's Bureau of Radiation Protection. This bureau implements the Radiation Protection Act, Public Law 1958, Chapter 116 by promulgating and enforcing rules and regulations to prohibit and prevent unnecessary radiation by registering radiation sources, by issuing licenses for the possession and use of certain sources of radiation. The bureau also monitors the environment to determine compliance of major nuclear facilities with applicable safety standards and it maintains an emergency response capability to insure the safety of the public and the protection of the environment from accident or equipment malfunction of those facilities. In the process of developing an emergency response capability for major nuclear facilities, the Department of Environmental Protection through its Bureau of Radiation Protection has developed all the necessary components for this complex function that demands immediate decision making. The components include a statewide emergency communications network, highly specialized equipment including emergency vehicles, and highly trained personnel. The Bureau of Radiation Protection has as a matter of course been responding to transportation related radiation accidents during the entire course of its existence. During this time we have developed a procedure that coordinates the efforts of the State Police and all emergency services into a comprehensive system of emergency response activities. New Jersey is one of sixteen states whose emergency response capability has the concurrence of the Nuclear Regulatory Commission. Such concurrence is given only after strict review by a federal interagency task force which includes the Environmental Protection Agency, federal Civil Defense and the federal Department of Health, Education, and Welfare.

During the past two decades there has been growing public awareness and concern over potential accidents involving the transportation and storage of radioactive material, an industry that has grown significantly during that time. During 1961 based on a survey of shippers, an estimated 200,000 packages of radioactive materials have been transported in the United States. In 1973, an estimated 800,000 to 1,000,000 such packages were shipped. By 1975, that figure grew to 2.2 million and projections for 1985 estimate 5.6 million packages will be shipped. The total number of packages shipped, however, gives only a partial picture of the potential growth of this industry.

A second factor to be considered is the total measure of radioactivity shipped. While the increase in the number of shipments in the decade from 1975 to 1985 is projected as a two-fold increase, the total amount of radioactive materials shipped is projected to increase by a factor of 15. This depends, of course, on the federal government's policy with respect to the disposition of high-level waste such as spent fuel. The development and implementation of an efficient and comprehensive

program to monitor and regulate these shipments is a complex undertaking and for this reason the Legislature enacted Public Law 1977, Chapter 233 granting the Department certain specific authority in this area. This Act requires the Department of Environmental Protection to approve routes and in-transit storage condition for radioactive materials in quantities of 20 or more curies. A certificate of handling is required before the transporting or storing of such material to provide the State with the information as to the amount and type of radioactive materials and the routes to be used. This transportation law serves several purposes. Its immediate effects are to minimize the possibility of a transportation accident by taking into account local traffic conditions and to minimize the potential consequence of an accident by taking into account local population densities. It also improves the effectiveness of emergency response through prior knowledge and approval of routing. The long-term effect of the Act will be the sorting of the information obtained into patterns of shipment. This will help to facilitate future monitoring and enforcement. In April 1979, the Department proposed rules and regulations designed to implement the statutory requirements that the Legislature held would insure the safety of radioactive material shipments. The proposal was not made without controversy. The Department received petitions from several sources including local and county governments who expressed concern over radioactive material shipments through their areas. Hearings were held on June 11, 12, and 13th in Toms River, Ocean County, at Hancocks Bridge in Salem, as well as here in Hackensack. The rule making record has just closed and the Commission on Radiation Protection, which is the rule-making body, is in the process of reviewing the information received at these hearings. It is not possible at the moment to comment specifically on the proposals or the comments received, however, be assured that all concerns will be carefully reviewed. We thank all those who did make comments and suggestions on the Department's proposal.

We are also in the process of working along with the State Police to develop an official means of enforcing the regulations and the law. In addition to these activities, the Department will be supporting two further legislative proposals. The first is the Radiation Accidents Response Act which will formalize our system of emergency response by codifying the countless ingredients of understanding that presently exist among the many different agencies for that purpose. The bill would also clarify roles which State and local agencies will play in the development of the emergency response plan. It will also assign specific tasks and duties by which each agency will contribute to the plan in such areas as transportation and evacuation, health care facilities, and alternate energy sources during times of emergency. The second proposal involves amendments to the Radiation Protection Act. So there would be a sound basis upon which the Department may develop a wide range of programs to keep pace with its expanding needs.

We of the Department of Environmental Protection are happy to work along with the Legislature to further develop the steps already taken to alleviate this problem and to identify and deal with other areas of concern.

ASSEMBLYMAN BURNS: Thank you very much. I don't have any questions. Do you have any questions?

ASSEMBLYMAN KERN: Do you think that you will be able to get to this Subcommittee's specific amendments that you want to see enacted for the Radiation Protection Act?

MR. COSOLITO: Yes. That work is presently under way. I think the Attorney General is looking into 3553.

ASSEMBLYMAN KERN: Is that part of it? Is A-3553 part of your recommendations or not?

MR. COSOLITO: Pardon?

ASSEMBLYMAN KERN: Is A-3553 part of your recommendations?

MR. COSOLITO: Not at the moment. We just received that on July 19th and it is presently under consideration.

ASSEMBLYMAN KERN: What do you figure the timetable is for your proposed amendments getting to us?

MR. COSOLITO: We just completed reviewing some 500 pages of testimony. We boiled down these major issues to 30 issues that the Commission on Radiation Protection will be addressing on September 19th at their monthly Commission meeting. Along with that it will just take the time necessary to consider these proposals and to make the appropriate amendments to the regulations. I would estimate a couple months at best. We are simultaneously working on an enforcement procedure which will give us enforcement on the highways for random shipments of radioactive material. We are doing this through the Division of Motor Vehicles.

ASSEMBLYMAN BURNS: Acting under existing law.

MR. COSOLITO: Acting under existing law. That has recently become a subsection of State Police. I'm sure you are aware of that. We have instrumentation on order which we feel will be adequate for this purpose. It is something novel. It hasn't been done before in the United States. But we have been able to get in touch with manufacturers and they are coming along with some new things which we think will be suitable.

ASSEMBLYMAN KERN: This will be for checking and monitoring?

MR. COSOLITO: That is correct, yes.

ASSEMBLYMAN KERN: You mentioned the Radiation Response Act. Do you have a number for that?

MR. COSOLITO: No, I don't, but I can get it for you. I am not sure who has put that in.

ASSEMBLYMAN BURNS: You mean a federal citation?

ASSEMBLYMAN KERN: No. He said that they want that particular act enacted into law.

ASSEMBLYMAN BURNS: You mean a bill.

ASSEMBLYMAN KERN: It is a bill. Thank you very much.

ASSEMBLYMAN BURNS: James McGovern, Union Carbide Corporation. Mr. McGovern, in what capacity are you with the Union Carbide Corporation?

J A M E S M C G O V E R N: My title is Manager of Radio-Chemical Productions in Tuxedo, New York.

Good evening, Mr. Chairman, Assemblyman, ladies and gentlemen. I'm with the Union Carbide Corporation and we operate a nuclear facility in Tuxedo, New York. It is about twelve miles north of the border--north of Bergen County. Our business in Tuxedo is to produce radio-chemicals and radio-diagnostic agents that are geared or addressed to the nuclear medicine industry. In general, the radio-diagnostic agents that we make take the form of finished doses that are in the proper form for administration to patients who are suffering from serious illnesses or have a possibility of being in trouble. These diagnostic agents are radioactive traces that are placed into the body. They are used to image organs. Most vital organs in the human body can be imaged these days. These traces are also used for studying the function of the various organs of the body. So they are very vital to diagnosing patients and they do serve a

useful purpose.

The other aspect of our business is the bulk radio-chemical supply to the pharmaceutical industry. The pharmaceutical industry--many companies, one of which is situated in New Jersey which is E. R. Squibb and Son--receives products from our plant. The bulk radio-chemicals consist of shipments of large quantities of radioactive materials. Some of our shipments are several hundred or a few thousand curies of bulk radioactive materials that are shipped to pharmaceutical houses. These shipments are broken down and put into the proper dosage form for distribution to the hospitals around the country and, in fact, around the world.

The radio isotopes that are produced and shipped out of our Tuxedo plant would serve to facilitate about 15 million diagnostic tests in the United States every year. And if you take our worldwide operation into consideration, it probably reaches 30 million people in a year's time. To make these radio isotopes the way we make them at Union Carbide is to use a nuclear reactor to make them. We have a small 5 megawatt research reactor that you might know about. When we use this reactor we put target materials into the reactor---

ASSEMBLYMAN BURNS: What kind of materials?

MR. MC GOVERN: The general category is target materials. These are stable isotopes that we put into the reactor. They absorb neutrons in the reactor core. They become unstable and then radioactive. These are the useful isotopes that we produce for nuclear medicine. Now, not all isotopes that we produce are useful. We have waste products that we have to deal with. Just like any manufacturing process, you have a finished product and a waste product. We also have waste products from the reactor. We have spent nuclear fuel that we have to deal with--that we have to ship.

To shift gears a little bit, I'd like to go back a little bit in time to address the history of the regulations as they pertain to the transportation of radioactive materials. There are many types of radioactive materials. There are many different isotopes. There are over 200 different radioactive isotopes in the chart of the neutrons. There are many forms of radioactive material--liquid forms, solid forms, gaseous forms. They are classified into various categories according to their toxicity, whether it is a chemical toxicity or a radio toxicity. It's a very complex problem. They are also categorized according to their criticality nature, such as special nuclear materials--uraniums, plutoniums. These gentlemen from Jersey Central Power and Light addressed the problems with plutonium. That's not my subject tonight. There are regulations that have been in existence for at least 20 years to my knowledge. The bases of the regulations are studies that were done by the International Council on Radiation Protection which is a council sanctioned by the International Atomic Energy Agency which our government is also a member of. These people ran studies on what the toxic effects of the various radio neutrons would be to human organisms in the event of certain accident conditions. They categorized the various isotopes by the toxicity level or the potential toxicity level in the event these things were released in an uncontrolled manner. They categorized them and put them into the relevant hazard categories. Then they took the maximum quantity of each category that if it were released in an uncontrolled accident situation and people were exposed to it, the likelihood of any ill effects would be minimal. Then they decided that there should be packaging designed and built and tested to contain the various categories of materials and the various quantities of materials. So as you see, there is no simple answer to transportation, packaging, and general safety of radioactive materials. It is a very complex problem.

The various governments around the world, including the United States government, attacked this problem and they have initiated regulations and they have been changed and revised over the past 20 years to what we have now in the form of government regulations, U. S. Nuclear Regulatory regulations under Title 10 for the federal regulations, part 71, which addresses the packaging of radioactive materials. We have Title 10, Code of federal regulations, Part 73, which addresses the physical protection of the special nuclear materials that the power reactor people were mainly concerned with, and we are concerned with too when it comes down to fuel for our reactor.

The United States Department of Transportation regulations under Title 49, Code of federal regulations, Part 173, 174, 177, and 178 address the more detailed specifications of packaging and transportation of radioactive materials. There are other regulations that probably apply just as well that I didn't enumerate. They would come under the Federal Aviation Administration, the United States Coast Guard, and there are also commercial industrywide organizations that deal with this same thing. It is a commercial backup to the government regulations. The Civil Aeronautics Board is one; that's the only one that comes to mind off the top of my head.

To put some perspective on this problem of transportation of radioactive materials, let me put some facts out here. First, there are about 500 billion shipments total in the United States every year. One hundred billion of these shipments are hazardous materials. They fall into the hazardous materials category of the Department of Transportation regulations. Only 1 million of these shipments are radioactive materials every year. Most of these 1 million shipments are isotopes that in one way or another find their way into the practice of nuclear medicine.

As I spoke of before, these regulations address mainly the packaging of radioactive materials so that in the event there is an uncontrolled release due to an accident in transport, no one will be hurt. Packages are categorized by toxic nature. The more toxic a material is the less the amount of material is allowed to be contained in a type of package. Packaging is categorized in various types depending upon the severity of the test that it will withstand or the severity of the accident conditions. Packages are designed with performance criteria in mind, with actual conditions in mind, as was very graphically demonstrated in this maximum security container for spent nuclear fuel in the film that you just saw. That would be the ultimate package for the most hazardous quantity and category of radioactive materials. The large quantity shipments that we handle would be one order of magnitude less in packaging security which is a type B container. Once the package is designed to this criteria then that particular design must be tested to make sure that it does in fact withstand that criteria. These tests that Sandia Labs performed on that one cask are an example of the testing that is done on the various design containers.

I'd like to start to summarize by saying that the regulations that are enforced today probably need to be continually updated or upgraded when we come to considerations that haven't been thought of yet. However, over the past 20 years or so, I believe they have withstood the test of time. The current rate of radioactive shipments is one million a year. Up until this time there has probably been tens of millions of shipments of radioactive materials throughout the United States and no one has yet been killed to my knowledge by any accident of radioactive material. There have been accidents, people have become contaminated by a material being released, but no one has been hurt. In general, I'd like to summarize by saying that the transportation of radioactive materials, we feel, is truly an interstate problem.

Up until now it has been regulated by the federal government as an interstate problem. I feel that local legislation could seriously affect the supply of our materials around the country and probably around the world. We do compete in the world and we do compete against other producers in the world market. If we have to play by a different set of rules, we can't compete on an equal basis. We probably couldn't compete at all. If nothing else, any added local legislation or regulations would definitely increase the cost of the supply of these materials. I'm certain, although I can't speak as an authority on this, but I'm sure that any further local legislation or regulation would definitely increase the cost of providing energy to the normal household. I'm sorry I didn't have a better prepared talk. I am just speaking from notes. I just found out about this hearing yesterday.

ASSEMBLYMAN BURNS: Your talk was very good. May we ask you a few questions?

You heard Mr. Cosolito of the Department of Environmental Protection here in New Jersey. How do you think the regulations that he outlined would affect you? How would they affect your organization or business?

MR. MC GOVERN: They will increase our cost of operation by the added administrative requirements placed on us by reporting daily shipments to the State of New Jersey. We have commented on those proposed regulations and we have addressed the various sections in there that would definitely affect us. We have asked for a provision to issue general permits for people who routinely ship to the State every day.

ASSEMBLYMAN BURNS: New York City has a regulation on the transport of radioactive materials and it has been upheld regardless of the federal overstructure. How does that block of roads and transport that come between you and the outlet of the court affected you? Have you had any dislocation?

MR. MC GOVERN: Very slightly. Let me say this: The New York City regulation or law is less strict than the New Jersey law.

ASSEMBLYMAN BURNS: You mean the proposed law or what we already have?

MR. MC GOVERN: The law that is now in effect in both states. The law in New York City is less strict than the law in the State of New Jersey. The restriction of 20 curies per shipment in the New Jersey law is much, much more restrictive than the New York City law.

ASSEMBLYMAN BURNS: You're not talking about Byron Baer's proposed bill; you're talking about Public Law 1977, Chapter 233?

MR. MC GOVERN: Yes, I believe that's the law. I can go back and get my copy and make sure. It is much more restrictive than the New York law.

ASSEMBLYMAN BURNS: As a division of Union Carbide Corporation, do you have any idea whether your division has made a profit for the company?

MR. MC GOVERN: Yes, we have.

ASSEMBLYMAN BURNS: How much did you make?

MR. MC GOVERN: Our radio-chemical business reports through the Medical Products Division of Union Carbide. Our group within the Medical Products Division is the Nuclear Products Group. As a group, we are just about breaking even this year. We have not made a profit as yet. The radio-chemical segment of the Nuclear Products Group has made a profit by itself. But the group, as a whole, has not made a profit. The radio-diagnostics part of it is just starting. It is a fledgling operation. So it is a drain on them.

ASSEMBLYMAN BURNS: How long has it been in existence?

MR. MC GOVERN: The Nuclear Products Division has been in existence for about 15 months.

ASSEMBLYMAN BURNS: And the other group that made a profit, do you know how much money they made?

MR. MC GOVERN: Radio-chemicals would have been operating for--- Well, we have been operating since 1963 so that would be 16 years.

ASSEMBLYMAN BURNS: And the profit of that group?

MR. MC GOVERN: We have just been profitable the past 3 or 4 years.

ASSEMBLYMAN BURNS: Do you have an idea of the profit in dollars?

MR. MC GOVERN: I can tell you our gross. I can't tell you our profits. The gross that we have today in radio-chemicals is about \$8 million a year.

ASSEMBLYMAN BURNS: We are trying not to impede you as a private enterprise to make a profit. But we have been under terrific pressure, especially in the light of the oil companies and the oil situation, when they are announcing profits of hundreds of millions of dollars, 60, 80, 100 percent more than last year. I was just curious whether your organization fell into that category. And if you found that some protective regulations were inconvenient, this would have a light on how we'd be able to approach legislation.

MR. MC GOVERN: I can only speak from my own local experience here and my own personal experience. I have been working at Tuxedo for 17 years. And the amount of regulations that we have dealt with most recently have probably increased by a factor of 2 or 3 since I can remember back 15 years ago.

ASSEMBLYMAN BURNS: Mr. McGovern, the gist of what you are saying is that we have enough regulations now. You would not like to see any additional.

MR. MC GOVERN: I believe we do have sufficient regulations to protect the public against accidents in the transportation of radioactive materials.

ASSEMBLYMAN BURNS: What we have in existence would protect the public and any additional would be superfluous?

MR. MC GOVERN: I believe so. The only thing that the New Jersey regulation would add, I believe, would be a higher presence of mind in the local authorities about what amounts of radioactive materials are going through their areas. I don't think the regulation is designed to prevent accidents. I believe it is just going to help to respond in the event an accident does occur.

ASSEMBLYMAN BURNS: How about New York State? You cited our regulations. Do you find them more compatible with your organization than the New Jersey State regulations?

MR. MC GOVERN: As far as I know, the state of New York has not proposed any laws or regulations. I'm sure there are legislators who are thinking about it and probably would like to see it. But there has not been any activity up until now. Rockland County has been interested mainly due to the large number of waste shipments coming down Route 17 from the New England states and probably our own operation. They don't like to see us coming through either. So the county of Rockland has been very active. There has been a law proposed by the county legislature. We have been trying to work with the legislature and work with the county Board of Health to answer as many of the questions that they might have about the potential hazard of the shipments.

ASSEMBLYMAN KERN: What do you do with your spent fuel from the reactor?

MR. MC GOVERN: We store it for a period 2 to 3 years, depending on how much fuel we use. We package it and we ship it to Savannah River which is in South Carolina near Barnwell. It is a government processing facility. The type of fuel that we use in our reactor is the uranium-aluminum fuel. The only reprocessing plant that will

handle that is a government installation. So they process our fuel for us.

ASSEMBLYMAN KERN: Does the transport involve these casks like what were demonstrated tonight?

MR. MC GOVERN: The cask that is used is designed to the same test criteria but the cask is much smaller.

ASSEMBLYMAN KERN: What is the coolant at your reactor?

MR. MC GOVERN: The coolant? It's lake water.

ASSEMBLYMAN KERN: Does that ever become contaminated?

MR. MC GOVERN: Yes.

ASSEMBLYMAN KERN: What do you do with that?

MR. MC GOVERN: We keep it in the plant. We continually deionize it which takes the radioactive constituents out. We recycle it. Water evaporates; we have to add to it every once in awhile. But the system is a closed system. It is never allowed to be released.

ASSEMBLYMAN KERN: But what about the evaporation?

MR. MC GOVERN: Well evaporation is water H₂O. It is water vapor; it's not radioactive.

ASSEMBLYMAN KERN: Water vapor is not radioactive?

MR. MC GOVERN: No, there is no radioactive evaporation so to speak.

ASSEMBLYMAN KERN: But is there any distillant that you have to get rid of?

MR. MC GOVERN: Yes.

ASSEMBLYMAN KERN: And how is that handled?

MR. MC GOVERN: All the radioactive waste products that we produce whether it is liquid, solid, or gaseous is contained within the building. We process it by solidifying it, putting it into solid form. If it is a water we mix it with concrete and make it into a solid. If it is a solid material, we don't have to worry about changing its form; we just package it so it is tight. We package it in concrete as a matter of fact. If it is a gas, we absorb it on an absorbant and package it in concrete and ship it.

ASSEMBLYMAN KERN: And the shipment is done by cask or some other mechanism?

MR. MC GOVERN: The shipment is done by a shielded cask. It is a type B container. It will hold large quantities of radioactive material. Some of our waste shipments, I must say, run 1,500, 2,000 curies. Some of our finished product shipments run 2,000 curies in a shipment.

ASSEMBLYMAN KERN: You feel that precautions that are on the books right now are satisfactory to handle those types of shipments?

MR. MC GOVERN: Yes.

ASSEMBLYMAN KERN: Thank you. We appreciate your coming.

ASSEMBLYMAN BURNS: From the Bergen County Energy Action Network, is Mr. Andy Mayer here? Mr. Mayer, would you fill us in on what kind of a group the Bergen Energy Action Network is?

A N D Y M A Y E R: Sure. It is a citizens' organization which was formed about a year ago in the county to see how we used energy in the county and specifically how Bergen County was impacted by nuclear power. I am a high school teacher. I work in East Orange now. Right away we began focusing on the transportation of radioactive waste as it became apparent that we had no reactor in the county, although we are a neighbor of Indian Point in New York State. We have been working through the various government documents and contacting State and local officials that are concerned with the transportation of radioactive materials.

It's the position of our group now that these wastes shouldn't even be created. We are opposed to nuclear power. But we believe that since they are being created we have to deal with them in a safe manner. We have to protect the health and welfare of the citizens of Bergen County. We feel that Bergen County bears an inordinate burden from the transportation of radioactive waste because, as Assemblyman Kern said, all the north and south highways on the East Coast go through the county. It really doesn't matter whether shipments go from New England down to Barnwell, South Carolina or whether they go from all over the South up to West Valley, New York, they still go through New Jersey. Our group is most concerned with high-level radioactive waste and spent fuel from nuclear reactors because these are the most dangerous materials. We're not as concerned with radio-pharmaceuticals although we are sure that they may need a little more regulation. We are mostly concerned with the most dangerous ones. And there is a wide gap in the danger. You hear numbers such as 20 curies being discussed as a certain benchmark in the discussion of radio-pharmaceuticals. Well, spent fuel from nuclear reactors can have up to 7 million curies per truck. The gentleman from the Motor Truck Association was wrong in not understanding that. His talk about the small packages and the transportation indexes which have to add up to less than 50 only concern partial shipments and only have anything to do with small packages like radio-pharmaceuticals. The government documents indicate that up to 7 million curies of spent fuel can be carried on one flat-bed tractor trailer truck. Now these are the same materials that are in the core of the reactor. Once they are used up, they are over one million times more radioactive than they were when they first were loaded as fresh fuel. Now this is a considerable increase. These are very dangerous materials. And we are depending completely on the casks that you saw in the film to protect us from them. The same materials that we feared would be released in the event of a complete meltdown at Three Mile Island are taken out of all these reactors and then shipped through our communities. Each reactor can generate about 120 flat-bed tractor trailer trucks full of spent fuel rods, the same type you saw in the film.

The representative from Jersey Central Power and Light said that the figures from government documents talking about the \$2.7 billion that a one percent release of a spent fuel cask could cause, the thousands of deaths and the evacuation of up to a million people are not true. But those are in this document. This is done by the very same Sandia Labs that put out this authoritative film. This is called, "The Generic Environmental Assessment on Transportation of Radioactive Materials Near or Through a Densely Populated Area". It's a big bestseller. There is one chart after another in here that predicts, through different computer models, 500 deaths in one method, 5,000 deaths through another, 2.7 billion dollars of damage, again, in the release of only one percent of these truck shipments. These are the government estimates and there are no more authoritative ones. If these are wrong then this is still the most authoritative single fact book that we have to go by. The Utility can't deny that these are the best estimates there are. The casks that you saw are our only protection against a release of these materials. And again, even the release of only one percent could require the evacuation of a county. I'm glad the representative from the Utility changed the wording of what he was saying from the film being a result of tests of these casks to the fact that the film is actually a demonstration of the casks. These things all look very impressive crashing trains into trucks and trucks into walls but, in reality, the standards that he mentioned are only adequate to the standard transportation of the materials and not all accident conditions. Number one, the cask must withstand a fire of 1,475 degrees. Well, many, many materials that

are regularly transported on the highways burn much higher than that--some of them up to 6,000 degrees. It must withstand a forty inch drop on to a six inch diameter steel pin. Well, forty inches is just about the height of a regular tractor trailer. If it were to fall any further, say off the side of a bridge or down an embankment and hit something that is not as nicely formed as a pin--say a piece of steel that had been left down there, another bridge abutment at the bottom, an incline, or after a fall--this could easily be exceeded. Another point is that it must withstand immersion in water for eight hours. If it were to fall into a river there is almost no chance that it could be gotten out within eight hours because of the fact of its weight. You would have to get a crane there that would lift a twenty five to one hundred ton object. If it were in there later than eight hours it has then passed its design criteria. The most important single thing that the film said was that these demonstrations were done exactly four times. Any sort of industrial testing facility will tell you that they slam a car door a hundred thousand times to see if it is safe. You can't depend on computer models in these things. Computer models come in all different sizes and you can get them to tell you it is safe, you can get them to tell you it is deadly. Four tests were done. If it failed completely on the fifth test, that would be a 20% failure rate and they would have to write down "20% failure rate." As it is, it is 100% successful. The train and the truck crash at 50, 60, 80 miles an hour doesn't matter, two of these trucks colliding head on could be closing on each other a 110 or 120 miles an hour. We are trusting our lives to these cask tests and they have been done four times. Again, I think the better word for them is "demonstrations." I don't think they are actual scientific tests at all.

Other representatives of the nuclear industry have said, at hearings very much like this in the past--for instance one that took place in Rockland County six months ago, a man from Con Edison got up and said--and I quote exactly, "All risk has been eliminated," from these shipments. Now no one can make a statement like that and pretend to retain any shred of scientific authority. The fact is that one of these accidents could happen tomorrow. And as much as Utility representatives would like to portray public concern over radiation as bad, it simply isn't so and I think that is insulting to the general public. I note that only people whose companies have a definite profit motive in the distribution of these materials will stand up and say that they should be shipped.

This government document also talks about the possibility of sabotage. We don't even have to talk about an accident. This goes at great length into sabotage pointing out that it would be easier for a group of lunatics of whatever persuasion to take a cask like this and blow it open. Releasing only a small percentage would do catastrophic damage. They wouldn't even have to take the material, reprocess it, and make it into a bomb which they could do also. They'd just have to blow it open, immobilize the truck, and we have had it.

There are accidents, there is sabotage and there also must be considered the constant low-level radiation that these shipments--and again I'm talking about the spent fuel and high-level shipments--emit. Many doctors say now that there is no safe dose--no safe minimum dose of radiation and that all radiation doses are cumulative. Well, we in Bergen County who live near the highways will be getting constant low-level radiation doses from this. Now the government will say that these doses are safe but they have continually changed their radiation dose that they describe as safe. So we won't really know for quite a few years.

Our group has looked into the readiness of Bergen County to deal with an

accident like this. We started by making phone calls. And in our first series of phone calls, it took us six tries to get to the Bureau of Radiation. One of these tries was to the State Police at the Little Falls barracks on Route 3. They gave us as their number--the number written on the desk for radiation emergency--the number of the Bureau of Pest Control in Trenton. Several local police said they didn't know what to do. A couple of them said things like, "That's a good question. Boy, I really wish I knew." We did find out from the Bureau of Radiation that they can respond in two to three hours from Trenton. They set out from Trenton in a Winnebago. Considering the fact that spent fuel shipments could provide imminent death to people who approach them, this is simply not enough. Again, we are talking about material that is a million times more radioactive than when it went into the reactor. Government documents talk about how a breached spent fuel cask could simply provide a fatal dose of radiation within minutes for someone standing within ten feet. For someone standing within a hundred feet, it would take as little as an hour. We don't think this is fair to the police in this area. The Radiation Action Plan for Bergen County which we have reviewed is from 1973. It is an old naive plan which deals mostly with lower level materials. It tells you such things as "Roll up your sleeves and your pants cuffs before you walk into it. Wash your hands afterwards." They are talking about mild materials--things that are fairly innocuous. It is in no way ready to deal with an accident that could not even be approached except by remote control equipment. Indeed, the spent fuel casks are loaded under water by remote control equipment that is heavily shielded. There is nothing available in this area to reload a cask that could break open. Now they say the cask never will break open but we have been assured such things by the Nuclear Regulatory Commission in the past. If it were to break open, we are completely unprotected. There is simply no way to reload it. There is simply no way to get near it for days, weeks, who knows, until we can get shielded equipment to the scene. In the meantime, Bergen County, or an area its size--a population of up to one million people--will have to be evacuated and remain evacuated. We are concerned about this because of our ancient Route 17 which goes right down the middle of the county and is the main route for these shipments. We are concerned because every one of our homeowner's policies has three long clauses excluding every sort of nuclear accident from coverage. We wonder why we have to, in the terminology of the insurance industry, "go naked" on these shipments. If they are so safe, the insurance companies should be lining up to sell us protection, but yet you can't buy it at any price.

The population density is another thing that struck us right away. As you know, there is a population density of 3,400 people per square mile in Bergen County. It goes up to 5,000 and 6,000 as you go down in through Essex County on these roads. There are alternate routes which go through counties that have populations less than 50 people per square mile, less than 30 people per square mile.

Now, again, our group is sorry that these materials were ever created and we wish that they would stop being created because we don't feel nuclear power is as necessary as the Utilities would make it out to be. But if these are going to be shipped, they have to be shipped in the safest possible way. The documents go into specific numbers for much safer it would be if the trucks went through less populated areas, how much safer it would be if they travelled only from midnight to three A.M., for instance, how much safer it would be if they had escorts--trained radiological escorts--in front of and behind the truck. All these things are things that could be done but they are not being done even in the face of these facts of how dangerous an actual accident with one of these high-level waste or spent fuel trucks could be.

To summarize, our group feels that sort of a game of hot potato is being played with these wastes. As you know, there is no federal plan that has been adopted and none expected before the year 2,000 for dealing with high-level waste. They are just moving it around. They don't know what to do with it at the other end of the shipment. They don't know what to do with it in Barnwell where it just sits or in West Valley where it will just sit. So we don't see any point in shipping these things around at all. We should stop making them. But if we can't do that immediately, we should let them pile up at the reactors where the people who created them could take responsibility for them. We think that no spent fuel and no high-level nuclear waste should travel through such a densely populated area that is so unprepared for an accident and would urge the Committee to take such legislative steps including Assemblyman Baer's bill that are required to see that these shipments are stopped. Thank you.

ASSEMBLYMAN BURNS: Thank you very much.

Is Mrs. Ruth Gabey here? Mrs. Gabey, you are speaking for Sid Goodman?

R U T H G A B E Y: Yes. I have a copy of his testimony.

ASSEMBLYMAN BURNS: And you represent the Committee for Application of Nuremberg Principles to U. S. Nuclear Power Production?

MRS. GABEY: Yes.

ASSEMBLYMAN BURNS: You'd better enlarge on that one.

MRS. GABEY: Sid Goodman of Bergen County SANE and New Jersey SANE.

ASSEMBLYMAN BURNS: But would you enlarge on your Committee.

MRS. GABEY: As Dennis Hirschfelder explained, SANE is a national organization and it is a Committee for a Sane Nuclear Policy. SANE has been abbreviated because of the lengthiness ---

ASSEMBLYMAN BURNS: On my agenda Sid Goodman is listed as representing the Committee for Application of Nuremberg Principles to U. S. Nuclear Power Production.

MRS. GABEY: Yes, he is involved in that also. I'm sorry. I thought you were talking about SANE. They feel that there is a relationship between the two, this being a holocaust-type situation with the production of nuclear power, in that it is actually endangering and probably has killed many people already. This is the idea behind the organization.

ASSEMBLYMAN BURNS: All right. You can go ahead, Ruth.

MRS. GABEY: I just want to say that I thank you for being here tonight. I know you are not Loretta Wayne and I know you are not Jeremiah O'Connor. Will you please tell me who you are?

ASSEMBLYMAN BURNS: Assemblyman Walter Kern is on my right. He is a member of this three-man subcommittee. Assemblyman Cali could not be here tonight. I am Robert Burns, Chairman of this subcommittee. And this is Larry Gurman, Aide to the committee.

MRS. GABEY: And you are in the Assembly?

ASSEMBLYMAN BURNS: The State Assembly. And the purpose of the committee is to ---

MRS. GABEY: What area of the State do you come from?

ASSEMBLYMAN BURNS: Bergen County. I represent Hackensack and the surrounding area.

MRS. GABEY: I am a member of the League of Women Voters, so the next time I see you, I will know who you are.

ASSEMBLYMAN BURNS: Assemblyman Kern is from Bergen County also. He is from the Franklin Lakes, Wyckoff part of the county.

MRS. GABEY: I was from that area at one time.

ASSEMBLYMAN KERN: Now we know one another, but we still don't know what the Committee for the Nuremberg Principles is. But you go ahead.

MRS. GABEY: I just want to explain a couple of things. Sid and I are very good friends. We have worked in this anti-nuclear movement for quite a number of years together. It is a gutsy issue. Sid often uses the word "prostitute" in his testimony. I went to the dictionary today and just so that you don't get shocked every time I use the word, it also means a person who deliberately debases himself or his talents, as for money. This is what Sid is referring to here. He is not referring to ladies.

This is how it goes.

(Reading Sidney J. Goodman's statement)

For 25 years it has been the policy of the United States government to deliberately lie to the American public about the hazards of radioactivity. Recently, it became known that President Eisenhower (himself) initiated and recommended this deception. The events evolving from the Three Mile Island nuclear plant fiasco proved that this policy of deceit is still alive and well.

Radiation chemist, Dr. Chauncey Kepford, of State College, Pennsylvania measured levels of radioactivity 30 miles down wind of the smoldering reactor. He measured levels which were fifty times higher than natural background radiation. This was more than fifty times higher than what confidence men for the industry have assured. Dr. Kepford was appalled to learn that NRC radiation monitors are and remain all in positions which specifically avoid registering the contamination he encountered.

The persistent irresponsibility and deception of industry prostitutes is terrifying, particularly with regard to that most dangerous cargo of all streaming right near our homes, radioactive cargo.

The industry points to a few successful tests of radioactive container prototypes. They arrogate that these tests "prove" that we ought to welcome their shipments of packaged death near our children.

They know very well that there is a huge discrepancy between what the nuclear industry can do, what it boasts it will do, what it actually does do, and what it says it does, on a daily basis. This is the heart of the problem. It is a problem of human frailties, not a matter of scientific disagreements.

They know that an accident on a single shipment has the potential of killing more than a million people, as determined by the top experts of the New York City Bureau of Radiation Control. The New York City Bureau used the NRC's own data and applied basic principles to this data. They know that a single accident could contaminate a vast stretch of our community forever. The radioactive half lives of their materials has been well documented.

Yet, the Nuclear Regulatory Commission's teams of PhD "scientists" have been satisfied to accept ridiculously inadequate specifications for containers. They have been satisfied that high level waste containers should withstand a fall from a height of 30 feet on to a flat unyielding surface, and only a 40 inch drop on to a steel projection.

Now Sid goes on in here to give a mathematical formula, an equation which I will not go into because I'm afraid you are going to ask me questions about it and I won't have the answers.

(See page 1X for formula)

Thus, a drop of 30 feet results in a velocity of 43.955 feet per second, or only 30 miles an hour in round numbers. So, these PhD's are happy that a container rated for a 30 mile per hour impact may, in fact, be carried on the highway at speeds which have been known to exceed 55 miles per hour.

To survive a 55 mile per hour impact, the container should be able to withstand a drop height of 101 feet. Actually, many cargoes have been carried on routes which exceeded 101 feet.

Of course, if the container is involved in a head-on collision at 55 miles per hour (relative impact of 110 miles per hour) this equates to a drop height of 404 feet.

The same distinguished PhD's, who must surely know how to use the above simple formula, committed the obscenity of approving the flying of plutonium into Kennedy Airport, New York City, in 1975.

Plutonium is incredibly toxic. Only one microgram--454 times less than one millionth of a pound--is enough to cause lung cancer. Plutonium is so radioactive it must be isolated from the biosphere for 250,000 years. It must be kept out of the hands of irresponsible people because it is the stuff that atom bombs are made of.

Each of the six shipments flown into Kennedy Airport were more radioactive than all of the atom bombs that were ever exploded. The plutonium was in a smokey powder form--about 1 microgram particle size. It was transported through the crowded streets of New York City over high bridges, where there was an abundance of rigid projections below, at least projections which exceeded 40 inches. These containers--rated for a 40 inch drop height on to a sharp projection--were trucked over the George Washington Bridge on their way down south.

The bizarre inadequacies in safeguarding the public inspired the United States Congress to wake up from its nap and outlaw such shipments. Shocked by the outright lies and inappropriate assurances of paid industry prostitutes, the City of New York was compelled to issue its own protective ordinances.

None of these measures would have been necessary if the industry had been responsible, and honest.

Even if accidents with nuclear shipments occur less often than those involving other cargoes, the substantial number of shipments can bring on a significant number of mishaps. Between 1971 and 1975, the United States Department of Transportation reported 144 air, rail, and truck accidents involving nuclear materials. Of these, radiation leakage was reported on 34 occasions. The number of accidents with suspected or actual contamination rose to 61 in 1976 and 90 in 1977.

Assurances that the amount of radioactivity released have had no significant effect on the health of the public have less credibility than a Confederate three dollar bill printed in Liberia.

Human beings have inalienable rights. Heroin does not have inalienable rights. Neither should radioactivity.

In accordance with your responsibility to protect the public, the following should be included in that protection:

1. All shippers must be licensed.
2. To qualify for a license, a shipper must meet minimum requirements such as the following.

- (a) Equipment must satisfy physical standards for safety whether it is new or has been used for any period of time.
 - (b) Personnel must be mentally healthy. Certification by a psychiatrist is required.
 - (c) Personnel must be fully trained to deal with all contingent emergencies.
 - (d) Vehicles must have a speed limit posted plainly which is compatible with the drop height rating of the container.
 - (e) Shipper must post a bond of \$200,000 to be forfeited if a license revocation is required at any time due to an accident or a potential accident.
 - (f) Shipper must have a certification from the utility or organization being serviced. This certification will guarantee that in the event of an accident which exceeds the Price Anderson Act limited liability of \$560 million, the utility or organization will cover the full cost of a clean-up, in the event that the shipper's assets are not sufficient for this clean-up. This is to guarantee compliance with the law A-1953 which requires that shippers be held fully responsible for the costs of an accident.
- 3. Radioactive cargo must be prohibited from all routes where there are potential drops on to rigid projections which exceed the rating for the container. The projection drop height must be plainly posted, for example, 40 inches for a container with that rating.
 - 4. Radioactive cargo must be prohibited from all routes where there are potential drop heights which exceed the rating for drop heights on to a flat surface.
 - 5. Containers must be designed to withstand prolonged temperatures of fires which may be encountered in transportation accidents. These standards must be realistic, and not just suited to meet the convenience of contractors.
 - 6. Each shipment must be accompanied by no fewer than five guards. The guards must be adequately equipped, as well as trained.
 - 7. Containers must be prohibited from exceeding the speed limit plainly posted on the container. This is the speed limit mentioned in paragraph 2(d).
 - 8. Shipments made in trains must fully comply with all of the requirements.
 - 9. Whether the shipment is made by truck or train, shipments of other materials which are either explosive or combustible must be prohibited from accompanying the radioactive cargo.
 - 10. Shipments, whether by truck or train, must be preceded by another vehicle of suitable size to act as a buffer in preventing head-on collisions.
 - 11. All municipalities and counties must be notified that the traffic is coming through to permit checking on speed limits, drop height ratings, use of buffer, and all permits and safeguards are in order.
 - 12. The vehicular escorts must keep bystanders and bypassers at safe distances so that no member of the public is subjected to dosages of radioactivity from the shipment which may, when added to dosages from other sources, exceed the total dose guidelines which have been recommended by the U.S. Department of Environmental Protection. The guidelines used must be

no less stringent than those which will become effective on
December 1, 1979.

Respectfully,
Sidney J. Goodman, P.E., J.S.M.E.
Committee Member

I would just like to mention one thing on my own behalf. People do not die directly from contact with radiation. It takes seventeen to twenty years for the body to break down as a result of radiation exposure. People from the industry who say that no one has been killed can say that because they are safe in saying that. It is just not the type of thing that kills you outright, as the bombing of Hiroshima and Nagasaki. Those people were killed outright. Do we want to wait until we get something like that, to prove that it kills you outright?

We have evidence of increasing cancer from the G. I. who witnessed the bomb blast in the fifties. Many of them are getting cancer one after the other, and in fact, they have formed a Committee to try to get compensation from the Government, and they are being refused. So, you have to think about these things. You have to think of a long-range effect. This is something that mankind is not accustomed to. It is not anything that we have ever known before. It is entirely new. And, we really don't know what we are dealing with.

I personally call it the Frankenstein monster. It is getting out of hand. I personally have a great deal of faith in the democratic process in this country. I have been involved for ten years. This is the closest I have ever been to a hearing. I usually travel long distances. I have testified before the Congress as an individual. I am not paranoid; I am not masochistic. I didn't work all day, commute to New York, come here without dinner because I am masochistic or paranoid. I am really frightened.

I will spend the rest of my free time, the rest of my life, trying to get this point across to the people who control the legislation in this country. I as an individual can't do anything. The people in this audience can't do anything as individuals. We rely on you. You could be holding these hearings for weeks, and still not know it all. It is just such a vast complicated thing. It is much more than a human being can cope with. I think you have to put an end to nuclear power, which will put an end to nuclear transportation, waste and all the other insanities that go along with it. Thank you very much, gentlemen. (Applause)

ASSEMBLYMAN BURNS: Thank you very much, Ruth. I appreciate your points. From Burns and Rowe, is Mr. David Lilley here?

D A V I D L I L L E Y: My name is David Lilley, and I am a Project Engineer for radioactive waste programs at Burns and Rowe.

ASSEMBLYMAN BURNS: What is Burns and Rowe?

MR. LILLEY: We are a major nuclear architectural engineering firm located in Oradell, New Jersey. I am a registered professional nuclear engineer and a certified health physicist. I am very pleased to have this opportunity to discuss with you the current problems and dangers associated with the transportation of nuclear materials in New Jersey. I'd like to apologize in advance for what may appear to be a somewhat disorganized presentation. I only learned about this opportunity today. I would welcome the opportunity, if you think it would be useful, to submit a more refined copy of my remarks in writing at a later date because I believe this is a subject of great importance to us all.

MR. GURMAN: We would definitely appreciate that if you could do that.

MR. LILLEY: Some of the things that have been said by my predecessors tonight, some things that I am aware of the factual presentations to, and rather than entering into an emotional argument about the factual matters I would rather set the record straight by appropriate technical reference. Basically, my presentation is going to cover the following points: The perspective and risk, the implications of cooperative federalisms as espoused by the Interagency Review Group on Radioactive Waste, a federal organization, the role of railroads in reducing the risk of the citizens of New Jersey in transportation and the philosophy of safety associated with the transportation of nuclear materials. I would like to limit my remarks to those four points in the interest of brevity and conciseness and the hope that perhaps I can respond more fully at a later date. Before I begin I'd like you to know that the tenor of this meeting is deeply disturbing to me. My two predecessors on the opposed side of the nuclear industry have made some very valuable observations. They are quite right that the nuclear industry, represented by myself and my fellow prostitutes, can no longer afford to shrug off the valid concern or the worried public as we have just seen by Ruth's statement earlier. We have got to address these problems. We must act responsibly and I can tell you that from Burns and Rowe's perspective that we are committed to do so. I regard it as a great tragedy. The situation, at this point, has become so polarized that two people who are rational human beings can arrive at the same podium to discuss the same technical materials and to have such completely diverse emotional reaction to the situation is a sign of a problem which is long overdue for a solution. As public policy makers, you have tough choices to make at this time and I don't envy you. But, I'd like you to know that we at Burns and Rowe do not regard the concerns of the public about transportation, about the safety of nuclear power, about the reliability of the disposition of nuclear waste as dilly dallying by amateurs or some of the other adjectives you may have heard tonight, but rather as the valid concern of a public which, in our judgment, is under-informed and perhaps misled by organizations who are committed to political ends, which in many cases have nothing to do with nuclear power or transportation or nuclear waste or anything else.

Without further delay then I'd like to talk about the subject of perspective and risk. Much has been made, and most of the conversation we heard so far, has been on the subject of spent fuel shipments. I'd like to put this in the total context of the need for the protection of the public of the State of New Jersey. We'd like to just throw out some numbers that perhaps will give some sense of perspective to the quantitative nature of this risk. Every year approximately 2,500,000 packages of radioactive materials are shipped in the United States. Earlier a number of about 1,000,000 shipments was mentioned which I believe is also a correct figure because, of course, many of the shipments contained multiple containers and so forth. Let's look briefly at a breakdown of what is in these shipments and what are the relative hazards of these shipments. For example, of the 2,500,000, 700,000 of the packages are so-called exempt materials. These are materials that are naturally radioactive that contain such low levels of radioactivity that they are exempted from regulation by the NRC and basically from all types of regulations except during their manufacture. These include such items as the tritium dial on your wristwatch that makes it glow in the dark, the mantles in a Coleman lantern which contain borium, and other items which in themselves are extremely low and therefore not regulated but whose shipment is regulated. So in the 2,500,000 we are talking about 700,000 of those packages which were only marginally radioactive and are regarded by almost all experts as not

presenting any substantial public health hazard. Nine hundred and ten thousand of the shipments contained radio-pharmaceuticals for medical shipments. This includes items that are injected into human beings for the treatment of cancer as well as tracer materials much as the items that are manufactured by Union Carbide and others. An interesting aspect of this is that many oncologists who treat cancer credit the use of radioactive materials with saving over one million lives from cancer by the use of these radio-pharmaceuticals, which are generally associated with either the treatment of cancer or the diagnosis of conditions which are frequently cancer related or heart disease related or some of the other major problems. As you well know, we had a problem with containment of medical costs in the United States. The practice of nuclear medicine while spectacularly effective is also quite expensive. If we increase the transportation costs for these 910,000 shipments, the end result is it increases your Blue Cross bill. Of particular importance to this subject is the collection and disposal of the waste from the radio-pharmaceuticals, which while in itself is not much of a health hazard is a substantial logistics problem to the health care industry. If overly elaborate precautions or regulations are imposed upon this shipment of waste which is distributed throughout the country, the effect on our health care costs should be considered in any such regulations. Approximately 220,000 of the shipments are associated with industrial radiation sources. These come in two basic categories. There are process control monitors such as are used in the textile industry and the paper industry to control the thickness of paper as it is made. They are using process monitors that are absolutely essential to industrial strength and industrial growth. Also included in this category are industrial radiography sources which are quite large sources in some cases that are used for X-ray, pipe welds, and so forth. Another 200,000 shipments are associated with the nuclear fuel cycle exclusive of wastes associated with the nuclear fuel cycle. This has to do, of course, with the shipments of new fuel, shipments of source materials, samples that are exchanged between one activity and also is associated with the shipment of uranium ore concentrate, uranium hexafluoride, and all the front end cycles of the nuclear fuel cycle. Only 150,000 of the 2.5 million shipments are associated with waste shipments of which only one third are associated with the waste of nuclear power. Of the 2.5 million shipments only 50,000 are associated with nuclear power--packages rather. In the case of nuclear power, the packages are normally lumped into van-size shipments so the number of shipments might be as small as 10,000. The remaining approximately 378,000 shipments or packages are associated with the nuclear weapons program. In response to a remark that was made earlier concerning plutonium shipment by air and so forth, it is important for us to remember that in terms of cost benefit most of the waste problem we presently have in the country and most of the shipment of fuel, believe it or not, in the country is associated with the production of nuclear weapons, which is a subject which although it has nothing to do with nuclear power is an interesting one in terms of the cost benefit analysis. It is clearly inappropriate to establish to use the conventional framework of cost benefit analysis that's been developed for commercial nuclear power and apply it to--which is one of a series of alternative ways of generating electricity--and to turn and apply that to the production of nuclear weapons which guarantee our strategic defense is clearly an inappropriate application of these fancy tools which the National Environmental Policy Act has provided to us in its implementation. It is important then in looking at this problem of transportation to separate out defense and non-defense, medical from power, and industrial from power, and to recognize that by far the greatest majority of all shipments are, in fact,

low specific activity shipments that are in vital need at various parts of commerce that have nothing to do with nuclear power. A widespread application of increasingly limiting legislation to this whole broad area of commerce would certainly have greater implications than even some of my associates who are dreadfully opposed to the further progress of nuclear power would suggest. I'd also like to further put this subject of risk in further perspective by indicating that the 2.5 million packages of hazardous material that are represented by nuclear materials are a small fraction of the total quantity of hazardous materials that are shipped on our highways and on our railroads every day. Over 100,000,000 packages of hazardous material are shipped up and down the roads. In fact, the regulations which govern the shipping of nuclear power are really a subset of the Department of Transportation regulation--I believe it is Title 49--which governs the 91 pages worth of regulations that govern hazardous material shipments of all types. Included in here are flammable material such as petroleum, which most transportation fatalities are associated with and other hazardous materials such as corrosive materials, acids, compressed gases, and other hazardous material. So it is important to recognize as we look--- The big plea that I have to make opposite this point is that we keep our concern with the societal risk and the risk that we are all willing to accept in Bergen County and elsewhere in perspective with the risks that we routinely accept because we don't know anything about them. One thing we can point to very proudly in the nuclear industry is that we have gone to tremendous efforts, with the help of the United States government, to qualify our risks, to let them be known, to issue the reports, and so forth and so on that are frequently misinterpreted and used for opposed points of views. But more is known about the hazards of radioactive material, the health hazards and others than the hazards of carcinogens in our environment such as cyclamates and all sorts of other contributors. I think it is vitally important for us to recognize that to single out the transportation of nuclear materials because nuclear power plants happen to be vulnerable to this particular issue should be kept in perspective regarding the other hazards, even in transportation that we routinely accept. For example, the Department of Transportation performed a study based upon shipping accidents during the period of 1973 through 1976, a four year period. They considered the fatalities associated only with the shipping of hazardous materials. There were a total of 113 fatalities, ninety seven of which were associated with the shipping of flammable materials, five were poisonous materials, five were corrosive materials, three were compressed gas, two were explosives, and one with radioactive material. As a matter of fact, the one fatality was the truck driver who was killed by the impact of the accident in an accident which involved no release of radioactive materials. If these numbers are weighted by the number of shipment miles that each category of material is presented with, the conclusion is that radioactive material shipments as far as hazardous to life are twice as safe as other materials. And if you consider them as opposed to total accidents of all types--that is non-hazardous as well--they are four times as safe. To further my plea for keeping the hazard associated with radioactive waste--the risk associated with radioactive waste--in proper perspective, I'd like to run through the following numbers very quickly.

Fatalities Per Year From Various Causes--this is from NRC Report New Reg. 0170. Every year we have 55,000 fatalities from motor vehicles. We have 18,000 fatalities from falls, 7,500 fatalities from fires, 1,800 fatalities from air travel, 1,100 fatalities from electrocution, 91 fatalities from tornadoes, and based our experience to date we can have something like .0004 fatalities per year from the shipment of radioactive materials. It is interesting to note, for example, that while

we are very concerned that these materials be shipped safely, we routinely accept a much higher risk associated with airplane travel every time we get on it. We are not willing to accept the risk of a terrorist getting his hand--the extremely unlikely probability--of a terrorist getting his hands on radioactive material and terrorizing us with it, but we are prepared to accept a Saturday night special as a way of life in the United States. I say that without judgment on whether Saturday night specials should be or not a part of our way of life, but only to point out that we casually accept so many kinds of risks that are so much higher than those associated with the transportation of nuclear waste that I ask you to consider seriously if further regulation on this particular hazard with its demonstrated safety, its demonstrated low probability of occurrence is warranted in view of the many other hazards that perhaps are in need of regulation or that we routinely accept without regulation.

The next point I would like to make--and I could go on on this subject a great deal--I'd like to correct one thing that was said earlier. It is that the Sandia Report indicates that the worst possible so-called likely accident--that is an accident that is not associated with a terrorist attaching a charge to a vehicle and blowing it up--indicates that for a shipment of spent fuel the likely consequence, even the most severe transportation accident is (1) Immediate death and perhaps 20 or 30 delayed fatalities associated with the induction of cancer much later on. When you consider that using the same methodology that one death was calculated with, the number of fatalities associated with a massive release of chlorine gas in the city limits of New York City can be shown to cause 18,000 fatalities and yet chlorine gas is routinely shipped through New York City in trainload quantities. I simply wonder what foot we are putting the shoe on when we make these regulations. I'd like to go on but in view of the hour--- The subject of risk and perspective is of great concern to me and to our public policy makers, I know, as well.

The next point I want to take is basically the implications of cooperative federalism, as is espoused by the Interagency Review Group. This is just a fancy term which I'd like to familiarize you with because it took me about six months to figure it out. Perhaps you would bear with me for a moment. The Interagency Review Group was announced by President Carter in April 1977 as part of his energy message in which he formed a review group of 14 federal agencies who were concerned with the subject of nuclear wastes disposal specifically. That group was charged to develop a national policy on radioactive waste and to report back to the President. If he approved their recommendations, he would presumably implement them. That report has been issued to the President about two months ago. To date he has not taken any action on the subject although action is anticipated. Without going too far into this subject, there is a new concept which basically grew out of the influence of the National Governors' Conference on the Interagency Review Group since they were a contributing member. It is a doctrine of cooperative federalism. It recognizes the fact that states, as individuals, cannot solve the problem of transportation or waste disposal. It urges the President to establish regional planning councils to reasonably deal with the subject of waste. I'd like to commend that to your consideration because, after all, why should the citizens of South Carolina accept all the waste that is generated in the State of New Jersey? Why should the citizens of New Jersey have to put up with the transportation of all the waste from New York State across our highways all the way down to South Carolina? What is the moral or ethical justification for this arrangement? Well there isn't any. It turns out to be an accident of history that Barnwell is a burial ground. What is really needed here is some kind of a mechanism

which is urged by the IRG to make sure that the people who obtain the benefits from nuclear power also obtain the risks that are associated with nuclear power. In my judgment, of course, the benefits so far outweigh the risks that if I could have one next door to me, I would jump at the chance in terms of my tax rates and other benefits that are associated with nuclear power construction. Be that as it may, the fact of the matter is that in the recent OPEC oil hike New York City's Con Ed immediately announced something like a 35% rate hike or fuel adjustment hike in order to pay for increased fuel costs. The Public Service Electric and Gas which generates over 35% of its power from nuclear sources did not have to make a similar announcement. So I felt the benefit from generating nuclear power in New Jersey in my pocket. I appreciated the fact that people in Public Service and in the Jersey Central Power and Light had the forethought 10 or 15 years ago to plan for the nuclear electricity generation. As a consequence of this benefit that I received, I am quite willing to dispose of radioactive waste that is associated with those plants in New Jersey. I would rather dispose of them in New Jersey on a quid pro quo basis with Massachusetts rather than have the Massachusetts waste transported through New Jersey farmland. If we, on an each state basis, could dispose of our waste, I think that would be quite valuable. For example, if I recall correctly well over 50% of all waste is buried at Barnwell, almost all the waste of the East Coast, as you know, goes into Barnwell, South Carolina. Well over 50% of that waste is generated in New England. And, of course, it goes right down the New Jersey Turnpike on its way to Barnwell. That's the simple fact of the matter now. If, on a regional basis, we said, "Well, gee this region, the Northeast because of its peculiar situation with fuel supplies for its utilities, has quite an incentive to develop nuclear power as opposed to other regions" then as a region we should solve this problem not only of transportation and the waste disposal, I believe, in a moral sense that a far more equitable solution can be arranged for all of us.

On the subject of how complicated this cooperative federalism is, just for a minute I'd like to list for you the federal agencies which have purview over the subject of nuclear waste transportation, even though nobody is a lead agency. That, of course, is part of our problem. Much of the need for hearings like this and for State legislation derives from the fact that the federal government has apparently been woefully inadequate in their ability to establish regulatory standards for the safe shipment of nuclear materials. New Jersey is not the first state to have the limitations that we have now or to propose more stringent ones. I will get to the list of existing regulations in other states in a moment. We arrive at this difficult controversy in this room because of the failure of the federal government to basically complete their charter as presently written. This failure is primarily the result of a lack of coordination between the multitude of federal agencies that have purview over this subject, including the Office of Managing a Budget, Department of Transportation, Department of Energy, the Nuclear Regulatory Commission, the White House Staff, the National Transportation Safety Board, The Environmental Protection Agency, the Council on Environmental Quality, the Interstate Commerce Commission, the U. S. Geological Survey, believe it or not. As a direct consequence of this regulatory morass in Washington, some 21 states have felt it necessary to establish their own regulations to limit the exposure of the public to the risks associated with nuclear wastes. For example, in Arkansas regulations are being developed; California has established restricted routes for the transportation of nuclear material; Colorado has restrictions on tunnels; Connecticut requires a written permit, restricted routes, restricted hours and days of travel, a signed shipper and carrier certification

requirement; Delaware requires prior notification on shipments crossing the Delaware Memorial Bridge; Florida has prior notification on fissile material; and so on and so forth through Indiana, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Minnesota, New Jersey--no travel permitted on New Jersey Turnpike without special permit, prior notification required on all shipments of 20 curies or greater, restrictions on certain bridges--New York, North Carolina, Oregon, Pennsylvania, Rhode Island, Vermont, Chicago, Illinois, New London, Connecticut, New York, New York, and Plymouth, Massachusetts. In the interest of brevity, I will not read the summary of all of the restrictions that are in place in those states. But I point out to you that this is not necessarily, in my own opinion, an indictment of the present level of safety of shipments. It is an indictment of the confusion that results from the regulatory morass in Washington. In many cases I don't feel that all of these regulations are required, but I think that the states feel, in response to the public concern on this issue, that something must be done. They don't see Washington moving in this area so the states move in and do things which are sometimes less than effective and which sometimes impede the normal course of commerce. That is what I had to say on the implications of cooperative federalism. The topic seems to be esoteric and I apologize.

The next thing I'd like to talk about briefly is the subject of the role of railroads in reducing risks. Much of the previous testimony tonight has dealt with the shipping of spent fuel which is, admittedly, an extremely hazardous material, whose hazard lasts over many generations and is deserving of our critical concern and our evaluation of how we deal with this material. One interesting thing is that railroads have a slightly lower accident rate per mile than trucks do. Also, the railroad car can hold approximately four times as many fuel elements as a truck car can. Also the route that a railroad car can take is perforce limited by the right of way. And in many cases the railroad routings are through industrial areas or reduced population zones and so forth. There seems to be a good deal of mileage to be made, to coin a malapropism, encouraging the railroads to deal with spent nuclear fuel. The response of the railroad industry is interesting, however, their attitude is to put barriers in the way of the nuclear industry. The Eastern Railroad Association wants unit trains, trains that will be dedicated just to shipments of nuclear fuel. The cost to be borne, supposedly, by the almighty rate payer--the man with the bottomless pocket is of little concern to the railroad. They have put all kinds of barriers through their lobbying and trade organization--the American Association of Railroads--between them and the utilities' desire and preference for shipping spent fuel by rail instead of by truck. I consider that this is a significant problem that may bear further investigation. There are, as far as the rate of accidents to the extent that accidents are a concern, substantial benefits to be gained by shipping fuel by rail instead of on a truck. On the other hand, of course, the chances of a head-on collision with the railroad train, while existing, are relatively unlikely and not of great concern. I will cover the subject of impact resistance in just a moment. So that is just sort of a point that I wanted to make because I think it is not often made.

The next subject I want to cover and the last major point I would like to make is on the philosophy of the safety of radioactive materials. Say what you will about the philosophy of the safety of radioactive materials or the effectiveness of this approach, it is interesting to point out that there have been no releases of radioactive material from high-level waste shipments in the history of the nuclear industry. It is interesting to note that the number that was mentioned earlier of

thirty four shipments that have leaked have all been shipments that had low specific activity materials in them or otherwise were very low-level radiation shipments. This is a direct consequence of the philosophy of safety of transportation of radioactive materials that you will see in a minute. The first point in this philosophy is that protection should be proportionate to the risk of the shipment. Therefore, we have seven shipping classes of materials and we have three different grades of containers that are required for those materials. The effectiveness of this program is obvious. In the thirty four cases where the shipments because of their low degree of hazard did break open due to a transportation accident, no substantial consequences were reported. There was no exposure to the public. In the case of the types of shipments where there would have been substantial exposure to the public, the accidents that resulted did not result in any breaching of the casks. This is in my opinion a validation of the basic approach. It is a way of dealing with the nuclear fuel cycle on the least cost, acceptable basis.

The second point sort of implied in my earlier remarks is that the package should provide all the protection needed. This is important because our transportation system in this country, as you know, is based upon principally a common carrier or contract carrier basis. The least cost is associated with using the existing transportation system instead of having to form a new one as the American Association of Railroads has suggested that we do or the City of New York has suggested we do in moving local fuel by barge, for example. By requiring no operator attention to the package, unlike a recommendation that Ruth made earlier to require special training of the operator, is of little value if the operator is killed by the impact. The package has got to be the basis of our protection. If our protection is inadequate, if the risk is unacceptable, the proper solution is to make the package better not to establish elaborate routing constraints or other costly and noneffective methods.

The final point that is associated with our philosophy of safety is an engineering test should be based on extra severe consequences. I heard much--although I was not here for all of the proceedings unfortunately tonight--I heard a good deal of the common misunderstanding which is that the 42 inch drop on to the 6 inch pin and the 30 foot drop are, in fact, estimates of the worst accidents. That is, in fact, manifestly not true. The worst accident is based on an 80 mile an hour crash for a railroad train and so forth. The purpose of these tests is to damage the container so you can find out where it leaks. These containers are so strongly built that the transportation accidents that we have seen won't damage the casks. What you are trying to do is establish some outer boundary that would be well beyond that which we could expect to find in any conceivable transportation accident, including the head-on collision that was referred to earlier. We are intentionally trying to break the cask. People don't understand that an unyielding object is a very severe test. It is probably true in politics as well as physics that you rarely encounter an unyielding object. And the collapse of the cabs of two trucks as they fold into each other upon impact, for example, may absorb over 90% of the energy of impact. When you postulate your test in terms of an immovable object which does not absorb any of the impact, the shearing energy of that pin, for example, is enormous and considerably above the energy associated with hitting a guard rail, a deeply imbedded piece of steel, or anything like that. For example, one of the casks that was tested for the 30 foot drop was dropped from an airplane 10,000 feet. Some numbers were mentioned earlier about dropping a cask from 800 feet to, in fact, get to an 80 mile an hour equivalent velocity. They were dropped on the very, very hard packed soil--somewhere over the Great Salt Lake or something like

that out west. The cask penetrated more than 4 feet into the ground even though it was very hardly packed and rocky and so forth. And it was not damaged at all. The same cask exposed to the immovable object test is, in fact, damaged because the immovable object test is designed to damage the cask in order to prove that even under extremely unlikely events the cask is not to be damaged. So there is a basic misconception about the usefulness of this test and physically what it means in terms of conservation of momentum under collision conditions.

I'd like to close by giving lip service to a few points that were made earlier. Again, I feel no useful purpose is given to just emotional argument. I would not suggest this from a point of view of egotism or superior view at all. I simply mean to say that it is not really my purpose to argue with the opponents of nuclear power. It is my purpose to try to persuade them that their interpretation of the same data that I view is perhaps not the one that I take from the position of an informed citizen. But I would like to mention a few points that were made because I think they perhaps will flesh out my remarks a little bit.

The Price Anderson Act is one of the most misunderstood pieces of legislation that Congress has ever passed, which, in my judgment, is quite an endorsement. The Price Anderson Act is, in effect, passed for the protection of the public. It is a no fault insurance policy which allows the public, in the event of a major nuclear catastrophe, to recover the damages to their property without having to prove negligence on the part of the shipper or the part of the nuclear utility. After all, these things are quite complex. As we are going to find out at Three Mile Island, I believe, it is going to take years to prove that the utility was negligent--if, in fact, the utility was negligent. The Price Anderson Act in the event of a major consequence or a major spill--it's almost hard to imagine a spill that would have consequences high enough to trigger the Price Anderson Act--but if such a spill were to occur, it would come into effect and the claimants would be paid through a combination of insurance pools and a secondary insurance pool, which are almost completely paid for by the utility, not the federal government. They are, in fact, a valuable protection scheme for the public. In the event that the Price Anderson Act does not come into play because the consequences are not large enough to trigger its setpoint, then the public has the usual consequence to the insurance carried by the carrier for his actions which are, in fact, for the nuclear carriers proportional to the risks that they see. It is quite common, of course, for many types of hazards not to be carried in household policies because of the nature of the risk they are more properly carried by insurance pools rather than by individual insurance companies as is the case in nuclear insurance and certain types of flood insurance and so on. But it is a popular misconception that the lack of indemnity against nuclear accidents means that no one will insure the thing. In fact of the \$560 million of the Price Anderson Act insurance, over \$380 million per claim of that insurance package is paid for by insurance pools. The remainder is based on nuclear utilities' contribution to the secondary insurance. Only \$85 million of the entire package is by federal guarantee. As additional nuclear power plants are brought into play, of course, even that \$85 million will be backed up.

The next point that was made had to do with emergency action. I'd like to reassure you on the subject of the effectiveness of the State of New Jersey's Emergency Action Plan--its radiological Action Plan, if you will. It is one of the few in the United States which is approved by the NRC because of its effectiveness. There was an accident drill held last summer, I believe, at the Salem nuclear power plant which was extremely effective in mobilizing all the personnel that were

required to respond to the particular accident. The vision of holocaust that was mentioned by one of my predecessors simply is not a likely consequence of a transportation accident of any kind. But in the event that it were a consequence, it shows the wisdom of basing our safety upon the package and not upon routing, not upon the operator's action and, for example, not an emergency action. In the 34 cases where spills have occurred as a result of low specific activity, generally speaking the reactions of the police, the drivers of the vehicles, and other emergency response agencies have been extremely effective. Cordoning off the road and covering all the material is basically all that is required. The material must be covered to prevent it from becoming air borne and nearby personnel need to stand away an appropriate distance. Obviously, "an appropriate distance" may be a long distance until radiation survey teams arrive. When they arrive, you can stand at a recovery boundary. Recovery for all 34 accidents involving leakage have been quite effective and certainly not a cause for the horror story that we heard earlier. Although in the end, the concern behind that story is a valid emotion and we need to learn to deal with them.

It is interesting to point out, by the way, that we talk about all these spent fuel shipments like they are going by one an hour. A Reader's Digest article reports that one out of every ten trucks that you pass on the highway has hazardous materials in it. Of course, nowadays the ICC and the DOT have gotten around to putting the placards on the side that have been required for over 15 years. We are finally enforcing that law. It's not hard to run down the New Jersey Turnpike, for example, and count--next time instead of playing bingo, that's what we play in my house, we count the station wagons or something--count the number of red placards you pass as you go down the New Jersey Turnpike and I think you will be able to verify that number for yourself. On the other hand, there have been a total of 4,000 shipments of spent fuel in the United States since the beginning of the nuclear age, 2,000 of which were conducted by rail and only 2,000 by truck. So it is not really a large hazard we are accepting at any base. I might also add that at the present time because of the uncertainty concerning the backing of the nuclear fuel cycle, nuclear power plants are being built with larger and larger on-site storage. Right now, for example, the local plants that are proposed for Jamesport will probably have storage for 15 years worth of their nuclear fuel. They do not have to ship it and they do not routinely ship anywhere because there is no place to put it. That is sort of the other Achilles'heel in the nuclear industry. So we are not dealing with large quantities of the shipment of fuel. In fact, where are you going to ship the fuel to? There isn't any place to put it so they keep it on site, in general. Small quantities have been shipped to Morris, Illinois recently, but there is no shipment of spent fuel problem. There is no place to put it.

Another point was made without some numbers about the New York City accident. Dr. Solomon, who is the Deputy Commissioner of Radiological Health in New York City and the author of the legislation that we referred to earlier, has admitted in Congressional testimony that he has been badly misquoted concerning a million deaths. Again, the most likely number of deaths would be on the order of 100 in the event that a terrorist blows the package up, not in terms of a regular transportation accident--even if the accident were to occur in New York City. The same study that reports the death number also refers to the fact that if the terrorists really want to terrorize somebody with an equal quantity of explosives, he could cause far greater hazards to life by, let's say, blowing up the New York City water supply, or finding a large liquefied natural gas storage terminal or many other places where explosives could be put to better use in terms of the number of people whose lives could be terrorized, if you will. So there

is little incentive for a terrorist in search of the greatest amount of "bangs for the buck", to use an overused expression, to search out the nuclear materials. Because the yield from that particular act of terror is far lower than other yields that can be extracted with similar quantities of explosives and organization.

An expression was used before which I think is important to correct concerning the effects of radiation. Ruth mentioned that the body breaks down. That, in fact, is not one of the identified consequences of long-term radiation exposure. The consequences are, in fact, cancer of the various types, primarily thyroidal cancer, which is one of the most curable forms of cancer. Lung cancer is next in occupational orders and leukemia which is probably the leading cancer. It's important to recognize that the consequences of these or the defects of radiation have been found in extremely high dose levels--those associated with atomic bomb victims, those associated with the radium dial painters, and other people, radiologists who used to routinely accept massive doses of radiation in the earlier days of the X-ray tube. It should not be thought to be characteristic of occupational exposures in the United States even under accident conditions--much less exposure even under accident conditions.

The other effect of radiation, latent effect, believed to occur, of course, is it is life shortening. The rats exposed to large quantities of radiation don't seem to live as long as other rats. This effect, by the way, has not been noticed among the survivors of Hiroshima and Nagasaki. In fact, many rats that are given relatively small doses of radiation like we might expect in occupational exposure or even exposure to the public under accident conditions live longer than other rats. It is sort of an anomalous effect, a radiation advantage.

In conclusion, I'd like to ask you to consider the risk to the public and the benefits from the use of radioactive materials of all types in your deliberations concerning the need for additional regulation in New Jersey concerning this hazard. I think the outrage of the public on the subject of the regulation of transportation is perhaps warranted. But I suggest to you that that outrage is directed primarily at the lack of organization--the failure of the federal government to get its act together on the subject of considerable concern to the public--rather than for any genuine need to increase the level of safety with which we ship the vast majority of radioactive materials. I would suggest that for that very small quantity of spent fuel, our experience to date has indicated that that material can be shipped safely in the containers that we ship it in and that it is such a small fraction of the number of shipments that go through New Jersey that it does not really form a large part of the risk. One of the best steps we could take if we wish to reduce that risk is to encourage the railroads to ship that fuel at rates that are equivalent to what they ship other hazardous materials at. I'd just like to thank you for your time and your patience. Again, I'd like to present my remarks in writing. I'd be happy to answer questions. Assemblyman Kern asked me on the telephone if I would care to answer questions on vitrification and I am prepared to do so.

ASSEMBLYMAN KERN: I'd like to pursue that. I understand that the European Common Market has pursued a policy utilizing the technology known as vitrification or the disposal of radioactive waste in connection with nuclear power plants. Could you comment on that and compare it to what is being done in this country?

MR. LILLEY: Yes, sir. The basic difference is not the subject of vitrification but is the difference of an open versus a closed fuel cycle, as I'm sure you know. The British, the French, the Japanese, and all the other nuclear nations in the world have

decided that for economic as well as for public health reasons that a closed cycle involving the reprocessing of nuclear fuel and the use of bigger reactors is what their particular society is prepared to accept as a risk in turn for perceived benefits. It is, after all, the reprocessing of nuclear fuel which generates the high levels of liquid radioactive wastes which result in this country from the defense program which is frequently by misassociation attached to the nuclear power industry and which do in their liquid form pose a threat to the health and safety of the public. Therefore, for many years it has been the recommendation of the National Academy of Sciences in this country and other prestigious scientific groups throughout the world that liquid waste should be isolated from the biosphere by two mechanisms: The first is to fold the nuclear waste into a glass-like matrix through a process called vitrification. (I have a little black piece of glass about as big around as a quarter and about three or four times as thick which represents the radioactive waste from reprocessing the nuclear fuel associated with providing all the electric power needed for one year for a family of four, for example, to give you an idea of exactly how small the quantities of high level waste are when put in this form. I'm sorry I didn't bring it with me.) Of course, the advantage of putting the materials in a glass-like matrix is should the materials ultimately come in contact with water, a package is breached, or this that and the other thing, the radioactive material is not released from the glass-like matrix even over hundreds of thousands of years. The second step in the safe disposal of high-level radioactive waste is, of course, to entomb it far below ground in stable geological formations such as salt mines, salt domes, basalt, heavy lava flow, and many other suitable candidates. At the present time, the French and the British are operating commercial reprocessing plants where they reprocess fuel from all over including that supplied by the United States to other nuclear nations. Those two locations are LeHavre in France and Winsdale in Great Britain. The present option at those plants is simply to offer intermediate storage of waste. The waste is stored on site in heavy concrete buildings that are tornado resistant, flood proof, earthquake resistant, and so forth to await the eventual opening of a geologic repository in that nation or in the European economic community of repository in view of the greater degree of cooperation from that area. The Swedish have established a burial ground in granite in Sweden which is being evacuated for its use for spent fuel disposal and for vitrification products disposal. The French, interestingly enough, astute businessmen that they are, regard one of the services they provide as the absorption of the waste. So, if you are a Japanese utility operator and you would like to recover the valuable materials that are left in your fuel at the end of core life, you send it to France, they give you an appropriate credit for the plutonium and for the uranium that is in the fuel which they will either make back into fuel for you if you would like that and they also accept the waste and store it on their property. In their view, that is a service: "The Japanese are a lot more crowded than we are and we'll take their waste. As long as they give us their business to reprocess, we will be happy to accept this waste and to accept the economic benefit associated with a major new industry in France."

ASSEMBLYMAN KERN: In this particular process the glassine object is easier to transport and easier to store than the liquid waste?

MR. LILLEY: Yes, sir. Usually the form that would come out of this would be a column of glass perhaps six inches in diameter and ten feet long, for example. It is in that form to allow better heat dissipation from the glass form. Of course, it is usually doubly encapsulated. It is actually melted inside of a carbon steel vessel which

is in turn welded shut and placed inside of another stainless steel vessel which is welded shut and leak tested and then is shipped to a repository. Those are at least our plans in this country for the vitrification projects which are under way. You can do a lot of fancy numbers along the same lines as the Sandia report and so forth to show that the consequences of the same accident are much, much, much lower when shipping a vitrified material than when shipping spent fuel itself. Although, it is interesting to point out, of course, that if you take all the wastes from a standard shipment of spent fuel, it might fit into a jug this big. You take this enormous canister of waste and you can concentrate all that high-level radioactive material after reprocessing into a very small package which is very unleachable and so forth.

ASSEMBLYMAN KERN: Why haven't we pursued this particular type of technology sooner?

MR. LILLEY: The United States actually for many years was one of the world's leaders in all types of fuel cycle technology. It is no accident that we exploded the first atomic bomb. It is well known that the Atoms for Peace Program grew out of the Manhattan Project. For many years in all phases of nuclear technology, the United States was ten or fifteen years ahead of the rest of the world. In many cases we have exported that technology to the French and the British and they are using it just exactly as we have taught them. Our public policy seems to get in the way of an effective nuclear policy as well as an effective energy policy. To be more specific, President Carter in April of 1977 announced that there would be no reprocessing in the United States and there was no need for the employment of greater reactor technology, both of which are associated with the closing fuel cycle and which had put all the plans to move in that direction in abeyance for the commercial fuel cycle until Lord knows when. On the subject of the high-level defense waste on the other hand which are after all in existence--some 75 million gallons of them as I recall in three isolated locations throughout the United States--these are wastes that are associated with the production of strategic nuclear weapons that do much to guarantee our way of life as it is at the present time. Actually, in one of the sites, the Idaho National Laboratory site, the waste goes through part of the process of vitrification. The process is really a two step process. The first is calcination where the liquid waste is turned into a dry powder. The next step is to mix the dry powder with pieces of glass that are melted together and allowed to cool. A very simple process really. At Idaho National Lab that process is carried through to the end of the calcination step and the dry calcine is stored in bins awaiting eventual disposal. That waste form is quite a bit more attractive than liquid waste because it can't leech into the ground. Most of the waste is at Hanford, Washington, a very dry desert area in the state of Washington. There are presently no plans to proceed immediately with the vitrification of that waste although ultimately that is intended. Burns and Rowe pursued, unfortunately unsuccessfully, a major engineering design contract with the Department of Energy to design a facility that would cost in the order of two or three billion dollars to vitrify the waste at the third location in the United States which is, of course, Savannah River. There we are talking about 20 million gallons of high-level waste that will be vitrified starting in about ten years when the plant will be ready. The capital cost of that plant is two to three billion dollars. This brings in at the first order of significance the subject of cost benefits to society. The waste has been there a long time; it hasn't hurt anybody so far. The calculations of how many people it is expected to hurt are very low even when done conservatively. And two to three billion dollars is a lot of money when you consider the other needs of the nation, the concerns of a balanced budget, etc.

Nonetheless, the Department of Energy is proceeding at this time to build a vitrification plant in Savannah River to begin the process of cleaning up nuclear waste.

ASSEMBLYMAN KERN: Thank you.

ASSEMBLYMAN BURNS: Mr. Lilley, in the vitrification process is the radioactive material suspended or does it continue its half life and break down to eventual neutrality?

MR. LILLEY: It continues its breakdown.

ASSEMBLYMAN BURNS: So even at that in a few hundred years it will be---

MR. LILLEY: I'd like to point out one thing on that subject. I'm glad you mentioned that. On the subject of breeder reactors--one of my favorite subjects since I was fortunate enough to be involved with Burns and Rowe's project in the design of the Clinch River breeder reactor---we have over 550 people at work at the present time on the design of this important project despite the president's opposition to it. One of the things that the breeder reactor fuel cycle does is it burns plutonium. Breeder reactors use plutonium as fuel. It is a valuable fuel. As a matter of fact, on a neutron economic basis it is more valuable than uranium is. Therefore, in a fuel cycle which is allowed to progress in an appropriate technical way--although the way in which most technical people should feel it should progress, that is, with breeder reactor and reprocessing--the plutonium is recovered and re-used as fuel. You don't even have to have breeder reactors, however, to use plutonium. You can burn plutonium in existing light water reactors. In fact, that has been done. And so by burning plutonium as fuel, you take this extremely long half life substance, which is the 24,000 year half life that is of such great concern, and you remove it, burn it and turn it into fission products by the splitting process that occurs in fission. Those fission products have a much shorter half life. And so a much less hazardous waste form is the result of reprocessing technology and/or breeder reactor technology. The wastes that have plutonium remain hazardous--if you call this glass form hazardous--will remain active and retain sufficient activity to be considered hazardous materials for indeed thousands of years. However, if the plutonium is removed through the recycling process, in four hundred years the waste will return to the equilibrium activity of the ore from which the original fuel is made. In terms of an isotopic balance, in only four hundred years if that material were to be stored in the earth's crust where the ore is taken from, for example, we are back to ground zero in terms of the amount of curie content in the waste. So from a point of view of future generations, in addition to providing a secure energy future which I believe is as important to future generations as any conceived hazard to their health, the risks to future generations is greatly reduced by reprocessing by breeder reactors.

ASSEMBLYMAN KERN: I was delighted that you were able to come and enlighten us, give us some of your technical expertise, and shed some light on a subject that has had a lot of emotionalism connected with it. I think that your testimony has been invaluable to this Committee in the evaluating of the present situation. I'd welcome your comments in a more lengthy printed form.

MR. LILLEY: Thank you very much.

ASSEMBLYMAN BURNS: Is Dr. Martin Welt here? Jack Greenspan? George Apfel, you have one question?

G E O R G E A P F E L: A few more came up since our last discussion. If I may please?

I'm very glad that you brought up the matter of the watch dials because my aunt was one of those who were highly involved with that. It brought on her death in Orange. She worked for the U. S. Radium Company back thirty or forty years ago when

we weren't quite as knowledgeable about radiation as we are today. So that just touched me in one spot.

The other point to be brought out I think is rather from a selfish standpoint. He said that power was so much cheaper and he was so glad he could pay for it. It was so much less because of the nuclear power. I think he is very, very selfish because he is actually extending the extreme high cost of that power over to the next thousand generations who are going to have to pay for the storage of this material. It will take some 25,000 years to reach half life so actually the future generations are going to be paying for that extremely cheap power we are getting today from nuclear forces which I think is very selfish on the part of the gentleman.

The other thing is that I have insurance on my house, my car, and my boat covering me against every kind of catastrophe with the single exception from nuclear of any sort. Every policy that I read has exclusion of nuclear accident. It is the darn safest thing that anybody ever invented and we are never going to have any trouble with it but no insurance company will cover you on a private policy on it. So I am just curious about the disinterest of the people who are in a position to make some money on insurance premiums but won't even talk to you about it. So how safe is it? I don't know. Of course, the federal government tells us it is extremely safe and at this point I have absolutely no faith in anything that the federal government tells me regarding nuclear energy. Because the only people that are involved in it are basically people who have come from the industry and they are part and parcel of the regulatory body. What faith can you have in them? You remember the stories that came out of the Three Mile Island incident. They didn't know this; they didn't know that. Yes, this was going to happen; no, that was going to happen. Nobody knew what he was talking about or they made believe they didn't know what they were talking about. They didn't give us the truth--the true picture of what was going to happen.

I would like to suggest to the Committee that you contact some disinterested professional engineer as to the validity and accuracy of the statements that were made pro and con today about these containers because there seems to be a vast difference in the amount of residual energy or momentum that is involved. You hear one side of the story. I think it would pay you to contact some disinterested engineer and find out how these tests actually occurred and are they valid tests. I notice that the specifications for the test are some number. None of the tests were carried through to the final condition--where they ruptured the container so that they would have some idea of exactly how much energy was involved in rupturing a container. They went so far, and as one gentleman said they made four tests and if the fifth test had ruptured there was something wrong somewhere. So at this point just saying we tested for a forty foot drop and we tested for 80 miles an hour, at what point do we rupture these containers? That would give us more valid answers I am sure. Insofar as somebody exploding a truck of spent fuel as compared with blowing up a water supply, a very much simpler deal would be to drop two grams of plutonium in anyone's water supply and the effects of that would be so vastly greater than any bomb that anyone could set off in any city. So that is a very important comparison. I thank you for your time.

ASSEMBLYMAN BURNS: We have one more, Mr. Peter DePaul.

P E T E R D E P A U L: My name is Peter DePaul. I'm from Bergen County in Edgewater. I didn't come with a prepared statement but I feel it is a responsibility. Many people, myself included, often sit back and try to get both sides of the argument and will talk about it at home, at work, or sometimes in a tavern. Many people are worried about the

nuclear waste transportation and the waste processing and storage. The problems that we were worried about and that we have heard discussed by both sides tonight, I have written down.

One is the low-level radiation. You take risks with that every day. Then you hear stories of low-level risks in Rocky Flats, Colorado and how the people there are subject to higher cancer rates than other counties in that state. Is there a relationship? I'm not a scientist; I can't answer that. Dr. Helen Caldecott, however--this information I've gotten from the SANE group--has come out against the low-yield radiation in medicine which she feels is beneficial, and yet she does name it as a cause of cancer.

The high-yield radiation which is transported through Bergen County, if it is in small quantities it is still dangerous. Are we getting low-yield radiation off of these high yields?

Then when coming to the question of transportation, I don't feel comfortable as a citizen of this country to say, "As long as it is not in northern New Jersey, let the people in Pennsylvania take it." I don't think that's the type of country I want to live in and that's not the type of country that I want to leave to my children. If plutonium or these other radioactive elements have a life of--someone said--250,000 years, it would be a dirty trick on my son or daughter or anyone to say, "Well, I'll give you life but then you have to figure that out for yourself. I've done my job." That is something that bothers me and I believe other people who don't get up and talk quite a bit.

I also heard mentioned that the radioactive waste that is buried in upper New York State in one of these salt caverns, the cavern from the heat of the waste material has begun to melt. And the United States Government who had this project decided to cancel it--this approach. Which side are we going to believe as the average citizen now? Are salt mines possible or other geological constructs? Are we holding something that is dangerous at this point and we need to stop and look at what we are doing with this energy? Is it really producing as much as they said it would? And what can we do with the wastes?

I question the nuclear power given us because I remember as a boy the arguments of Atoms for Peace and how it would cost pennies for electricity by the time we were grown. A recent statistic I heard is that energy created by the nuclear industry at this time is twenty five percent more expensive than coal and oil burning. So, over twenty years there has been a big change of cost in that approach if it is going to get us out of our energy bind and create chief energy sources for industry.

I question, and I have heard many people question, the nuclear industry because of their concern for profit more than for the people of this country. I do take that position. I'm trying to think of an example. One might be the 25% more it costs the nuclear industry in making energy than it does making energy using coal or oil. I see their interests are at stake. If I had a company put in thirty years and billions of dollars in investment, I would feel it would be very difficult to turn around and say that was a waste of time or a waste of money. Who is to pay for it? At this point--and again I'm looking negatively on the industry itself--with the Price Anderson Act, the insurance will cover it only for a large exposure. The average person on Three Mile Island probably won't collect on that insurance policy, I believe. This fellow mentioned that he can't get protection on his house. In the house where I live the landlord can't get it either. There are questions of why you can't get protection if it is so safe.

I won't take more of your time. I know it is late. Thank you for coming to us and hearing our pros and cons on the issue. I would take the position that it is not only transportation but also the development of the nuclear industry that has to be regulated and halted at this time until we can find some definite safe answers. I know that is difficult. I'll close with this. Governor Byrne was at an energy meeting in Lawrenceville, I believe. Congressman Roe came out in favor of opening up the sale of reactors. Now if we say we are going to limit transportation but the sale of reactors are going to go on the electrical production and then triple their waste deposits, somehow waste is going to come into our State. If it is not going into the most populated section, I don't think that people in Salem County or Ocean County should have to bear that problem.

I know I have not given any facts in large proportions for you, but if you want any I will get them for you.

ASSEMBLYMAN BURNS: Peter, thank you very much.

Is there anyone else who wants to be heard?

W I L L I A M J. K A L A V S K Y: My name is William J. Kalavsky and I am just an ordinary citizen of River Edge, New Jersey. I was not interested in nuclear energy up till two years ago. I was on my way to Florida and was going down Route 95. In South Carolina it was raining and the downpour was coming like a son-of-a-gun. I had to slow up to about 40 or 45 miles an hour. I saw that picture on the screen that showed those large cylinders. Well, let me tell you what I saw. I was going 45 miles an hour in this terrifically heavy downpour and I saw these frightening lights coming behind me and he passed me like I was standing still. There in the middle of this big flat bed truck was this giant cylinder, roughly about 12 feet high and about 8 or 10 feet wide in diameter, on end--not horizontal, on end. Now that gentleman who was driving that truck probably never had a front tire blow out or a rear tire blow out. Now the gentleman said that they hit a solid immovable object. If that truck had gotten a blowout and that thing had come loose and flipped, you can imagine what would have happened. Then about a half an hour later another truck went by with the same cylinder up there with that nuclear insignia that looks like a propeller that means it is radioactive waste. Then a half hour later a third truck came by. They were all going at this tremendous rate of speed. There were no police escorts--nobody. Now, if a terrorist wanted to blackmail a country all he would have to do is just park on the side of 95 in South Carolina and wait for the first truck that comes by. It is possible.

When I saw that I thought how I trusted our government for 37 years figuring that our physicists and our scientists knew what they were doing. When I came home I went to the library and picked up all of these books like Hiroshima and General Groves and the explosion of the first atom bomb in the desert. By the way, Enrico Fermi died in terrific agony from radioactivity. He practically broiled on the inside of himself. In reading this book Hiroshima I read that in 1959, almost 15 years after the Hiroshima explosion, almost 200,000 Japanese appealed to the government for help with some kind of radioactivity cancer or something like that. That's in the book.

Then I got worried and today I am terrified. Man, am I scared. Yes, I went to Indian Point too. I saw that big load up there. They said that we had benefits. When I was a kid, I lived in Jersey City. I was born in Jersey City. I lived in a tenement flat. I used to go down to Fitzgerald's workshop on Eleventh Street where the Holland Tunnel exits now and used to wait for slats that they would throw out so I could take them home to my house to put into that stove. We burned coal and wood but

we had a nice cozy fire. This nuclear energy is not worth it. Not twenty years and look at the headaches we've got with this stuff. You can't get rid of it. It lasts for hundreds of thousands of years.

Now let me get this across. President Carter, I think, is asking for \$80 billion for a synthetic fuel to be made out of shale or something like that. And Congress, I think, is striving to get \$200 billion in monies for synthetic fuel oil. Let's say the population of the United States is roughly 225,000,000. I'm guessing, I don't know. I guess it is that much. If some of that money was actually given over to solar power--- The average family is four people and if you divide that population number by four you will come up with something like 500,000 families in the United States. They're in the various parts of the country. The ones living in Georgia or down in Florida or someplace like that probably won't need as many solar heating panels as the people up in this area would need. But, there is a fellow in Dumont, I think, who has two solar heating panels on his roof and a tank in his house. I asked him what it cost to put one of these things in. He guessed maybe three or four thousand dollars. So I am going on that figure. If the government, if President Carter would give--instead of giving \$80 billion or \$200 billion for a synthetic fuel--give each family four or five thousand dollars to put in solar heat--they might have to have a backup system with oil in case you get some weeks of snowy weather in the wintertime when they have to have a backup system to provide heat for the house--I think it would be cheaper if they used that money for solar energy which they can have now. Think of all the jobs it is going to produce. They need copper for the pipes. We have lots of copper in this country. We have carpenters; we have plumbers; we have all these people that come to put solar heating into each individual home. I'm getting way ahead of myself. I don't know what to think. I'm not an educated man. I finished the eighth grade in school and I just loafed my way through high school. I didn't amount to much.

But those three trucks passing me about 2 o'clock in the morning, going at terrific speed warns me that this country, especially this area around here--we have approximately 9 nuclear plants in this area--now if the wind is blowing just right, 20 miles an hour, 30 miles an hour, I'm talking about the human failure. I'm talking about metal fatigue. The gentleman here spoke about breeder reactors. Now that is a thousand times--in my opinion, the way I understand it--more dangerous than the so-called reactors that we have now. A breeder reactor must use liquid sodium for a cooling system. If you have metal fatigue where the metal gets a pinhole in it and that liquid sodium is exposed to water maybe, some liquid, there is a tremendous explosion. There goes your breeder reactor. If that same liquid sodium is exposed to air, it catches on fire. Now we all know what happened to Alabama where just a candle almost put maybe the entire Southeast of the United States into total destruction and would make it probably uninhabited for a thousand years.

We had the Fermi nuclear reactor that almost knocked Detroit out of existence because of a knockdown. That was a small reactor compared to what we have around us.

In closing, I think we are living on borrowed time. You people make the laws. But I'm just an old guy and I'm stupid but I think that nuclear power is wrong. The main thing you ought to do is go down to Trenton and tell Governor Byrne and tell President Carter, or whoever the next president might be, to make these nuclear people get insurance, not for \$560 million but for \$18 billion and \$100 billion which would cost--I'm not saying for a life, this is only if you happen to be alive after an accident. What can I say? We're all on borrowed time and nuclear energy is just not worth it. That's it. Amen.

ASSEMBLYMAN BURNS: Anyone else?

S T A N L E Y M I T C H E L L: My name is Stanley Mitchell. I live in Hackensack.

The breeder reactors that I have heard about promise to triple or probably quadruple the amount of atomic wastes. Where does that leave us? We are already in trouble now. If we quadruple the amount of waste what are we going to do? We are just hell-bent for destruction. This is my point. This is my final point, thank you.

ASSEMBLYMAN BURNS: Thank you.

The meeting is open for the public. Does anyone else want to speak? Oh I'm sorry, do you want to tack on an appendage here?

MR. KALAVSKY: We have 72 nuclear reactors operating in this country. The majority only came into activity in the last 10 years. Now we have 125 million gallons of liquid waste in Hanford, Washington. The containers that were put there to bury this stuff in the ground started to leak. Those containers were stainless steel encased in cement I have read. And they were supposed to last 100 years. But they started to leak within 18 years or something like that and they are still leaking. They polluted, I understand, the Columbia River. I lost my taste for salmon. Honest to God; it's no joke.

They located all these nuclear reactors in some of the most beautiful parts of the country. I went to Barnwell, South Carolina and I rode through these burial grounds where they have this waste. On each street corner in Barnwell they had a litter basket, "Please help keep Barnwell County clean." Those people don't realize that they have the deadliest stuff in the universe buried right there in their town. We have approximately 20 million gallons of liquid waste buried in Barnwell and there is more coming. We have so much waste now in this country that if we had 9 rocket ships going to the moon every day--9 rocket ships--we would have to put up 9 rocket ships every day until the year 2,000 to get rid of what we have now. Now, by next year, 25 more, approximately, reactors are supposed to be put on line within the next year. If we have this much liquid waste and we have a breeder reactor that they want to build in the Tennessee Valley Project, and the other one is being built up in Hanford, I think, where does that leave us? Again I say we are living on borrowed time and it is up to you guys to make these people carry full insurance and let's get back to burning wood. I don't care if we get a little smoke from the coal fires in our furnaces, you can grow vegetables on it. It is life sustaining. You could go out and have a picnic. I'll tell you something else. I took my kids on a trip in 1960 and it has given me some cause for alarm. The road was being rebuilt in Utah so we had to take a detour and we went through some rough territory. We came to a place called Grand Junction or Green River, I'm not sure. I saw some beautiful sand out there and I stopped the car, got out, and found this very fine sand. I took some of that home. Now I have found out that when they mined uranium there they used Indians in the mining. According to what I have read in some books, almost half of these same Indians have come down with lung cancer. I'd like to get a Geiger counter and use it on this sand that I have at home because I understand that the tailings from this mined uranium were just scattered all over the desert in uninhabited places. And believe you me I went nearly 70 miles on this detour without meeting a single automobile. So it was a desolate spot. Maybe I brought some uranium tailings home with me, I don't know. But I would like to get ahold of a Geiger counter.

ASSEMBLYMAN BURNS: I think that almost any high school science department would be able to help you.

MR. KALAVSKY: Thank you for the information. I will take it to them. As

I said, please make these people carry \$20 billion in damages for any accident that happens because we aren't going to be here, definitely not. I don't expect to live to the year 2,000. Can you imagine this area if one of these 9 go up like a holocaust?

I went down to Crystal River and I looked at that one too. On the way back we saw a little museum they have on the side there--an Indian museum. I went in there and I talked to the little girl who was in charge. She worked for the federal government. I asked her if she saw the picture, "The China Syndrome." I was arguing about nuclear plants and how damaging it was for her to live in such a place. She said, "My boyfriend works in that nuclear plant." I said, "Then you and your boyfriend should go to see that picture 'The China Syndrome'." She said, "Politics doesn't have anything to do with it." See what I mean? That's the way some of the people are. Now I'm wondering if they are not going to use the Vietnamese as laborers in the Three Mile Island plant. How come they're sending robots in there? Why don't these people that pronounce this radioactive water as safe expose themselves to it and take a bath in it? The people on the Susquehanna River get their drinking water downstream from this area. They don't do that. I'll tell you what I am predicting. I don't think they are ever going to reactivate Number 2 again because it is certain death to walk in there. Believe me. I feel sorry for all those people who live around there because the radioactivity is probably in their bodies even at this saying. Thank you very much for your time.

ASSEMBLYMAN BURNS: This portion of the hearings on the transportation of radioactive waste will be continued to another date which will be announced by the chairman of the Committee. Thank you very much for being here.

But one does not need to have a PhD to know what that drop height specification really means. From elementary (high school) physics it is easy to know this following equation.

$$V = \sqrt{64.4 h}$$

where V = velocity of a falling body which is dropped
from a height of h feet in feet per second (fps).
and h = drop height in feet (ft).

The same simple equation may be easily rewritten in the following form. Just solve for h.

$$h = \frac{V^2}{64.4}$$

(The equations are easily derived by merely equating the potential energy of a falling body and either solve for the velocity V or the drop height h.)

Gurman



GENERAL ASSEMBLY
OF NEW JERSEY
TRENTON

WALTER M. D. KERN, JR.
ASSEMBLYMAN, DISTRICT 40 (BERGEN)
31 NORTH BROAD STREET
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TEL. 201-444-6000

August 29, 1979

Mr. Larry Gurman, Committee Aide
Assembly Transportation & Communication
Committee
Room 318C - State House
Trenton, N. J. 08625

Dear Larry:

I have enclosed herewith copies of material I have
received from Andrew Maier of the Bergen Energy Action
Network.

I would greatly appreciate it if you would have this
material entered into the record pertaining to the shipment
of Nuclear Cargo.

Thank you in advance for your cooperation.

Very truly yours,


Walter M. D. Kern, Jr.

WMDK/vbn
enclosures

bergen
energy
action
network

8/27/79

Assemblyman Walter Kern
31 East Ridgewood Ave.
Ridgewood, N.J.

Dear Sir;

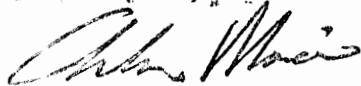
I am writing to clarify two points that were made at the hearings on the transportation of nuclear waste last week.

First- Contrary to the testimony of the representative of JCP&L, there has been at least one fatality that we know of as part of radioactive transport. Enclosed is the report on the death of Edward Gleason.

Second- The misuse of the film that the JCP&L man showed is widespread. I sought to outline for the committee some of the specific ways that the film is deceptive, but I think the best testimony on that topic comes from Ludwig Benner, Jr., who is Chief of the Hazardous Materials Division, National Transportation Safety Board. His letter is enclosed with the pertinent parts underlined.

We would all be grateful if you would relay this vital information to the full committee. We would not want a decision to be based on a falsely benign image of nuclear transport.

Thank you;



Andrew Maier
for BEAN

box 275, montvale, new jersey 07645



National Transportation Safety Board

Washington, D.C. 20594

May 29, 1979

Mr. Lindsay Audin
One Everett Avenue
Ossining, New York 10562

Dear Mr. Audin:

Thank you for your letter of May 9, 1979 concerning a paper you are preparing on the transport of nuclear materials, and your request to help in answering certain questions.

In contrast with other hazardous materials accidents in transportation, the National Transportation Safety Board has had few radioactive materials accidents to investigate. Therefore, first hand accident information on the transport of nuclear materials is limited. In that context, the following answers are offered to the questions in your May 9 letter.

1. The Safety Board has not taken a specific position with respect to DOT regulations on spent fuel transit. It has however, consistently criticized the methods used to identify safety concerns and regulations needed to address those concerns. In its report "Risk Concepts and Dangerous Goods in Transportation Regulations" NTSB-GTS-71-1, the Safety Board proposed that the Secretary of the Department of Transportation initiate the development and adoption of risk-based framework for evaluation in planning of dangerous goods transportation regulations or programs in the Department. This has not yet been accomplished. Until this is accomplished, we will have to continue to rely on engineering methods and accident analyses whether the concerns addressed by regulations are valid, and whether they are being adequately controlled by the regulatory and world community.

2. A summary of the Safety Board recommendations addressed to hazardous materials regulation affecting rail or highway transport of hazardous materials, including nuclear materials, is enclosed.

3. The Safety Board has not prepared any studies specifically addressing the safety of spent fuel shipments by road, rail or barge. However, Safety Board efforts to correct analytical and procedural problems with the regulatory process would benefit spent fuel transportation safety.

4. "Scientific tests" of sorts have been performed in connection with spent fuel cask safety, if credit is given to engineering analysis efforts. The high speed collisions test represent only two of a large number accident scenarios that need to be analyzed to assess the "safety" of spent fuel cask transportation. The motion pictures of the collision tests lend themselves to misrepresentation that the casks are "safe" when in fact the tests were performed to verify the validity of engineering models that can be applied to the analysis of alternative accident scenarios. It is the misuse of these films to represent that the casks are "safe" that is objectionable. The principle thrust of the test work is to assure casks integrity under all circumstances, when safety analysis efforts should be designed to assess not only the crashworthiness of packaging but the effects of a breach in the containment system - for any reason - and the predicted behavior of the contents when such a breach occurs. The "perfect packaging" philosophy assumes perfect performance by everyone connected with the packaging, and the Safety Board's accident experience suggests that this is not a valid assumption. A non-zero probability of the breaching of a cask during its life cycle, and spectrum of effects from such breaches, must be a part of any overall "safety" assessment.

5. All Federal regulations pertaining to the transportation of spent fuel or plutonium in regular activities are contained in Title 49 of the Code of Federal Regulations, Parts 100-199, and Parts 200-999. These regulations are available at most public libraries and in many legal libraries. The regulations are voluminous but reasonably well indexed.

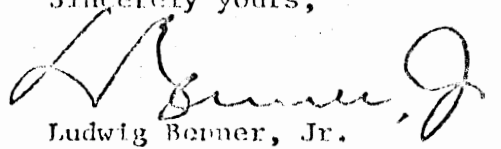
6. Routes for such shipments may be established by the shipper with respect to the carriers used but specific highway or rail links are selected by the carriers who handle such shipments. In some instances, routes are limited by local jurisdictions in the exercise of their police powers or public health and safety powers.

7. In accident investigations, the Safety Board probes the question of compliance with regulations, as well as the quality of the regulations, in attempting to assess the reasons for the occurrence of the accident. Otherwise, enforcement of Federal regulations is performed by the Federal agencies which issue those regulations. In accident investigations, the Safety Board relies heavily on the enforcement agencies for interpretative advice when Safety Board investigators observe differences between the regulations and the operations being investigated.

For further information about the regulations, we suggest that you communicate with Mr. Leon D. Santman, Director, Materials Transportation Bureau, Research and Special Programs Administration, Department of Transportation, 400 7th Street, S.W., Washington, D.C. 20590, telephone number 202/755-9260. Mr. Santman can speak about both transportation safety regulations and their enforcement relative to your project.

I trust you will find the above helpful in the development of your project.

Sincerely yours,



Ludwig Berner, Jr.
Chief, Hazardous Materials Division
Bureau of Technology

Enclosures

APPENDIX B

Statement Submitted to Attorneys for Mr. Edward Gleason

Re: Edward Gleason, et al vs. NUMEC

by: Arthur R. Tamplin

The following is my analysis of the origin of Mr. Edward Gleason's soft tissue sarcoma that ultimately resulted in his death and of the Consultation Report, submitted by Dr. Niel Wald, dated Jan. 29, 1973.

Mr. Gleason unloaded, rotated, and loaded a crate containing a leaking carboy of plutonium-239 (Pu-239) solution. This could not have occurred without contaminating the palmar surface of his left hand, which was bare. The question is: did this Pu-239 contamination cause Mr. Gleason to develop a sarcoma? Since radiation induced cancers are identical with those that occur spontaneously, it is necessary to consider the relative chances that the cancer was spontaneous or Pu-239 induced.

The United States Vital Statistics, record a death rate for malignant neoplasms (other than melanoma) of the skin in the upper extremity of less than one per million per year. Since synovial sarcoma is a rare form that often metastasizes and hence has a poor prognosis, its occurrence rate is certainly less than the total skin cancer death rate of one per million per year. Thus it is highly unlikely that anyone who handled this crate would spontaneously develop this sarcoma on the contaminated hand (less than one chance in a million).

Now let us consider what the chances are of the development of cancer as a result of plutonium contamination of the skin. Experimental data from plutonium contaminated animals demonstrate that injection of 1 microgram of Pu-239 into the skin of rats promptly produced cancer in up to 5% of the animals (Exhibit 1). The particular tumors are fibrosarcomas.

Now the analysis done by LASL indicated that the Pu-239 concentration was about 160 micrograms per milliliter. This is reason to suspect, since the volume of liquid was reduced, the Pu was actually more concentrated in 1963. But setting that aside, one drop would be expected to contain between 8 and 16 micrograms of Pu-239. One-one hundredth of a milliliter (a very small amount of liquid) would have been sufficient to

produce sarcomas in animals. There is little reason to doubt that this small amount of liquid (0.01 milliliter) or even more found its way below the surface of Mr. Gleason's palm. In this event, his chance of developing cancer would be one in twenty. This is at least 50,000 times higher than his chances of developing the cancer spontaneously. In other words, the evidence is overwhelming in favor of the tumor resulting from Pu-239 contamination.

The above relative probability is based upon data from animals. It is quite possible that man is more sensitive than animals to cancer induction by Pu-239. In fact, the biological evidence strongly suggests that man is more sensitive. Exhibit 2 is a case report of a nodule removed from a man. This nodule contained only 0.08 ug of Pu-239. Commenting on the histological examination of the lesion, the authors states, "The autoradiographs showed precise confinement of α -tracks to the area of maximum damage and their penetration into the basal areas of the epidermis, where epithelial changes typical of ionizing radiation exposure were present. The cause and effect relationship of these findings, therefore, seemed obvious. Although the lesion was minute, the changes in it were severe. Their similarity to known precancerous epidermal cytologic changes, of course, raised the question of the ultimate fate of such a lesion should it be allowed to exist without surgical intervention..." In this case, less than 0.1 ug of Pu-239 produced precancerous changes in human tissue. The dose to the surrounding tissue was very intense. There is every reason to believe that a smaller quantity of Pu-239 would have produced similar changes.

When I consider the above human and animal data together with the relative probability of 50,000, I can come to no other conclusion than that this sarcoma was a direct result of the contamination of Mr. Gleason's left palm by Pu-239.

Turning now to Dr. Wald's Consultation Report, it can be stated that he has presented no evidence to disprove the claim that this sarcoma was caused by Pu-239 contamination. I shall discuss Dr. Wald's report in the order that it was written.

According to the Division of Inspection Report submitted by Anson M. Bartlett on April 11, 1963, pages 29-30, the January 19 examination was conducted not on Mr. Gleason, but on his home, clothing and automobile. The single urine and feces

samples collected subsequent to January 20 gave negative results. The only thing that this demonstrates is that no detectable level of Pu-239 was found. Even following the injection of large volumes of Pu-239 solution into the skin and muscle of animals, the Pu-239 is slowly absorbed and appreciable fractions, up to 70%, remain at the site of injection. Moreover, of the quantity absorbed only a small fraction appears in the urine or feces (see page 3, Exhibit 3 and Exhibit 4). In Mr. Gleason's case we are concerned with only a very small volume of solution and hence we should not be surprised if we obtain negative results in an individual urine or feces sample. (See also Exhibit 5)

The physical examination performed by Dr. Roy E. Albert on January 23, 1963, has no relevance. One would expect no overt signs of radiation injury at this early date from the small quantity of Pu-239 which is at issue here. We are concerned here with the long term effects, not the acute effects.

The medical history of Mr. Gleason as recorded by Dr. Wald appears to be accurate, however, he omitted the conclusions of the Pathology Report of the Hospital for Special Surgery wherein the unanimous opinion of the pathologists was stated to be that this lesion was a synovial sarcoma.

The negative findings in the feces and urine in April of 1970 are of no more relevance than the similar findings in the January 1963 samples. The whole body counter has a detection limit of 0.3 μ Ci of Pu-239. At issue here are quantities below 0.06 μ Ci and, hence, well below the detectable limit.

There are three reasons for setting aside the negative findings in the initial tissue removed from Mr. Gleason. First, since the pathologist report indicated "no evidence of atypical or malignant changes," it is quite possible that this mass was unrelated to the sarcoma. Recall here that the histology of the small nodule in Exhibit 2 showed severe changes that resembled precancerous changes. Third, the site of contamination was not necessarily removed with the mass or it could have trimmed from the mass prior to production of the paraffin blocks and slides. Consider here that the nodule in Exhibit 2 was only 1/10 of a millimeter in diameter. Since Mr. Gleason eventually developed an infiltrating soft tissue sarcoma, and this original tissue removed showed no atypical change, there is no basis for

assuming that the origin of the sarcoma was included in this tissue mass.

The negative results on the clavicle specimen are also equivocal. The issue here is a small quantity of Pu-239 that remained localized in the palmar area of the left hand. This bone specimen indicates only that the amount of systemically absorbed Pu-239 was too small to be detected in this bone specimen.

None of these clinical findings are able to set aside the strong possibility that Mr. Gleason's sarcoma was a direct result of the plutonium contamination. The most likely course of events is that a small quantity of the Pu-239 solution (less than 0.01 milliliter) was deposited in the tissue below Mr. Gleason's palm. This may have occurred through a small cut or via a sliver. The body then reacted to this material as a foreign body, and encapsulated it. Eventually, a lesion similar to that discussed in Exhibit 2 developed. This nodule progressed beyond the precancerous stage to become an infiltrating soft tissue sarcoma. The chances are some 50,000 times greater that the sarcoma developed in this fashion than that it occurred spontaneously.

I think that it is important to point out that all of the information relevant to this case was available in 1963. Had Mr. Gleason been informed of the potential cancer risk subsequent to the incident, he could have informed his physicians. As a result they would probably have treated him more cautiously and the tragedy could have been substantially mitigated.

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