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UNITED STATES NUCLEAR REGULATORY COMMISSION'S

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

DATE: Tuesday, December 12, 1989

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UNITED STATES

NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

HUMAN FACTORS SUBCOMMITTEE MEETING

Phillips Building
7920 Norfolk Avenue
Room 110
Bethesda, Maryland
Tuesday, December 12, 1989

The above-entitled proceedings commenced at 1:00 p.m., pursuant to notice, D. Ward, subcommittee chairman, presiding.

PRESENT FOR THE ACRS SUBCOMMITTEE:

D. Ward, Chairman
J. Carroll
W. Kerr
C. Michelson
C. Wylie
H. Alderman, ACRS Staff Member

PRESENTERS:

R. Stater

K. Perkins

D. Lange

L. Bush

E. Baker

T. Szymanski

Z. Rosztoczy

S. Bahadur

S. Frattali

R. Inchabaldt

P. McKee

PROCEEDINGS

[1:00 p.m.]

MR. WARD: The meeting will now come to order. This is a meeting of the Human Factors Subcommittee of the Advisory Committee on Reactor Safeguards. I am David Ward, the Chairman of the Subcommittee. Other ACRS members here are Mr. Carroll, Mr. Michelson, Mr. Wylie and Mr. Kerr.

Today's meeting will discuss the following three topics: First, we will hear from Mr. Robert Stater about his concerns regarding some elements of operator training; second, we will hear a discussion of a proposed change to Rule 10 CFR 55 concerning operator licensing; and, finally, we will hear a discussion from the staff of the proposed so-called Access Authorization Rule.

Herman Alderman on my right is the cognizant ACRS staff member for today's meeting. Rules for participation in today's meeting were announced as part of the notice of the meeting as published in the Federal Register on December 6 of this year. The meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act and the Government Sunshine Act.

We have received no written or oral statements from members of the public. I would like to request that each speaker first identify himself or herself and speak with enough clarity and volume so that he or she can be readily heard. I

don't have much in the way of comments, since I have just taken over the Subcommittee since Forrest Remick has left the Committee. So, I think I will need help from the rest of the Subcommittee members here in developing information that we will need to bring to the Full Committee.

In particular, I think the staff has asked that we prepare letters if we see fit on the two rule changes, both the Fitness for Duty and Access Authorization Rule revisions. We have provided time at the Full Committee both tomorrow and Friday - Thursday and Friday, to let the staff come in and discuss with the Full Committee, both of those topics. In fact, we have about as much time at Full Committee for those two topics as we are going to spend on them here this afternoon. We will have to wait and see what we hear this afternoon and decide what parts of the presentation or what parts of the issue we want to emphasize for the Full Committee.

Do any of the other members have something they would like to say before we go ahead with the agenda?

[No response.]

MR. WARD: Okay then, I will call on Mr. Robert Stater, who will give the first presentation. Bob, I don't know if you had prepared to, but if you would say a few words about your background and how you came to be concerned with this. Maybe that is part of your presentation, but if it isn't, I would like to hear that.

MR. STATER: I will do that. As a matter of fact, I will go out of order and get that right up front. I would like to thank the Chairman and Committee for inviting me here today. First, a little about my background. I have 36 years experience as a nuclear engineer. I have an M.S. in Chemical Engineering from Northwestern University. I attended the Oakridge School of Reactor Technology, which converted me from a chemical engineer to a nuclear engineer.

I was hired out of ORSORT by the General Electric Company at the Knolls Atomic Power Laboratory in Schenectady, New York. That is part of the Nuclear Navy Program. I spent 33 years at KAPL. For the past three years, I have been a publisher of a Reactor/Operator Training Letter, and a consultant on training matters. I am a licensed professional Nuclear Engineer.

More specifically, in the time I spent at KAPL, I spent 10 years as supervising physicist for initial start up and lifetime physics testing on the SIR prototype - Submarine Intermediate Reactor. That was a liquid metal cooled system. On the S3G prototype, cores one and core two. I spent four to five years in several different areas which included large Sieden blanket reactor design, advanced physics concepts, plant analysis, reactor safety and nuclear criticality safety.

I was associated with the Capitol Power School for five years. The Power School is the GE equivalent of Orlando

for the Navy. While in the Power School, I developed and conducted simulator courses on plant start up, shut-downs, maneuvers and various things of that nature for each class. I taught two courses; one was reactor dynamics, which is really kinetics and it is really reactor behavior which is the subject I am going to address here today; and I taught reactor safety, which included the classic accidents like loss of coolant, rod withdrawal accidents, steamline ruptures and so forth.

For the past 20 years on my own time, I have sort of acted as a private eye or a sleuth. Ever since I came out of ORSORT, I have been trying to track down the missing link on reactor theory. When at ORSORT, we had the galley sheets for the first textbook that I am aware of that was ever written on this subject. It was Glastone and Eddelin, The Elements of Nuclear Reactor Theory. That is what we used for our course down there. One of the chapters in that book was kinetics. This book is still around and is still used extensively, I know, it was an excellent work.

That particular chapter was highly mathematical. I spent a lot of time or whatever it took to understand it, but I still felt like there was something missing. From there, getting into the work that I did on physics testing and acting as an instructor in the Power School, this thing just never seemed to leave me so I kept working on it.

Does that explain enough of how I got to where I am

up front here?

MR. WARD: That is good, sure. I appreciate it.

MR. MICHELSON: Which year were you at ORSORT?

MR. STATER: I was there in - we got out of there in August of 1953. Somebody here was there in 1953 or 1954, I saw in the write up.

MR. MICHELSON: You recall before Glastone-Eddelin, there was one other little book about one-half inch thick or less, a quarter-inch thick called Elementary Pile Theory, I think it was.

MR. STATER: Oh, yes.

MR. MICHELSON: That was really the precursor of the more extensive work.

MR. STATER: We also had Holmes and McGerblin as instructors for that course, and they later wrote their own book which was even more technical than Glastone, I believe. As I was rushing around yesterday getting things ready for today, I ran into a friend who wanted to know it was about and I said well, I am going to Washington tomorrow to give a presentation to the NRC. My friend say gee, that sounds exciting. What is it going to be about?

At that point, I wanted to get on my way so I said, I am going to explain how a reactor works. At that point, my friend looked a little perplexed and then he said well, good luck, I think you are going to need it. I said what do you

mean by that? He said, it seems to me what you are doing here is pretty much like going to Rome to explain God to the Pope - maybe so, but I am going to try.

You have an handout which covers much of the material that I am going to be talking about today. It covers more generally than what I am going to show you on the overhead, so you won't have to be taking notes off of there. If there are any of those overheads that you might want a copy of, there is a copy available. Most of the overheads are also in your handout.

[Slide.]

MR. STATER: Tom Peters, on one of his best sellers on excellence said, if it ain't broke, fix it anyway. What he meant by this, of course, was that the path of progress leading to excellence demands continuous effort toward improvement. Today, I am going to apply Tom Peter's fix-it principle to an important area of reactor operator training with what I think you will find to be some rather startling results and some unexpected opportunity.

I say reactor theory, because I think that is what most people recognize. What I am going to be speaking about is really only one part of what I think reactor theory is considered to be, and that's what I call the basics of reactor behavior. I will get to what the difference between reactor theory and reactor behavior is in just a moment. First, I

would like to show you where we are going. I have an outline here.

I am going to cover four areas. Why is the subject of reactor behavior important? Why does that question even have to be asked? Well, I will show you. The next area will be the way we were, which sounds like a good title for a movie. Were was scratched - the way we still are. The still are is a little bit mangled. What is wrong? What is wrong with the subject of reactor behavior as is currently being taught in the training programs? And last, what can we do to fix it?

Let's start with the first. Why is the subject important? I don't think I have all the reasons here, but I think I got three or four reasons that are pretty good. I am sure that you can come up with some others. The reactor is the major plant component; it is the heart of the system. I will give you a quote. "The complexities of overall plant behavior can never be truly grasped until the character of its key component is established and understood." That, to me, is just sort of common sense. I mean, we got the reactor, it's the biggest part of the plant. Of anything in that plant that affects what is going on in transient situations or whatever, the reactor is the big part. So, it is almost a given that we got to understand the reactor if we are going to understand the whole plant.

Number two, the success in any educational system is

inherently limited by the quality of the material being taught. We really have three inputs to any educational program. We have the instructors, we have the students, and we have the material being taught. In the nuclear industry, there is no doubt in my mind that the instructors and the students are first class. I have seen or heard nothing to indicate otherwise. However, even with those two out of the three inputs, if the material you are teaching these people is unsuited for the purpose related to the job they are going to do, then you are defeating your own educational system. I think that is what we are doing here, in part of the training program.

The third item, classroom study of reactor behavior, is a key prerequisite for plant transient studies, plant accident scenarios, operating procedures, and simulator exercises. A poor prerequisite experience has adverse consequences in all training for which it prepares the way. If you don't get the foundation right, the house if going to fall down. Abe Lincoln once said, if I knew I had nine hours to cut down a tree I would spend six hours sharpening my axe. Now, that is what I call respect for prerequisites, and maybe we need a little more of that in certain areas.

The fourth item on why reactor behavior is important is because diagnosing requires understanding. Another quote: "It is not prudent to expect and rely upon unerring diagnosis

in the control room of complex events that threaten reactor safety while the classroom training promotes false concepts about basic reactor behavior."

With these four items of importance, I would like to show you what we have done commensurate with teaching this material. It is a little history lesson, as I see it. I may have missed something. The way we were or the way we still are, Steve Hawking gave you a brief history of time. All I can give you today is a brief history of reactor theory. I got four years here, and I have rounded them all to nine. It is actually pretty close, but some of the years might be dawdled by a year or two or three.

Nineteen forty-nine, the Manhattan Project was winding down. The pioneers of the industry had done the work, the technical work, the theoretical work. We had things like elementary pile theory and Glastone-Eddelin starting to evolve. This material was heavily weighted with mathematics, it was done by scientists and engineers, and it was done for scientists and engineers. It was well done, and it served its purpose.

Somewhere around 1959 and probably a little bit earlier, somebody was appointed to or volunteered to scavenge this early work to come up with something that was appropriate for training in the commercial business. It was obvious and understood at that time that this early material back here

wasn't going to suit the purpose of reactor/operator training. This scavenging job was not well done.

In 1979 we had TMI. Lots of good training things came out of TMI, a lot of upgrade. Strangely enough, as best as I can tell, reactor theory was not touched. It stayed exactly the way it was prior to TMI, there was no upgrade at all.

MR. MICHELSON: Wasn't that due in part though, to the fact that TMI was not a reactor theory related event? If it had been, of course, I think you would have gone through quite an evolutionary change. But, reactor theory wasn't the crux of the problem, or lack of understanding of reactor theory wasn't even the crux of the problem.

MR. STATER: Perhaps that is true. It could be.

MR. MICHELSON: So, if it had been, I think you would have seen a somewhat different subsequent scenario.

MR. STATER: Good point. In any case, I think you agree with me, not much was done in that area. Here we are today in 1989 - before I leave that, not only wasn't it changed at that time with everything else that was changed, I think it received NRC sanction, official blessing. I think what that did was cast it in concrete, whether it was good or not.

So, here we are today in 1989, and we are using vintage 1950 material, 40 years old. It wasn't very good when it was originated, and it isn't any better today. There are a

lot of training people out there, surprisingly enough to me, I have talked to quite a few that are aware that something is amiss in this particular area. They don't know what to do about it, and they are living with what they got.

We are going to get into more detail on what this current material includes in a while, but at this point I would like to say this: it is hard to argue with success, and the U.S. nuclear industry has had much success - has had a lot of success. You might ask the question, how it can be that there are some serious deficiencies in this program after all the work that has been put in it. I can't answer that question. I say wait, the whole training program may be so good that if there are any weak areas they are being supported by other areas which are particularly good. There are weak spots. Sometimes we succeed in spite of ourselves.

My position here today is that reactor theory, as is currently constituted, leaves much to be desired. What I would like to do now in that regard is show you what I consider to be wrong with reactor theory. To start at the beginning of the reactor theory, the course of title, ain't much help. I will give you another quote: "Throw theory into the fire and it only spoils life." If you didn't know better, you might think that that came out of the nuclear business within the last year or two or three or four, because theory is not a very popular word. That statement was made in 1842 by Mikhail Akunan.

In today's climate of task analysis, the title of reactor theory is like the kiss of death. The question that comes up might be, is it really reactor theory? I will say probably yes, it is theory. The reason I say that is for two reasons. First of all, reactor behavior is mixed in with several other subjects. These other subjects include things like cross-sections, flux, nuclear structure, age, slowing down, six-factor formula, lifetime effects, coefficients of reactivity and the like, some of which are more necessary than others but a lot like nuclear structure. And, some of the design things are more theory than they are anything else for the reactor operators.

It has been diluted by some subjects which really are theory. Then, if we look at reactor behavior itself and see what we are doing, we find out that we go through a little rigormoro and come out with two or three equations and that's as far as we go. We stop with the equations. There isn't really any application, and I call that theory two. Yes, that is theory. If you ain't going to apply it, it's theory.

It seems like the title is a little bit trivial but it's not here, because between the title - I think what has happened here is that between the title and the content of the material that we are teaching which is so poor, we have a perception - we developed a perception in the industry that the subject doesn't have any priority. It's a low priority because

we are working on task analysis today. Anything labeled theory has low priority. What this does, what this little hangup on the course title does is, it negates all those little items I just gave you why it is important. Everybody agrees reactor behavior is important, but when you put a title on it of reactor theory, you just wiped out all your attaboys.

The second item of what is wrong is the coverage. The coverage is superficial for the needs of the reactor operator. Number one, it lacks breadth and depth appropriate to these needs. Number two, it lacks the ingredients for understanding, real understanding of reactor behavior. Number three, it lacks integration. The whole subject is totally fragmented as is currently constituted. To give you an example of that, there is two major concepts. One is source multiplication, which in the current material is applied to the subcritical region. Let me back off for just a minute.

We have two domains, and we will look at these a little bit later. We have two domains of operation. We got the subcritical region where the non-fission source is significant like during start up, coming off the bottom. We got the delayed critical region around criticality where the non-fission source is not important. These two regions of a reactor behaves differently. You got to address them both. Source multiplication addresses the subcritical region, not the delayed critical region.

The other concept we have is reactor rate. It is addressed in the delayed critical region, not in the subcritical region. The two major concepts, one is in one region and the other one is over here in the other region, and never the twain shall meet. This is an example. There is a lot more of this that goes on in the whole content, and we will see some of that. This particular thing about coverage on integration - integrating the subject is really ironic because reactor theory is the only subject that I have ever seen - and there are probably others - you can take the whole subject and condense into one equation, one equation. It's everything you really need to know, and it's not that complex of an equation.

If the reactor operators understood everything that was in this one equation they would be in great shape for understanding reactor behavior.

The third item is a course titled coverage, omissions and errors. Now, I am going to get to the omissions a little bit later, but I will give you an example of an error that is in the current material. If it is a key equation, the error is 1,300 percent, and it's in the reactor rate equation. Now, you have a page in your handout which gives you some verbal description of that particular error. It looks like this, and you can read that later. What I want to talk about is the graph, so I am going to replace that figure with a little larger graph.

This is a reactor rate diagram. We got start up rate on the left and reactor period on the right. This is reactivity. It goes from zero on the left-hand side, criticality to a prompt critical, just beyond the center line to 012 on the far right. It is all super critical stuff. There are two curves on here. One is a dotted line going straight up near the middle of that graph, and I got an A up here near a point that I am going to talk about. The other is a solid line coming out here at a much lower level, and I got a label B down here on that one. Both lines sort of merge before prompt criticality, someplace below prompt criticality.

The dotted line is the reactor rate you calculate with what we have in the current training material. It tells us that at prompt critical, this is pretty swift up here - 2,000 decades per minute on the start up rate to .01 on the reactor period. It tells us we got 1,700 decades per minute at prompt critical. The NR equation or the correct equation tells us we have 130 decades per minute at prompt critical. The difference is the 1,300 percent, what I call the 1,300 percent error.

The funny thing about this is that the 1,300 percent is the error you get after you illegally throw out a term. If you don't throw that term out, you can't even define what the error is because this point up here is down here somewhere, it's negative. That is just one glaring example of the kind of

error that we have in the present material.

MR. MICHELSON: Is it an error or a simplifying assumption?

MR. STATER: No, it's an error.

MR. MICHELSON: Well, it depends on how you define error, I guess.

MR. STATER: I can tell you what they did. It might be a little tough. If you want to know, I can tell you what they did if you want to come back to that. I think I will keep going right now.

MR. MICHELSON: I think they just threw out a couple of terms to get there, and that's a simplifying assumption to make the thing easily manageable.

MR. STATER: No, they didn't do that at all. They did throw out one term, but that wasn't why they ended up here. They are missing a term they never had. Let me back track a little bit here and show you where we are. I had what is wrong and I was going down through the items. The first title, coverage and errors. Now, I am going to take a look at misconceptions.

The current material promotes numerous misconceptions. We had a 19th Century American Humorist named Josh Billings, who said something which I think has been paraphrased to the effect that, it ain't so much what we don't know what hurts us as it is what we do know that ain't so.

Now, I will show you some of those things that we do know that ain't so in reactor behavior. I have 10 common misconceptions. I will just run down through these. If you want to make any remarks, feel free.

MR. MICHELSON: When you run down through these, would you also explain what difference it makes in terms of operator response or whatever - in other words, does it make any difference?

MR. STATER: Yes, it makes a lot of difference.

MR. MICHELSON: That's what I would like to know, what difference it makes.

MR. STATER: Okay. It's tough to take any one item and say what specific difference that one item makes. When you take them all together, if you look at these things, these are not this little asides that we are talking about as we go through the course. I mean, we got major terminology problems here. What it boils down to, if you don't understand the terminology and you got some of these misconceptions, there is no way in the world that you can get a real understanding of the underlying physical process that explains how a reactor works.

MR. MICHELSON: You are going to also explain how much that underlying process the operator really does need to understand. It's just like the airline pilot. He doesn't have to know how to design an airplane but he sure has to know how

it handles.

MR. STATER: Yes, that's right. As a matter of fact, a lot of the things the reactor operators are getting today under the title of reactor theory is reactor design, cross-section, fluxes, six-factor formulas. They have nothing to do with reactor behavior. What I am trying to focus on here is reactor behavior.

K-effective is not directly applicable to the propagation of chain reactions. The underlying physical process is built on chain reactions. That is all there is. Fission - it's a sequence of fission events in time, and it explains all reactor behavior and we can do it off a model. The propagation of this chain is going to be based on something, and it is usually based on k-effective, and k-effective is not the right thing to propagate the chains with. K-effective is essentially a batch factor. You got so many neutrons, they slow down and cause fissions, and from that set of fissions and that set only, they produce neutrons. You count those neutrons, and k-effective is the neutrons you produced over the neutrons you started with.

The neutrons you produced are both prompt neutrons and delayed neutrons. You are going to have to wait for the delayed neutrons. The prompt neutrons are going to show up right away, 10 to the minus 14 seconds or whatever the fission event. You are going to have to wait 10 seconds, 20 seconds,

30 seconds, 80 seconds and more to get all of the neutrons that go into that definition of K. That is what K is. There is no time factor in K.

MR. WARD: Bob, your concern is that operators in the present training are taught that k-effective is directly applicable or is not directly applicable? I am trying to figure out -

MR. STATER: Yes, they use it as directly applicable. I will show you that in just a minute.

MR. WARD: Okay. So, your not in each of these straightens out the misconceptions; is that right? I am trying to find out which is negative and which is positive.

MR. STATER: Maybe I can help here by - I tried to give you an idea of where we are going to go, but maybe I didn't do enough.

MR. WARD: No, I just have a sign problem here. Each of these statements has not in it. Is the not the misconception or does the not correct the misconception?

MR. STATER: The not corrects the misconception. I am sorry, Dave, the not corrects it.

MR. WARD: That's all I wanted. Go ahead.

MR. STATER: Beta is not the delayed neutron fraction, it is a precursor yield. There is a big difference, big difference. You can pick up almost any college textbook, and if they start out by saying beta is the precursor yield,

you don't have to go two or three pages before they call it the delayed neutron fraction. For some reason it happens all the time. It's everywhere. In this case, I am not particularly on reactor operator training.

Non-fission neutrons are not the primary neutron source in a reactor core. Non-fission source neutrons are the only source the reactor operators know about. There is another source, and I will be mentioning that in a minute. Generation time, and this is used everywhere in textbooks and everywhere else, is not a valid concept for explaining either reactor behavior or reactor controllability. What is commonly done here, we got the lifetime of the prompt neutrons which is 10 to minus fourth or 10 to minus fifth. We got the lifetime of the delay neutrons, which may say a critical is on average 10 or 12 seconds. Every textbook in existence will start out with all prompt neutrons and will show that with an excess reactivity the power goes up so rapidly that it is uncontrollable.

Then, we throw in the delayed neutrons and we average the lifetime of the 64 delayed neutrons and the 9,935 prompt neutrons, and we come out with a tenth of a second. Low and behold, the reactor is controlled. That is not what makes the reactor controllable. What makes the reactor controllable is when you take those delayed neutrons out of the immediate fissions, you make the reactor sub-critical on prompt neutrons all the time, all the time you are operating. That is what

makes the reactor controllable. It ain't going to go anywhere on prompt neutrons. The prompt neutron lifetime could be 10 to the minus 55th, and it wouldn't make any difference. It is sub-critical on prompt neutrons.

Prompt criticality, you know, I probably have it on here somewhere. Prompt criticality is where your critical and prompt neutrons - we never even get close to that. We are always sub-critical on prompt neutrons. It doesn't matter what the lifetime of the prompt neutrons is. Source multiplication is not limited to the sub-critical region. That is the only place you will ever see it anywhere, textbooks or anywhere. Prompt jump is not different in magnitude from power change by reactivity ramp input. Now, that one is a little bit picky. What I am saying here and what is not taught, it doesn't matter how the reactivity goes in, whether it's a step change or whether it's a ramp change or whether it is non-linear. For a given increment of reactivity, the power always changes by the same amount, assuming the source didn't change. We are always operating on source multiplication. If the source stays constant, if I change the reactivity by any means at all, the power changes by the same amount.

The reactor rate is not defined correctly by the qualification exam equation, that's the 1,300 percent. Reactor rate is not limited to the delayed-critical region, as implied by the current equation. Delayed neutrons are not

insignificant at prompt criticality. The reason I say that is because 1,700 decades per minute is calculated from the present training equation, and the way they come up with that numbers is that they are using only prompt neutrons. That is wrong, that is wrong.

Chain reactions are not individually self-sustaining at criticality. That is, perhaps, somewhat of a shocker because you always hear about the reactor self-sustaining at criticality. You know, it sounds good and I understand what it means and you understand what it means, but when you get down to the nitty gritty of the chains, they are not self-sustaining. They all end - they all end.

I ran through a sample calculation the other day if you are at critical. Your k-prompt - I don't know if everybody knows what that is. You have k-effective say as one at criticality. K-prompt has a definition similar to K, but it only includes the prompt neutrons produced. You forget about the delays, okay, so it's prompt neutrons over whatever neutrons you started with. The k-prompt is equal to k-effective times brackets, one minus beta. That is what k-prompt is. K-prompt at critical is .9935, if you are 0065 on beta. You take that, you take 10,000 neutrons and you multiply them 2,000 times by 9935, and you know what you come out with? You come out with zero. You don't have any neutrons left. You know how long 2,000 lifecycles are at 10 to the minus fourth

each, two-tenths of a second.

You know how long it takes the delayed neutrons to appear after that chain has already ended? From two-tenths of a second, the delayed neutrons are going to be way over there at 10 or 12 seconds, and the chain ended. The chain is gone. Now, those delayed neutrons over there are going to start some more chains. If you want to, you can call that self-sustaining, but is not what people usually think of. They think if you got a chain, if you got 10,000 neutrons and it is critical, it is going to go 10,000, 10,000, 10,000 and it's just going to stay there. That's not the way it is at all. Chains are dying out all the time and new chains are being formed.

The net result of all it is true enough, you are self-sustaining and I won't argue with that. The underlying thinking is wrong. These are some of the misconceptions, and if you want to come back to those later, I will be willing to try to answer any questions about it.

The fourth item that I want to talk about today - well, let me back up here and - I sort of lost track of where I was going. I started out with what is wrong. I got off on a couple of other transparencies. We went through the course title theory, the coverage, superficial, omissions we haven't talked about yet. We had a 1,300 percent error, and we have numerous misconceptions of what things are really about. What

I would like to show you is, I am going to compare what the subject - if you were going to teach this subject what it would look like if you laid it out. I tried to get everything on one page, and it's sort of cluttered. By the time I get done, hopefully, I will sort this out so it doesn't look quite so cluttered.

MR. MICHELSON: Are you going to tell us later or were you going to tell us during this presentation of some of these misconceptions, as to what difference it makes? These misconceptions result in simplified thinking but, perhaps, not correct thinking. Are you going to tell us what difference that makes to the reactor operator, what he might do that would be bad or whatever? In other words, what difference does it make if you do have some misconceptions?

MR. STATER: Well, okay.

MR. MICHELSON: A lot of these are just -

MR. STATER: The problem with misconceptions is trying to develop a training material that is correct and complete. I can't use the misconceptions - why should we be teaching them the misconceptions when it is just as easy to teach them what is right? I mean, why not try to justify the misconceptions? I can't develop the material that I want to present - and I am going to show you what that is right here - if those misconceptions exist. I got to treat things right.

MR. MICHELSON: Maybe it will come out later.

MR. STATER: There is a reason for not doing so. I mean, there is nothing more difficult about doing it right than there is doing it wrong.

MR. MICHELSON: If it's just as easy to do it right, then that's quite correct.

MR. STATER: Yes. I think the thing about it is, by doing it right - you got a guy coming out of a classroom - I would be coming out of a classroom with my head spinning. I mean, I would have nagging doubts, and I think the operators do, about a lot of the aspects of reactor behavior because of the conflicts of these various misconceptions. Nothing fits together, nothing is integrated. You got a certain definition over here which don't seem to jibe with something else you got over here, and it just creates a terrible situation.

What I am going to try to do is, lay out reactor behavior in the simplest possible form of the things that should be covered and go through them in some detail. When we get that all put together, in order to compare I am going to go back and show you what is being done currently out of this set of materials. That's the only way I could think of comparing what should be done with what we are doing currently. I think you will find it turned out to be a pretty good way of doing it.

Let's take a look at this clutter. I have four columns on the page. The first thing we are going to do is

model the chain reaction, the basic process. It is going to give the operator a visual picture of what is going on, something I venture even a grade school kid can understand. Then, we are going to go to an equation development. All the equation development is, is a math description of the model. The model we are going to begin with is a numeric model and, actually, we even start before numeric. The symbolic model is general, and is going to include symbols instead of numbers. From those symbols we are going to be able to derive equations. We are going to derive those equations with a little bit of algebra - a little bit of algebra and no calculus. No calculus whatsoever.

We go from the equations which describe the model - we go from the numeric model to the symbolic model from which we are going to get some equations, and from the equations we will go to a pictorial - a graphic overview, which is just a picture of the equation. Nobody likes an equation. It's a necessary evil. We are going to have to go through the equation to get to the picture. We get a graphic overview of what the particular model is telling us. From that graphic overview, we carry it to application and diagnosis, which means that in the classroom the reactor operator is going to carry this subject from the model and the equations which are really the principle - I won't even use the word theory - we are going to carry the principles through this diagram into the

operational areas.

MR. KERR: Mr. Stater, let me see if I am following what it is that you are attempting to do. Step one was to convince us that the existing concepts that are generally used in teaching were incorrect. You have done that now to your satisfaction. What is step two? Is step two introducing us to the correct concepts?

MR. STATER: Yes, the correct concepts.

MR. KERR: But it seems to me that you are combining that with also telling us how to teach these concepts, or am I missing something?

MR. STATER: Yes, I am. No, you are not missing anything.

MR. KERR: You are introducing us to the correct concepts and also telling us how best to teach these concepts simultaneously; is that right?

MR. STATER: Yes, that's right, Doctor.

MR. KERR: Thank you.

MR. STATER: The sequence of teaching, you start with a simple model and you develop an equation that represents that model, and an important thing about the equation is that you understand what parts of that equation represent what parts of the model. You keep the physical process connected. Then, you go from the equation to the graphic overview. This is all the possible calculations that you could do with this equation, if

you will. Once you know everything that can happen, you apply it through some specific operational situations. That is the sequence of teaching.

Now, in the process of doing this, we are going to use the correct concepts. We split it in four columns. There is a double line here and we split it horizontally in three columns. All this horizontal split in the first three columns is, everything above the double line is steady state, everything below the double line is transient state.

MR. KERR: To help me, I would like somehow to be able to relate the 10 common misconceptions to the 10 correct conceptions; am I going to see that later on?

MR. STATER: Yes, I will try to point those out as I go on.

MR. KERR: Okay.

MR. STATER: As a matter of fact - okay.

MR. KERR: I am not suggesting -

MR. STATER: I will check the list to see if there is anything that I missed.

MR. KERR: That will be introduced naturally in your presentation?

MR. STATER: Yes, I think so. I think so. I will check the 10 misconceptions. There are a couple on there - maybe I can get them all.

MR. KERR: I am not trying to change your

presentation, I am just trying to relate it.

MR. STATER: I understand. Perhaps I should have done the presentation a little bit differently to keep - like you say, I have mixed a couple of things here after leaving the misconceptions, and I think that is bothering a lot of people. I will try to pick up the misconceptions as I go through what ought to be taught to cover the entire subject.

What I am going to do here is go down through each of these four columns, explaining what is in the column. That is not the sequence that the subject would be taught in. The way you are going to teach the subject of reactor behavior is, first, you are going to teach steady state. Steady state is always easiest in almost any field. So, we come across the top half of these first three columns and get the steady state down, right up to the graphic display. Once we have the steady state, we come back and pick up the transient state back to the model, pick up the transient state through the equations and diagram. Once we got the transient state in place, we are ready to apply it to the operational situation so the third phase of teaching would be over here in the fourth column. It is the application. Steady state, transient state, and application.

I will start with the modeling, a numeric model. This is not - everybody does this in some way. Some ways are not as good as others. I think this particular little model

here happens to be about as good as you can get, because it shows you a lot of things with a very few numbers. I started this out with some pictures, and I can show you those later if you want to see them. I made pictures of the chain reaction with eight neutrons going to four neutrons, going to two neutrons, and then I converted the pictures to a numeric model. This is a chain reaction going across the top of this block right here: eight neutrons, four neutrons, two neutrons, one and none.

These eight neutrons that we are starting with are source neutrons. These source neutrons are slowing down and producing fissions, which generate fission neutrons. The reproduction capability I have chosen for this system is not realistic, it does not have to be to demonstrate the principle. We got a reproduction capability of .5, so of the neutrons starting any lifecycle, we always end up with one-half. Out of eight neutrons we produced four, out of four neutrons once around the cycle we produce two, and out of two neutrons we produce one and I have rounded off fractions. Any fraction is zero. This thing would carry out to several fractional numbers if I carry them. I am trying to keep the model simple.

The time element of this model is the neutron lifetime of 10 to minus four seconds, not the generation time, which is one of the misconceptions. The chain reaction propagates lifecycle to lifecycle to lifecycle on the neutron

lifetime, not on - the neutrons don't know anything about any average that you find in any textbook. This is 10 to the minus fourth second. As I said, the reproduction capability is .5. The top line is one chain reaction. You start with a set of eight source neutrons and they propagate and they end. They don't persist, there is nothing self-sustaining ever about them. I don't want to jump ahead.

The source is emitting neutrons continuously. We have a continuously emitting source, so you get source neutrons into every lifecycle. What happens here is, if we got a constant source we start a new set of chains every 10 to the minus fourth second. These chains propagate and I cut them off over here, you can't see the continuation of propagation. This is done. The objective of doing this is to show that if you have a continuously emitting source, usually your K is less than one - that is your sub-critical which is not true - this happens at critical also. You go out on the street and John Q public knows - a lot of people know that reactors run on chain reactions. That is common terminology.

But when we get into reactor operator training programs, we use chain reactions in the sub-critical region, but when we get to critical and when we get to 3,000 megawatts, you would think that there were no chain reactions. They are never mentioned again. The chain reaction is always there. If you are critical at 3,000 megawatts, it looks just like that

with different numbers.

The purpose of doing this and what everybody comes up with, down at the bottom here you got the total. So, we are starting with eight and then you add the column, we got 12 and then we got 14, then we got 15, then we got 15, then we got 15 - broken record. This thing started building up, but all of a sudden it leveled off. It got constant at 15, steady state. What this model is used for currently is to demonstrate that in a sub-critical reactor with a constant neutron source, you produce a steady state neutron level. It turns out in a critical reactor with a constant source, nobody knows about a source in a critical reactor, you also produce constant neutron level.

I think I have addressed one of the misconceptions here. I am using --

MR. KERR: I think you ought to -

MR. STATER: I am using neutron lifetime.

MR. KERR: I think you ought to rethink that statement. I don't want to argue with you here, but I hate for that to get on the record.

MR. WARD: What statement?

MR. STATER: Which statement, Doctor?

MR. KERR: The reactor at critical, the constant source power level is constant.

MR. STATER: I am defining another source. Bear with

me. I am going to drop down to the transient state first before I come back to that source issue. Let me check my notes. The question is - with a reproduction capability here of .5 and eight source neutrons we produce 15 neutron steady state. The question is, what happens if right here we would suddenly increase this reproduction capability in each one of these chains to .6, and then it remains at .6 thereafter? We up the reproduction capability of the fuel system, what happens? The answer is, not much.

What happens is, this 15 goes to 16 to 17 to 18 to 19 to 19, to 19, to 19. Another steady state. We go from one steady state to another steady state. In the real situation which I am going to show you in a minute, the reproduction capability is always less than one. What I am showing you here is the reproduction capability, is .5 and .6, it's always less than one. What happens? Nothing. We go from 15 to 19 and we stop. The question now is, if the reproduction factor doesn't sustain the power increase what does? The answer is, the source neutrons do, only it's not the source you normally think of. It is the delayed neutrons. The delayed neutrons are fission neutrons which act as source neutrons. Bear with me.

When you go from .5 to .6 and when this goes from 15 to 19 - and I will show you this over here a little better in this column - when you do this, you create an imbalance in the precursor inventory which is emitting the delayed neutrons.

You create an imbalance. If you are adding positive reactivity and this goes from 15 to 19, you are producing more precursor atoms than are decaying. They are still decaying on the old rate, but you are producing them on a higher rate. Therefore, the precursor inventory starts increasing and the omission of delayed neutron starts increasing. It does this by a constant factor in each lifecycle.

I am using a factor of two, only for demonstration purposes here. It is not realistic, but it will demonstrate the principle. What happens to this delayed neutron source, which is these eight neutrons up here is, that it doubles in each lifecycle. All of a sudden, after I have gone from 15 to 19 and created this imbalance in the precursor inventory, my inventory starts changing and my delayed neutrons go from eight to 16 to 32 to 64 to 128. They are doubling in each 10 to the minus fourth seconds. They don't double. They only increase by a number that is only slightly larger than one, but I am demonstrating a principle.

Now, we do the same thing here that we did up here. We total the columns and see what is going on. With only these five columns, you can see something very interesting. Look at this. Eight, 20, 42, 85, 170 - the power is doubling too. The power is doing the same thing the source is doing which, if you look at it and think about it, that's no great surprise except we have never taught this. We never taught this. It isn't the

multiplication factor that makes the power increase, it is the source strength. I am calling it delayed neutron source - delayed neutrons have never been called source neutrons.

Fission neutrons are prompt neutrons and delayed neutrons. We lump them together and take an average and we get a generation time, L sub G. Let me show you why that generation time averaging is not appropriate. Because, this change right here occurs very rapidly because it is all prompt neutrons. This is the multiplication by prompt neutrons. You are changing the source multiplication is all that you are doing. That happens very rapidly, in a few hundred lifecycles and a fraction of a second. But down here, this is the delayed neutrons that are doing this, and they got a completely different timeframe. It is stretched way out.

If we lump them together, we can't show - the transient state occurs in two phases. The first phase is a constant source and a change reproduction factor. The second phase is a changing source. There are two phases to every transient, a changing source and a constant reproduction factor. I am going to go through the same thing again in the second column, because the second column - this is my model. The second column is my description of that model in a foreign language called mathematics.

I am treating the delayed neutrons as source neutrons, and my total source strength is a non-fission source

plus the delayed neutrons. This is Lambda C up here or Lambda C times - there should be a lifetime of 10 to the minus fourth in there, but I am not going to diddle around units here. The units are okay, take my word. Source strength of the non-fission neutrons plus the delayed neutrons, that is your total source. Those neutrons, when emitted starting a chain reaction which is the same thing we had over here, this eight - we are not using eight, we are using S plus B to represent eight. Those neutrons are multiplied by a reproduction capability of .5 over here, but over here we are going to call it something else. What we are going to call it is Kp, the prompt multiplication factor.

K-effective minus one minus beta. It is only the prompt neutrons. When you are running down this chain, the only thing that is propagating that chain is prompt neutrons. There ain't no delays. If you try to throw the delays in there, you got a real problem. You are going to have to get about 10,000 accountants to keep track of them. The delays are showing up, the prompts are going down this chain, the delays that are created in this chain are showing up later on and much later on as source neutrons. I didn't show as many terms here, because I didn't have space. This would go to S plus D times Kp squared, S plus D times Kp cubed, and you keep going for the chain. Then you come over here and you start another chain. Eight neutrons down here, here's another omission. I am

assuming I have a constant source. I am working on the steady state upper half of this graph, so I have a constant source somehow.

I get another chain going, another chain going, and if I add those up and do a very simple mathematical manipulation, I come out with an equation which says divide through by three point one times 10 to the 10th fissions per second per watt and I come out with power. I add this column and I take the time element of 10 to the minus fourth seconds, and I can calculate power. What I get is powers equal to minus S plus Lambda C - Lambda C is that D up there. I am not trying to confuse you there, maybe I should have put a D in there. The total source over the total reactivity, the total reactivity that is propagating the chain.

The reactivity that is propagating the chain is this reactivity, and this is prompt reactivity right here. What I have essentially done is taken total reactivity - I just didn't do this. I mean, it comes out of adding this up. You take what you normally call reactivity and you subtract out what is being lost due to precursors which is beta, and this is prompt reactivity. So, I got total source over prompt reactivity.

Now, that equation looks different. It really isn't different, because I don't know how - I sort of lost track of how most technical folks treat it. I am familiar - you have a first kinetics equation and you have a second kinetics

equation. The first equation is the balance on the neutrons and the second equation is the balance on the precursors. If you take the neutron balance equation, you have something like DNDT is equal to beta minus Rho times K plus a source, plus a Lambda C. If you take that differential equation and you set it to steady state, and you solve for power, this is what you get. I got it out of the model. But you get this out of the differential equation for the first kinetics equation, for the neutrons.

That equation, if anybody really looked at it, is trying to tell us that delayed neutrons are source neutrons. They are up here with the non-fission source. That is why on that misconception that I had, the non-fission source is not the most important source in the core or something to that effect. Non-fission neutrons are not the primary neutron source in the reactor core. Well, it turns out there are two sources, and a non-fission source disappears right around criticality. By the time you get - it's a low power source. The delayed neutrons are the high power source.

What we got in a reactor - let me give you another example. Suppose you had a shutdown reactor. Can I produce full power in a shutdown reactor? No way. Everybody knows that is impossible. Well, it isn't impossible theoretically. If I got a 10 to the seventh or 10 to the eighth neutron per second source and I am shutdown to Kp .9 and I calculate my

power, I come out with something like one-hundredth or one-thousandth of a watt. I mean, I am really down there. How am I going to get to full power in a shutdown reactor. The way I am going to get to full power is, I am going to go out and buy a 10 to the 18th source, non-fission source. I am going to stick in that reactor with a Kp .9 and I am going to produce 3,000 megawatts. Believe me. The only problem is, by the time I get that source in there, there ain't even room for fuel.

I would need, I calculated a number, I think it is 10 trillion sources of 10 to minus seven, 10 to minus eight, whatever it comes out. It is a huge number source. You would really have to load the core down with sources and then you don't have any room for fuel. Theoretically yes, practically, no. We don't need to do that because when we are in a shutdown reactor, we already got a source in there that is potentially variable and which we can jack up a very high level, and it is called the delayed neutrons. It is the precursor atoms.

When we are shutdown at very low power, the delayed neutron source is even weaker than the non-fission source. This is weaker than that, so the way shutdown the non-fission source is predominant, it is stronger. As you get to critical, this thing stays constant. As you are approaching critical the power is going up, and the power is what is producing the precursor atoms so the delayed neutron source is getting stronger as you get near critical. As you get to minus 0065

beta, when you get to minus beta reactivity within reaching critical, these two sources are equal. Beyond that, this source is stronger. As you get to .9999, this source is much stronger. Once you get to critical, this source is there and this source is gone. It is trivial. The non-fission source eliminates itself.

What that boils down to is, this is a strange animal. This is a source multiplication equation. The general equation for source multiplication includes the two sources and it includes the right reactivity to multiply them with. That equation is like an amoeba, it splits in two parts. One of the parts is for sub-critical - this equation is for sub-critical or delayed critical. You use it wherever you want. It doesn't have that kind of restriction. When you split it, this is usually called equilibrium multiplication, equilibrium source multiplication, it applies to the sub-critical region. Rho has to be negative, or this whole thing blows up.

The other half of the equation is the delayed neutrons over beta at criticality. At criticality, your prompt reactivity is zero, so your prompt reactivity is just - you got a minus sign out here so the whole thing comes our beta. That is your source multiplication at criticality. The delayed neutrons are always multiplied by the same factor, which is one over beta.

I don't want to point out what we are doing now

versus what I am showing you here, but I will come back to it. This gets us through the steady state - as we go along here, right before I get to this equation, I take my equation representation and I go back over here and calculate 15 neutrons. I can do that. I can show the student that what I got in the equation is no different than what I got in adding that column. That means a lot. It means a lot.

Now he looks at the equation and he sees, I got this kind of source strength but from all these previous chains I got all these fission neutrons up here, and they really end up giving me a lot more neutrons that I would really get with the source alone. What do you get with the source alone, by the way? Suppose you take all the fuel out. You go eight zero, eight zero, eight zero, you get a steady state of eight. Nobody ever talks about that. What does the fuel do for you? It jacks the neutron population up to 15 neutrons. The reason it jacks it up is because it doesn't go eight zero, it drags out for some sequence of lifetimes and all of these fission neutrons add on with your current source emission to give you something called source multiplication. That is the terminology.

This is a general equation for source multiplication. This is a specific case. You got to be careful with this one. This can be real misleading. I say I am not going to tell you, but it can be misleading. This is what we are using right now.

It is misleading because it tells you the only source in the core is the non-fission neutrons. Not true. The non-fission neutrons are a little dittle of extraneous neutrons that don't mean anything when you are running at power. This is what you should be talking about. You know what that source is; 10 to minus seventh neutrons. You know what source is, at 3,000 megawatts, 10 to the 18th neutrons. There is no comparison. Why are we talking about 10 to the seventh when we ought to be talking about 10 to the 18th?

Let's to go the transient state.

MR. WARD: Bob, timewise, you have about 25 minutes left. I don't know how you are on your - where you want to be in your presentation.

MR. STATER: Am I taking up the questioning time, too? Yes, I guess I am.

MR. WARD: There is a total of about that much left.

MR. STATER: I will speed up. We got the transient model, and from this model we can show that the precursor inventory - when the precursor inventory is out of balance, it will multiply it by a constant factor, and out of that factor will come reactor rate. What I show you here is period, reactor period. You flip that over and multiply it by 25 and you got start up rate. But there are three terms in the denominator of the period there. You got a Rho dot and that's your ramp, reactivity ramp. We can handle ramps easily, and

there's no reason a reactor operator shouldn't understand this. The second term, Lambda Rho relates to the delayed neutrons. The third term, Lambda S comes from the - here you have your delayed neutrons and here's the S up here. Down in the rate equation, low and behold you got delayed neutrons and you have non-fission source neutrons.

The same things always show up everywhere out of this model. We got a magnitude of power and we got a rate of change of power. That's the two equations, that's all there is. We take those equations and calculate them. What I show you here is the equilibrium power equation - steady state power equation. We got power versus reactivity. You calculate this thing for sub-critical and you get a curve, and this is done. You get a curve that looks like this. But when you get over to reactivity equals zero, you get a vertical line. The power can be anything up to 3,000 megawatts by this equation right here. We never talk about that and it's never seen. The reason it is never seen is because delayed neutrons are never treated as source neutrons.

This is our steady state picture of this equation, that is what it looks like. If you had different source strengths, this curve here could be up or down, depending on what your source strength is. I mean, there's a whole set of those. Now, we take the rate equation and we will plot that. We will plot rate versus the same thing, reactivity. The solid

line is a stable rate. That is done. You will find that. It is the middle part of this equation right here, beta minus Rho over Lambda Rho. Stable rate.

If you are setting at a 0020 reactivity, super critical, you are going up at one decade per minute, so that's your point right on this curve. It will tell you that. If you are 0040, you are going up at six decades or whatever, that kind of thing. That explains the stable rate. You get a transient or a changing rate if you got a Rho dot or non-fission source. There are two dotted lines on here which nobody has ever used. There is one above the stable rate, it's a ramp line, and there's one below the stable rate that is also a ramp line. If I put in a reactivity ramp or a shim or linear change of reactivity with time which is say one times 10 to minus fourth per second, some nominal number, all I do is shift the stable rate curve upward. If I am sitting at one decade per minute, I move up to something else, 1.5 decades per minute. If I put it in the negative direction, I drop down, and I could drop negative.

You need all three curves. We are only using one. That covers the - it doesn't cover it. We have an S over P. There is another reactor rate diagram for the sub-critical region. This is for the delayed critical region. There is another one for the sub-critical region, no problem, but it has never been used. This is a full rate diagram that the

operators need for the delayed critical region.

Now, we have developed a steady state, we have developed the transient state, and we apply to operational situations. Well, how do we do that? Well, this curve here is great for doing that, because from this curve we can find out how the reactor rate changes with time. Let me show you how. Here is your stable rate, here is your ramp out, here's your ramp in. Here is Rho equals zero. If I am sitting here at a stable rate and I introduce a rod withdrawal, my rate will jump to the transient line - I won't use the word jump - it will move immediately to the transient line and that will be my new rate. It will be a higher rate if I am pulling out the rods than if I am sitting there with a stable rate.

If I continue to pull out the rods and the reactivity rate is linear, I am moving my reactivity out this way and essentially what I am doing is following this transient line out to the point where I stopped moving the rods, at which point I come back to the stable rate for whatever that reactivity value is. I got this little shape right here of what I have just done with a little reactivity manipulation. I can easily convert that to real time, and here's that sector of what you see right here. Here's the transient rate curve coming up this way and here's the immediate move up. Now, there is a stable rate curve - this is a stable rate point - that is stable rate point, these two points here.

Once I am sitting here and I am constant with time so I got a constant line. If I was sitting on a stable rate to begin with, this is constant with time. This is what my rate looks like with time. This is never used. The same thing for moving the rods in. If you are moving the rods in, you are moving reactivity in this direction and the shape looks a little different. What the shape looks like is this - okay? I am sitting at a stable rate and I flip - let me back up here.

I am moving in this direction and time don't go in that direction, so I have flipped that thing over. I am running time in this direction. When I flip this over, it looks like this. Constant rate, start moving the rods, I am tracking down this way. Stop moving the rods and I am on a stable rate. So, here's my two basic shapes in the delayed critical region for what the rate does with time. Once I have identified what the rate does with time, I got to go back to my - there's only a limited number of possibilities of what can happen, and they are like three or four.

The reactor operators, if they are going to diagnose abnormal situations, they certainly ought to be totally familiar with the normal situations. There are only three or four, and I am not going to show them to you because I don't have time. But, I can initiate a power increase, I can accelerate a power increase and I can decelerate a power increase. These all have their own characteristics and you

look at them and you should know. Another thing that should be done - I think this is a must here.

Another thing that I think ought to be done is, most students who look at that curve don't relate nothing to a meter. What we ought to be doing in a classroom is telling them what this means. I mean, it means that the meter doesn't have two different readings at the same incident in time, but it has two different readings at almost the same incident in time. It moves rapidly from one reading to another, and then it moves gradually to another higher reading. When you stop the ramp out, it drops back to some intermediate - you know, you go through the meter stuff to try to relate what you are showing them on the graph to what they are going to be seeing in a control room.

After you get through these simple transients, what you do is you introduce some more complex transients. I am talking about complex transients only related to the reactor. This will include reactor start up, establishing criticality, changing power level and shut down. It could be a scram or running a rods in, kind of shutdown - a couple kinds of shut down. What you do is, you take these simple transients and you say look, none of the complex transients can be anything but a combination of simple transients. You will not find anything in this reactor start up that I haven't already showed you. I mean, it is just that a lot of different things are put

together so you get some recognition of some more complex transients. That's what I am getting at here.

Now, I am going to keep moving. I want to show you - I want to be sure to show you, this is what we are doing. This is the omission. This is the same thing that I just showed you, with everything blacked out that is not being done now. We got the steady state about the line, the transient state below the line, and the applications. The grade in there is, we are not doing it. Applications are almost totally missing. Applications that are realistic to the control room that are in the classroom are applications that are appropriate to the simulator. You talk about them in the classroom and then you go out and do them on the simulator.

As I said before, you do pretty much of the steady state model in one form or another. You don't do the transient. There is nothing ever shown on the transient state with a model. I take that back. They diddle around in the sub-critical region, okay. What they do, using a generation time instead of a prompt life time, you look at this kind of a build up here. That's what they do. It is wrong. The transient state happens in two phases. With a generation time, you can never show two phases because to have - you have two phases because you have 10 to minus fourth seconds and you got 10 seconds. It's the big time difference between the prompt and delayed neutrons that is important, not that you average

them together and get a generation time.

So, you can't show the transient state. Now we come up to the mathematical description, and here's the difference. There is no delayed neutrons in there. Now, this is a major omission and it is not grade in or anything. But, if you don't recognize delayed neutrons as source neutrons in trying to develop this subject, you are doomed. First of all, you never get the general equation and you only get this thing that applies sub-critical and it tells you that the only source neutrons that you have are non-fission neutrons. The criticality is missing.

Then you come down to the transient state, the reactor rate. You got a term missing over here. You have a source up there, but that term - that third term in the denominator had an S over P is gone. It is not in our equation and, therefore, we can't apply a rate to the sub-critical region. Now, what does that mean? It means you can't apply the rate to reactor start ups and you can't apply the rate to reactor shut downs. When is the rate most important? It is certainly important for those two transients, so why aren't we teaching it in the classroom? No, we are only teaching rate around criticality.

Okay, let me come up here. Steady state. The source multiplication of the delayed neutrons is missing. That is as I mentioned. You come down here - the current material, I have

seen it on the exams, has a Rho dot term in it, but the Rho dot term is never used. These dotted lines that I have down here are never shown. If you don't have the dotted lines, you can't develop the rate versus time, which I had up here. You wipe yourself out. We got the stuff in equations, we are not carrying it through the diagram, and we are not applying it at all. That's where we are.

If you look at this, it is almost half of everything is missing over in these first three columns. We don't have the delayed neutrons so we miss this equation, so we miss this part of the diagram. We don't have a transient model, we are picking up the delayed critical rate, but we have left off a couple of lines and we got this sub-critical rate which we are not picking up at all. So, 50 percent over there, then we are not doing any applications at all.

Of the material that you do see on here, you got the 1,300 percent error and you got the 10 misconceptions. I mean, it is riddled with problems. We only got half of the first three columns, and that half ain't very good. Everybody likes to quantitize stuff, so I just took a little shot at it here. What I did was say okay, of all four columns we are probably covering 30 percent of the needed material. The quality of that material, probably you would give it about 50 percent. If you multiply the 30 percent by the 50 percent - because it has these errors and misconceptions in it - if you multiply the

stuff out we are probably teaching reactor behavior with about 15 percent effectiveness.

What I was going to ask you, and I don't want to ruin your time over here, I laid this out and there's no fat in here. There is nothing extra. It is bare-bones stuff. It is the entire subject, it is the basics of reactor behavior. If the reactor operator had an understanding of everything that is on this page, he would understand reactor behavior. This is not theory, it is not smoke and mirrors, and it is not black magic. With what you got now, take yourself and put yourself up where the instructor is. How would you like to be the instructor and you got to develop the rate equation and the rate equation is wrong? I mean, you got to develop it legitimately, okay? It is impossible. You cannot do it. You got to use smoke and mirrors.

What is on here is what the Rho needs. It is raw meat, it is substance, it is lean, it is bare-bones, there is no fat, it is basic stuff. I haven't included any extras, there's no fancy stuff. I was going to ask you, and maybe you can think about this later since we are running out of time. If you see anything on here that you think I am throwing in that isn't needed, I would like to know what it is, because I don't think there is anything on there that isn't just basic bedrock stuff if you are going to try to teach this course.

I will close out this. If I use up all my question

time, then nobody can attack me. That was my strategy all along. A quote, I will give you a quote. It is for the operational sector of the plant. There is no doubt in my mind that operators can always be more alert, can always run a plant better, can always be trained better. The operators are the guys who are always there in the middle of the night. There is room for improvement in human performance.

Now, you probably know where that comes from. It comes out of Nuclear News of November, and it's an interview by Chairman Carr. I submit that the ideas that I have sketched out here today will take us a long way in the direction the Chairman wants to go. I submit that reactor behavior must be a reactor operator special area of expertise. If there is going to be anybody in that control room that knows about the reactor, it has to be the reactor operator. I submit that the quality of training of the reactor operators is the best assurance of reactor safety.

I thank you for the privilege again, of appearing. Dave, if you want to take a couple of minutes, I will try to - I didn't check the list of misconceptions to see if I am missing anything. I don't want to run you over.

MR. WARD: We have 10 minutes left. Are there any questions or comments from anybody on the Committee?

MR. KERR: Mr. Stater, it seems to me that what you have done is to redefine a number of concepts in a way which

perhaps may be more satisfying to you but I could, if given a few minutes I think, point out a number of misconceptions which characterize your description from my point of view. I am sorry, but I am not convinced that this approach is better than the one that could be used.

I must say, I don't know how reactor theory is taught to operators in detail. I have tried to teach it to engineering students over the years, and it is not something that one becomes immediately familiar with. But I think given time, the existing equations can be understood and interpreted. Perhaps they can't by operator trainees, I don't know. I can't speak to that, but it is not obvious to me from what I have heard this afternoon that the approach that you suggest is better than at least an alternative approach. I can't speak to how it compares with what is being used.

I would say, however, that there are, at least from what I have seen, some serious flaws in the examinations that are being used now in both examining operators and then the requalification. I speak to the fact that we are moving toward a multiple choice system rather than questions which can be answered with English and some thought. The multiple choice system simply puts emphasis on being able to deal with things which you can check off and, therefore, will, I am convinced, mean that operators will have very little incentive to understand reactor theory anymore and they will just learn how

to answer these multiple choice questions.

MR. STATER: I would like to make one short response here, Doctor. If you will take a look at this later, this essentially summarizes everything that is being done now as compared to what I had laid out as a total picture. We do a model, we do an equilibrium sub-critical, we get this sub-critical line for steady state power. We do a reactor rate equation with a missing term, and there is also an extra term on there that creates that 1,300 percent error.

From that, we generate a stable rate curve, and that's about it. That is what is taught. Many times, for some strange reason, the stable rate curve is always broken in two parts. You got one graph for the sub-critical, you got another graph for the super critical. Why? I mean, why confuse the students by breaking this curve into two parts? It's all part of the same equation, it's all part of the same thing.

This is basically what is taught now as compared to the total layout. I agree with what you say about the questioning could be more effective, but I still think that the material - you can make more effective questioning on the material you got.

MR. KERR: Would your position be different if the people being taught had degrees in some technical subject and, therefore, a somewhat more sophisticated understanding of mathematics?

MR. STATER: Would my position be different?

MR. KERR: Yes.

MR. STATER: No.

MR. KERR: Because you are dealing with people now who can, in principle, be high school graduates.

MR. STATER: Yes, that's right.

MR. KERR: And, that certainly is going to have some influence on their ability to grasp mathematics or mathematical concepts.

MR. STATER: Yes, I did cut way back on the math, yes, but there is still enough math in there that explains everything.

MR. MICHELSON: I guess though, you are not claiming that because of the way it is taught versus the way perhaps it is, you are not claiming that this is somehow introducing some kind of a safety concern, are you?

MR. STATER: Yes, I am.

MR. MICHELSON: Well, if you are, then what is the safety concern? Could you give me some example or something. Give me some feeling for why, if they continue to be taught the way they are, that something bad could happen.

MR. STATER: Okay. If you want to take an operational situation - I don't have a situation, I am just going to work off the top of my head. Here is the rate curve with the stable and with the transient rates. You don't have

the transient rates now. But what this curve tells you is, you can be super critical, you can be on the right hand side of zero, you can be super critical and the power can be going down. Suppose he's in the control room at night and he's running at - I can't think of an example.

He looks at the power and the power is going down. What is he going to conclude? I know what he's going to conclude. He's going to conclude the reactor is sub-critical. Not true. The reactor is super critical and there's a reactivity change in the negative direction. There's a negative ramp that is large enough to override to suck this curve down to bring you in with that negative rate.

MR. MICHELSON: This is all happening in an instant.

MR. WARD: Pretty fast.

MR. STATER: No, not in an instant, not at all.

MR. MICHELSON: Can you give me an example on how this is going on slowly enough for him to observe and misinterpret?

MR. STATER: Yes. Here, we are talking about - let me see one of my scales.

MR. MICHELSON: You are in the super critical region, I think you said.

MR. STATER: Yes. Suppose I am out here at 0020 and I got a rate of plus one .2 DPM and all of a sudden that rate drops down. This ramp can be at a .5 times 10 to minus four or

.1 to 10 -- it can be very slow. Whatever the rate of the ramp is depends on how fast you are going to move along here. If you are talking about .5 times 10 to minus four, you are going to drop down here and then move very slowly negative. You are going to cross over this line. You got a negative rate, you got the reactor super critical.

It is going to - I guarantee you - it's going to be interpreted incorrectly because the reactor operator doesn't understand this.

MR. CARROLL: Yes, but you are leaving out of all of this, the fact that we are talking about 3,000 megawatts, right?

MR. STATER: Yes.

MR. CARROLL: You don't see these phenomena. What you see are the effect of various kinds of coefficients acting on reactor in that domain.

MR. STATER: That's right, and you don't even have a rate meter which is --

MR. CARROLL: You may have a rate meter if it is a boiling water reactor, it's bouncing all over the place because of voids.

MR. MICHELSON: The designers certainly need to be well aware of all of this, and I am sure they are. But, does the operator need to be that aware of the detail of what is happening?

MR. CARROLL: He doesn't even think of it.

MR. MICHELSON: He won't even think of it or see it.

MR. CARROLL: He won't even think of periods or start up rates at the power level you are talking about.

MR. STATER: Yes, that's right. I think it is an important part of his basic underlying understanding. I really do. The question is, how are we going to define what the reactor operator needs to know. What we have defined is pretty fragmented, and there's a lot of misconceptions in there.

Is that really what we want? I have defined something here. I have tried to define what I really think is the minimum that the operator should know to really understand the reactor. Now, maybe I - you think I included too much - I really don't think I have.

MR. CARROLL: I think what you are talking about are things that the operator should have had some exposure to, because they are important things on physics testing, on routine start ups and that sort of thing.

MR. STATER: You know, when you are running at 3,000 megawatts, as long as nothing goes wrong, he's never going to see any of this. But you know as well as I do, there are all kind of weird things that can happen.

MR. CARROLL: Sure, but periods and start up rates are not really very important or not even looked at.

MR. STATER: No, that's right. Unfortunately, all he

has to look at is the power meter and that's even worse. Now, he's got to interpret the power without an indication of the rate. He has to judge a rate by what the power is doing.

MR. MICHELSON: Do you think this would have helped the operator any on a boiling water reactor when it got into low power, power oscillations, this kind of understanding?

MR. STATER: I'm sorry, I can't answer that question because I am not that familiar with the boiling water.

MR. CARROLL: Have you made this same presentation to the training professionals and the NRC Staff and at INPO?

MR. STATER: No. I have sent my letter - well, INPO was subscribing for a while. I have sent all of my letters to people here in NRC, Human Factors and whoever reported to Chairman Zech. I sent Chairman Zech a letter and a copy of each letter I have written, and the reports to him. But, I haven't made a presentation of any kind.

I really think it is something that we ought to think about. If you like, I will try to defend my position again or better, or before somebody else. I think there is some level that the operators have to be trained to, because they are the only guys in there. It may not happen every time, but sooner or later it is going to happen that they are going to have to make some interpretation. In order to do it, they are going to have to have this kind of understanding, which is really just bedrock stuff, basic stuff.

MR. CARROLL: I was one of the scavengers in the late 1950's that was --

MR. STATER: Now I know my problem. I said the wrong thing.

MR. CARROLL: That was putting together training programs for operators, and I gave this quite a bit of thought. I guess I felt that some of the things you are talking about today were in training programs back in those days, because the people that were administering reactor operator exams were a very varied lot. You had everything from physicists who didn't know anything about hardware to --

MR. STATER: The operators were physicist and scientists, weren't they?

MR. CARROLL: No, not in the power industry. Just in self-defense, a lot of the things that you are talking about, we included in the utility that I used to work for as training programs in those days. Today we don't, partially because we didn't put that much importance on it. To be totally accurate, I think I can - you make it very black and white, that you are either being rigorous or you are lying to people in effect in your training. I think there is an in between position.

You can tell an operator, hey, this isn't exactly right, but for your purposes this is close enough to describe the behavior in this regime or in this regime. I guess I don't like your idea of two. I have always tried to tell operators

there are three states. One is sub-critical, one is delayed critical, to use your terminology, and one is prompt critical. Here is how the beast behaves under these three conditions.

MR. STATER: That's another way to go.

MR. CARROLL: I agree with you, or I think the industry has de-emphasized the rigor that you are suggesting for the simple reason that there are an awful lot of other things that people judge which are much more important to train operators on.

MR. WARD: Bob, we thank you very much.

MR. STATER: Thank you.

MR. WARD: I think we better wrap it up and go to our next presentation. Let's take a break and start up again at 3:00 o'clock then.

[Brief recess.]

MR. WARD: Now, for a little change of pace, our next topic will be a presentation from the Staff on proposed changes to 10 CFR 55, David Lange.

MR. PERKINS: David will be the presenter in just a minute. I am Ken Perkins, Chief Operator Licensing Branch. We are here today to brief you on our proposed response to a Staff requirements memo on making fitness for duty a condition of the part 55 license. I am going to ask Dave Lange, who is the Section Chief for the Development Section of Operator Licensing to tell you of the proposed package that we have provided to

the Executive Director of Operations.

MR. KERR: Are you going to tell us what that statement means, making something or other -

MR. PERKINS: Yes. The part 55 license. Part 55 license is the operators of the license, and Dave will describe to you what making fitness for duty a condition of that license means.

MR. KERR: Okay.

MR. LANGE: Like Ken said, I am Dave Lange. I am the Section Chief in the Program Development and Review Section in the Operator Licensing Branch. Today, I would like to talk about the proposed addition to 10 CFR 55 for operator licenses. Back when the proposed rule on fitness for duty, part 26 became effective in June, a Staff requirements memorandum was issued along with that.

[Slide.]

MR. LANGE: The Commission wanted the staff to take a look and visit the issue of operator license in 10 CFR 55. Specifically, they directed us to make it a condition in the operator's license to find a way to condition a specific area in part 5553 under conditions of licenses that the operators must comply with to maintain the license.

This revision is going to add to that section of part 55 condition of licenses along with some other things the Commission asked us to do. I want to make sure that everybody

has the handout that you will be looking at along with the slides that I will be putting up here, they should parallel one another. What I would like to do is, just briefly walk you through some of the background where we were eight to 10 months ago and where we are now.

To start with the background in March of 1989, the SECY 89-30 which was the final rulemaking, part 26, the fitness for duty program was approved by the Commission subject to the staff requirements memorandum. In April of 1989, the Operator Licensing Branch was assigned to draft a revision to 10 CFR 55, operator licensing in response to the SRM and DEO. In July of 1989, that draft was completed. That revision was sent to the Executive Director for Operations for his concurrence.

It was returned to the staff for some additional clarification and word changes, and in December of 1989, the proposed 10 CFR revision is expected to go to the Commission.

MR. CARROLL: Something like this does not go through CRGR, right?

MR. LANGE: Yes, it does. Back in June, along with sending a memo to the ACRS, the staff drafted the Rule at that point and sent it to CRGR. CRGR responded to us saying that they wanted to waive review of that proposal until after the proposal had been issued and we have received the public comments back. They wanted those comments back before and they take a look at those comments prior to giving it their review.

MR. CARROLL: Where do the public comments fit into this chronology?

MR. LANGE: Right now, the proposed rule is still with the Executive Director for Operators.

MR. WARD: Issuing is for public comment is still at that stage, going out for public comment.

MR. LANGE: Yes. After it goes to the Commission and gets approved, it will go out for public comment.

MR. CARROLL: I didn't read proposed where I should have.

MR. LANGE: I just want to remind everybody that this proposed rule, the Executive Director for Operations has not signed that rule. He is expected to sign that very shortly and, hopefully, it will get to the Commission before the end of the year. We thought this would be the appropriate time and the right level to brief the ACRS. Are there any questions?

[No response.]

MR. WARD: Will you fix him up with a microphone?

MR. PERKINS: While Dave is putting the microphone on, the status is that we have prepared a Commission paper which contains the proposed rule, and that is currently at the Executive Director's office. Once the Executive Director signs off on that, that will go to the Commission, be considered and, if they approve it, it will be placed in the Federal Register then for public review and comment.

It would be after we received back the public comment and address those comments, that the CRGR would be interested in taking a look at the package again.

MR. CARROLL: What is the timeframe for public comment, assuming this goes out in December?

MR. LANGE: Right, that would normally be 180 days.

MR. WARD: Is this the CRGR's position to wait to review it until after the public comment period; is that unusual or is that kind of typical of the way they deal with this sort of thing?

MR. PERKINS: I can't answer that. I know they have done it before. I know this is not unique. I just don't know how often they have done it. I am not sure that Dave answered the question that I think you were asking. I think the question you were asking was how long does the public have to comment on the rule.

That can vary, but I think we are - that may be changed by the Commission's guidance back to us. But I think we are thinking in terms of public comment period may be on the order of 60 to 90 days.

MR. CARROLL: The whole cycle of involving them and the rest of it is the 180 days.

MR. PERKINS: Right, is the 180 days.

MR. LANGE: Resolving them and going final with the rule.

MR. WARD: This really isn't very complicated, is it? I guess I am going to hear about that, but it doesn't strike me as -

MR. LANGE: No, it isn't.

MR. WARD: Do you expect any controversy in the public review?

MR. LANGE: No, not specifically controversy. I think singling out the operators and making it clear to them what the requirements are under their license and not just the part 50 license or the facility license. We still have rules and regulations and conditions of licenses right now in part 55 that govern the conduct of operations for operators for a condition of their license. And, we have used it in the past.

This is just to make it perfectly clear what we expect of them as far as a fitness for duty standard.

MR. CARROLL: The existing conditions of their license are things like if your health condition changes, you have to notify the Commission and things like that?

MR. LANGE: That is right. Anything that changes from what was reviewed on the initial application as far as medical requirements. If you no longer meet the conditions of the medical requirements for the NC standard that is reviewed on your physicals - and they do have a physical every two years to keep us informed of that.

MR. WARD: This wasn't part of the original package

when you did the fitness for duty rule?

MR. LANGE: No, it wasn't.

MR. WARD: Apparently, because the Staff didn't think it was really necessary, that this issue was sufficiently covered by the existing rules. Apparently, the Commission wanted a more definite, easy to interpret rule apparently. Is that the idea?

MR. LANGE: They wanted to let the operators know that they were important; that they needed to comply with the fitness for duty program at each facility; and, it would be a condition of their license, of their own Part 55 license. They want them to also understand the gravity of violating the cutoff levels in the Part 26 Fitness for Duty Rule, and the specific enforcement sanctions that would be taken against them if they violated those.

They wanted to put them on notice, to let them know how strongly they felt about the operator's duties.

MR. CARROLL: We are getting ahead of the story, but are the enforcement sanctions --

MR. LANGE: I would like to go through the slides a little bit, and I think it will help clarify a lot of things.

MR. BUSH: Dave, before you go any further, I would like to say something just to clarify this. I am Loren Bush - I guess the author of the Duty Rule. The Part 26 Rule is oriented towards the Part 50 license. In other words, it says

you must have a program which tells your employees that they should not use alcohol and drugs, and if they do, they are violating policy and will take action.

Nothing in that Rule says to the employee that you must refrain from using alcohol and drugs and if you do, action will be taken. That started getting into Federally mandated discipline and employment things. We made the decision that we would just require that the licensees have a program, and that they enforce their program. The Commission then, we have another group of employees that we have some control over through the licensing, and that's why we have this.

MR. WARD: Thank you, Loren.

MR. KERR: Only the licensed operators are subject to this. Maintenance people, for example, are not.

MR. CARROLL: They are subject to whatever the licensee's fitness for duty program requires.

MR. KERR: By this, I mean the thing we are talking about here.

MR. LANGE: Right, this applies to the Part 55 license operator. Getting back to the staff requirements memorandum. This was issued March 22, 1989, and directed the Staff to do two things. First, amend Part 55 to establish the 10 CFR 26 cutoff limits, and those limits are addressed in Part 26 for substances along with alcohol as an operator license condition. Penalties shall be clearly stated to inform the

operators of the gravity for exceeding cutoff levels.

The second thing it asked the staff to do was to amend 10 CFR 2, appendix C, to reflect the individual operator enforcement sanctions for exceeding those levels. Those are the two things that came out of the staff requirements memorandum.

MR. CARROLL: The penalties that the Commission envisioned in this staff requirements memorandum are something new; you had to invent them, right?

MR. LANGE: Yes. What we are going to be doing along with the final rulemaking is amending the enforcement section of 10 CFR Part 2 to include these.

Getting right into the proposed revision, it covers two sections in Part 55. The first is 55.53, which is conditions of licenses, and we are proposing to add the following: The operator shall not use alcohol within the power reactor protected area or the non-power reactor controlled access area. The only reason I have separated these out is because they refer to them in different terms in both facilities for underscored access.

MR. KERR: Why is the term us used there rather than consume? I ask, because in a reactor laboratory that one might find on a university campus, one could be using alcohol for experiments which would have nothing to do with consumption, and I am sure you don't have that in mind and maybe it's not a

problem. But, I was curious because at other places in here the term consume is used.

MR. LANGE: It does mean consume. It does not mean using alcohol for other than --

MR. KERR: Is there some reason not to?

MR. PERKINS: We could have as easily used the word consume there. We weren't trying to make a distinction.

MR. MICHELSON: How does the proposed revision read?

MR. LANGE: The proposed revision uses the word using alcohol, using alcohol on site.

MR. MICHELSON: Maybe then, there's a better word than use.

MR. WARD: I guess use is better with other drugs, I guess is a word commonly used with other drugs rather than consume. That's probably your problem. The first one doesn't mention other drugs, why is that?

MR. LANGE: I am going to go into that on the rest of this.

MR. WARD: Okay.

MR. BUSH: If I might, on the use of the word use, that is also used in the Part 26. It is used there, because it was used in the Executive Order that mandated the Federal workplace program. It is used in state statutes to make it a violation of law to use some or distribute drugs and things of that nature. It is using the same language to work its way

through the course.

MR. KERR: In your 10 CFR 55.61 proposed revision, the last bullet there does refer to unfit for scheduled work due to consumption of alcohol. That is what made me believe that the word consumption was admissible, at least.

MR. LANGE: Moving to the second bullet, licensees shall not use, possess or sell any illegal drugs.

MR. MICHELSON: What bothers me on that one is, I am trying to relate that to these cutoff limits that you described in the previous slide. If you use it at all, you may still be below cutoff limits. I don't know what those limits are. This one just says flat out don't use it, and I assume anywhere or just on site.

MR. LANGE: That would be on site of off-site.

MR. MICHELSON: Okay then, what does this have to do with these cutoff limits that you must stay below?

MR. LANGE: The cutoff levels is the only objective way we have of measuring the actual levels that are in Part 26 for the facility program. Also, they are going to be used for the enforcement sanctions for exceeding those levels.

MR. MICHELSON: Okay. Although you are saying don't use it at all, we will only take action against you if you exceed your cutoff limits; is that what it is saying?

MR. LANGE: No. If you possess or sell any illegal drugs also.

MR. MICHELSON: I am talking about use now, the word use here. I thought it meant any use whatsoever.

MR. LANGE: That's correct.

MR. MICHELSON: Even if it's below the cutoff limits.

MR. LANGE: You are going to have different ways. You have the drug testing random program in Part 26. It is going to perform some type of chemical test to determine the cutoff levels. But, you are also talking about a case where you find somebody smoking a marijuana cigarette on site.

MR. MICHELSON: Even though he was below the cutoff limits, you would take action against him on the basis of no use whatsoever.

MR. LANGE: That's correct.

MR. MICHELSON: Thank you.

MR. WARD: That means that the following - as Carl said, logically the cutoff limits are related to detectibility rather than impairment, I guess.

MR. LANGE: That's correct.

MR. KERR: There are --

MR. LANGE: When you get into the use, possess or selling, you get into the issue of trustworthiness and reliability.

MR. KERR: There are cough syrups that have measurable amounts of alcohol in them. Does that fit into this, or is that ignored?

MR. LANGE: That does fit into it, and I will explain that. The licensee shall participate in and comply with the facility's drug and alcohol drug testing programs. This is another condition of an operator's license. For power reactors, that is going to be a program established pursuant to Part 26, the Facility Fitness for Duty Program.

For non-power reactors, that is going to be per facility established program as applicable. Right now, Part 26 does not include the non-power reactors to have a Fitness for Duty, Part 26 program. They establish whatever program is required necessary for their workplace. The things they take into consideration are if they are being Federally funded, if they come under any type of other mandate or act.

Are there any questions on that?

MR. WARD: Yes. I don't understand that, the last point. For non-power reactors, Part 26 doesn't apply?

MR. LANGE: They may or may not have a program similar to Part 26 but you are correct, it does not apply. The Part 26 program -

MR. PERKINS: Could I try an alternative set of words?

MR. WARD: The part about whether they have a Federally funded program or not, that is the part that I didn't understand.

MR. BUSH: That is the Federal Drug-Free Workplace

Act. It requires that any business entity that receives over $25,000.00 of total funds have a program.

MR. WARD: That might be similar to something required under Part 26; is that the idea?

MR. BUSH: It's a much simpler program.

MR. WARD: Okay.

MR. BUSH: There is a requirement for a program. The Commission should be receiving sometime in January, a proposed policy statement that would expect that the power reactor licensee develop a program. The Staff is also asking the Commission to consider whether or not that should be followed up by a proposed rule.

MR. KERR: You mean in non-power reactors?

MR. BUSH: Yes, the non-power reactors.

MR. KERR: To be more stringent than the one required by the Federal law?

MR. BUSH: In one of the draft versions it says have a program similar to that. The details haven't been worked out yet.

MR. KERR: Because, almost all - certainly all university reactors will probably have enough Federal support that they will have to comply with that. Do you anticipate something more stringent than the Federally mandated one?

MR. BUSH: I really can't answer that. I might comment as to whether or not the universities are getting

Federal support, it really gets into some very tough legal interpretations. It could be possible that another part of the university is getting a Federal grant of some kind to do research with and that counts for that business entity.

MR. KERR: I would assume that would be typical of Federal interpretation.

MR. WARD: There aren't many universities that aren't getting at least $25,000.00 from the Federal government, I guess.

MR. LANGE: I would just like to continue with the next slide. Continuing on with the conditions of the license, the next slide I have here is a continuation of actual - one more bullet that I have defined. You saw the first three on the previous slide, this is the fourth one.

Shall not perform licensed duties while under the influence of any prescription, over-the-counter or illegal substance which could adversely affect performance. I think this may help answer the question you had earlier.

MR. CARROLL: So, you can't take Dristan if you have a head cold; is that what it says?

MR. LANGE: No, that's not correct. What it does say is, I have tried to define it here and we have defined it in the proposed Rule. For alcohol and illegal drugs, what we mean by under the influence is exceeding the Part 26 cutoff levels or the facility levels if lower. Some facilities do have lower

cutoff levels.

MR. WARD: Utilities, you mean the facility licensee would have his own rules.

MR. LANGE: That's correct.

MR. CARROLL: He got ratcheted into them before the NRC decided what the cutoff levels were going to be.

MR. KERR: I don't see how that bullet supercedes the first bullet on shall not use.

MR. LANGE: Which one, back on the first one?

MR. KERR: Yes.

MR. WARD: Consume it off-site. They could use it or consume it off-site.

MR. MICHELSON: No, they aren't even allowed to use it off-site.

MR. KERR: A guy has a bad cold and he brings cough syrup to work to keep him from coughing onto the tech specs -

MR. LANGE: Right now in what we have defined as prescription and over the counter usage as far as under the influence, that the licensee could be under the influence as determined by a medical review officer. It would have to adversely affect performance.

MR. KERR: The first bullet says shall not use, no restrictions. Does this bullet supercede the first one?

MR. LANGE: I am trying to see which first one you are talking about.

MR. WARD: The previous slide, I presume.

MR. KERR: The previous bullet says shall not use alcohol within the protected area, period.

MR. LANGE: That is correct, shall not use alcohol within the protected area.

MR. WARD: I think the question is, can he take this cough syrup into the protected area?

MR. LANGE: With alcohol in it?

MR. KERR: Yes.

MR. LANGE: Right now, the Fitness for Duty requirements under Part 26 require the facility to have written policies and procedures that address the use of prescription, over the counter, illegal drugs, along with fatigue, stress and a variety of other problems that may affect fitness for duty.

MR. KERR: I guess I am not making my question very clear. My question is, does this first bullet supercede that, so now it will be illegal to bring the cough syrup on site? I mean, is that the intent?

MR. LANGE: It is not the intent to have them bring cough syrup on site, no.

MR. KERR: The intent is to not permit them to bring cough syrup on site; is that right?

MR. LANGE: No. The intent is not to permit them to perform licensed duties, taking that cough syrup without realizing the consequence and having a medical review officer

determine that.

MR. PERKINS: Perhaps it would help Dave, I think the first bullet that Dr. Kerr is referring to talks about use. This talks about essentially, the way I look at it, you shall not report for duty if you are under the influence.

MR. KERR: That's right, but it seems to me use is more stringent. I mean, I can consume a teaspoon of alcohol without being under the influence, but it seems to me that shall not use makes that illegal if it is done on site.

MR. WYLIE: As I read this, 55.53, basically you say you shall not use it. But, for the purpose of implementation you say over here, for the purpose of this subsection with respect to alcohol and illegal drugs, determine that influence means the licensee exceeding the lower cutoff level of drugs and alcohol.

MR. KERR: Mr. Michelson, I thought, asked that question if that meant that, and was told no it meant no use at all.

MR. WYLIE: That's the clarification.

MR. WARD: No, I think Bill's question doesn't apply to this chart. You should ask the question on the previous chart, right - it's the first bullet on the previous chart.

MR. KERR: I said, did this bullet supercede that first one.

MR. WARD: No, I am just trying to get clarification.

I think basically what Bill's question is, there are certain prescription or non-prescriptions, cough syrups that have alcohol in them. Would an operator be permitted, would he be in violation of the rule if he brought some of that cough medicine within a protected area and used it, consumed it.

MR. LANGE: If it had alcohol in it, in the prescription drug?

MR. WARD: Yes.

MR. KERR: Or non-prescription. I mean, you can buy cough syrup without a prescription that has alcohol.

MR. CARROLL: I think NyQuil is about 80 proof, and it is a common cold remedy.

MR. MICHELSON: That is what puts you to sleep, huh?

MR. WYLIE: I guess what is bothering you is, how you would implement this. I guess if some guy came in -

MR. KERR: I am trying to find out what the intent is at this point.

MR. BUSH: If I could, I would try to clarify the Part 26 as how we see licensees at the present time. There was no intention by those of us who worked on Part 26 to prohibit the legitimate use of medication, whether it was over the counter or prescription or what have you. The fact of the matter is that there are some people that will abuse the cough medication because of its alcohol content.

We expect that in the licensee's programs, that they

will address that particular issue. I guess the bottom line is, legitimate use of the medication would not be a problem. If the individual carries several bottles in every day and so on and starts to be under the influence, the licensee will be expected to address the problem.

MR. KERR: I am not trying to be critical of what it is you are trying to do, because I think it is entirely legitimate. What I am trying to foresee is an inspector, a young man who has just been put on the job and therefore wants to find something wrong with what a licensee is doing, goes out and reads this, shall not use, the operator has a bottle of cough syrup. He knows from experience that NyQuil is about 80 proof. That's a violation. You didn't mean it, but the inspector doesn't know what you had in mind.

MR. BUSH: Well, we will be providing training to the inspectors.

MR. KERR: Are you going to tell him to ignore your own regulations?

MR. BUSH: No.

MR. CARROLL: I think it is a question of how you draft this thing.

MR. WARD: Yes.

MR. PERKINS: I think our intent was that this would address - this first bullet would not address the legitimate use of alcohol in a drug.

MR. KERR: Then, say so.

MR. WARD: It doesn't say that.

MR. PERKINS: It does not make it clear.

MR. WARD: At least this summary doesn't.

MR. PERKINS: Correct. If you go to the next slide, if you are taking medication - next slide. If you are taking medication that contains alcohol, then it speaks to whether you are under the influence of that.

MR. KERR: Sure, which is entirely legitimate, it seems to me.

MR. PERKINS: We maybe need to do a little bit of fine tuning there.

MR. LANGE: I can handle that.

MR. CARROLL: Does this include antihistamines, tranquilizers, or things of that nature?

MR. LANGE: Right.

MR. CARROLL: What you are saying is, in these kind of cases that licensees under Part 26 are putting out some general guidelines that it is okay if you take two Dristan tablets a shift but more than that you have to get a medical approval; have they done that kind of thing, or how is it being dealt with?

MR. BUSH: We haven't looked at the actual procedures and the policy statements at this particular point, because we are still sort of leaps away from implementing the program.

But some of the literature and guidance that we have put out would indicate that yes, the licensees would characterize what kind of medications, the use of should be reported to the medical doctor or the supervisor.

It gets to be quite involved. Very simply, there is an expectation that if people are using medication that could affect their performance, that fact should be known.

MR. KERR: I hope you mean affect their performance adversely because take medication because they think it will affect their performance.

MR. LANGE: Moving on to the next slide. In answering the Commission's directive on clearly stating what the penalty would be for the operator and identifying what the actual compliance standard would be, there is a section in 55.61 which is revocation and modifications of licenses. This is the section that establishes when a license would be or may be modified, revoked or suspended.

In that section there, what we are proposing is, the Commission may modify, revoke or suspend a license for - this kind of parallels what we have been talking about - the sale, use or possession of illegal drugs.

Second, the refusal to participate in the facility's drug and alcohol testing program. Third, a confirmed positive test result for drugs or alcohol. Fourth, use of alcohol within power reactor protected areas or non-power reactor

controlled access areas. We just had a little discussion that. Last, being determined unfit for scheduled work due to the consumption of alcohol.

MR. CARROLL: Which conflicts with those two bullets up, potentially.

MR. LANGE: In determined unfit for scheduled work versus confirmed positive test results?

MR. CARROLL: You could get a positive test result when you are called in on overtime.

MR. LANGE: Yes.

MR. CARROLL: On an emergency basis, non-scheduled.

MR. LANGE: Yes, but that would be covered under confirmed positive test results.

MR. CARROLL: It looked to me like the last bullet was to try to say that -

MR. LANGE: That was in addition to the confirmed positive test results. If the person was determined unfit for scheduled work due to the consumption of alcohol, showed up on site --

MR. CARROLL: Okay, but a lot of union rules are set up so that you call a guy out unscheduled and he says hey, I have been drinking and I really don't want to come to work. The supervisor says you better be here or it's insubordination, because I think you are using that as an excuse. Joe shows up and you give him an alcohol test and he flunks - you are saying

he may have his license modified, revoked or suspended, and that's not fair.

MR. PERKINS: I thought we were trying to say just the opposite; that if a guy was scheduled for work and he shows up --

MR. CARROLL: Okay, maybe you are.

MR. MICHELSON: Explain it to me, then. What do you think it said?

MR. PERKINS: First off, understand that bullets are a very difficult way to communicate, as we are discovering.

MR. WARD: You just discovered that?

MR. PERKINS: We discover that every time we try to go out and talk. With the last bullet, we are saying we made the distinction, determined unfit for scheduled work because we specifically did not want to penalize the guy who is ordered to the site in the middle of the night, even though he may have had a drink or two and he may even tell his supervisor he had a few drinks. If he is ordered to the site or brought to the site, it wouldn't be appropriate to give him a hit under Part 55.61.

What Part 55.61 is trying to address is the guy who shows up for work and is detected to be unfit for duty.

MR. LANGE: Normal, regular, scheduled work.

MR. MICHELSON: It didn't say anything about scheduled then.

MR. PERKINS: I meant to say shows up for scheduled work.

MR. MICHELSON: The earlier bullet didn't talk about scheduled, it just says shall not use alcohol within the protected area.

MR. CARROLL: I am thinking of the confirmed positive test.

MR. MICHELSON: Yes, he could get that at any time, that's true. Shall not be under the influence -

MR. LANGE: That would come under the facility program for fitness for duty.

MR. MICHELSON: How do you handle the shall not perform licensed duties under the influence? If he is called in on off-schedule and he says I have had a couple of drinks and comes in anyway, he is performing under the influence.

MR. LANGE: Hopefully, the Part 26 program --

MR. MICHELSON: He is responsible. He knows he has been drinking and knows he shouldn't be doing it, whether the boss says to come or not.

MR. LANGE: That is correct.

MR. MICHELSON: So, there is no way out for him. He better not work.

MR. LANGE: He better not perform.

MR. MICHELSON: Irrespective of what the supervisor says.

MR. PERKINS: I believe it is possible, based on some scenarios that I have seen, for a facility to call an individual in to help deal with a problem, yet not perform licensed duties. That is the distinction that we are trying to make here, though we perhaps aren't doing it as clearly as we could.

MR. MICHELSON: Well, he could come in as a consultant, he just can't work.

MR. PERKINS: He could not perform the licensed duties.

MR. CARROLL: That's a fine line.

MR. MICHELSON: No, it isn't.

MR. PERKINS: I think it is real world though.

MR. MICHELSON: I think in regulation it's a funny line.

MR. CARROLL: Manipulating controls.

MR. MICHELSON: No, but I say it's a regulation and that's a funny line.

MR. LANGE: The thrust of this proposed rule is toward the Part 55 operator. He is no longer holding his Part 50 licensee responsible, it is his responsibility as a condition of his license. The way I can see that happening is, he says I cannot perform license duties under the condition of my license.

MR. MICHELSON: He can come in and advise them or

whatever, but don't touch the controls and you will be okay?

MR. LANGE: Right. Cannot perform licensed duties or supervise those licensed duties.

MR. MICHELSON: Unless he gets picked up under exceeding the cutoff levels.

MR. LANGE: That is correct.

MR. MICHELSON: If there were a random test at that point.

MR. LANGE: Or, a testing for cause, you know.

MR. WARD: What would happen then? What if there was testing for cause or a random test under those conditions, where he has come in specifically not to perform license duties, and at the request of the supervision or management. Where does a person stand then?

MR. LANGE: For unscheduled work?

MR. WARD: For unscheduled work, yes.

MR. LANGE: He would fall under the Part 26 program. At that point, because it wasn't scheduled work, we wouldn't take licensing action under revocation, modification or suspension. However, the Part 26 program would have him coming up with a confirmed positive test.

MR. WYLIE: Really, instead of for, shouldn't that be while on scheduled work?

MR. PERKINS: That would be more accurate, more precise.

MR. WARD: Which is that, the last one, Charlie?

MR. WYLIE: Yes, for. I mean for scheduled work really should be while on scheduled work or while performing scheduled work.

MR. CARROLL: Then what you are saying is the third bullet, confirmed positive test results for drugs or alcohol, while performing duties as a licensed operator.

MR. LANGE: No, that would be a confirmed positive test results for drugs or alcohol, either performing or not performing licensed duties, if he gets picked up by the random drug testing program under the Part 26.

MR. PERKINS: Just like any other day worker.

MR. WARD: What if he is called in for non-scheduled-called in --

MR. PERKINS: Let me address that, if you would, Dave. Remember, it is the facility that decides when to do the test for cause. It is the facility's program that we are talking about here. The scenario, Dr. Ward that you are speaking of would have to be a case where the facility called this guy in, he told them he wasn't really - that he had happy hour and they still needed him in. It would have to be their decision to then test him for cause.

MR. WARD: So, if the facility speaks with one voice, this would never happen, I guess.

MR. CARROLL: Not necessarily. The resident

inspector says, I have been listening to this guy complaining that you brought him in and he had something to drink. I insist that you give him a blood alcohol test under your Fitness for Duty program.

MR. KERR: I'm sure a resident inspector would never do a thing like that.

MR. CARROLL: I don't think it is quite as simple as you are portraying.

MR. BAKER: I am Ed Baker. I am the Deputy Director for Enforcement. Given that scenario, that he told then that he had a couple drinks and they ordered him to come in, even if the resident said I want him tested, I don't think we would take the action that is described here, knowing full well that he had said that he had a few drinks and was ordered in.

MR. CARROLL: I agree with you, I don't think you should take that action.

MR. WARD: But he said he didn't think he would take that action.

MR. CARROLL: But I don't think the words - the words are what I am talking about.

MR. WARD: Maybe the guy in the job next month will, that's the problem.

MR. BAKER: Let me go back and say the enforcement policy is geared to get people to admit that they have a problem and take the right action, not to punish someone after

they have been forced to do something. Given that fact, I don't think it would matter whether it was me or someone else.

MR. CARROLL: Just looking at the bullet words up here and admitting that they may not be what is in the final rule, the Commission may modify, revoke or suspend Joe's license for confirmed positive test results for alcohol.

MR. LANGE: Correct, and that word may is important. There are going to be a lot of different cases that we are going to have to consider. I think that's what Ed is trying to say.

MR. BAKER: One other point that I think we need to make is that under this particular program the licensee is the operator, and he has the responsibility to tell his management that he is in this condition. If he came in for unscheduled work and did not report that he had had several drinks and was found to be unfit by someone else observing his work, then we would take action.

MR. WARD: That's clear. The issue is what probably is not just a hypothetical scenario, but where a person is called in and he lets his management know that he has had some drinks, but he is asked to come in anyway. It just seems a reasonable interpretation wouldn't penalize the man, I would presume. It would sure help if the rule could be written in a way that it is clear that reasonable interpretation should be made consistently. I think that is all we are saying. You

might need a few more words in the rule.

Maybe they are in there, and we are just looking at bullets.

MR. CARROLL: I guess I said it before, and I will emphasize it. One problem in dealing with bargaining unit people - and I have had 35 years experience doing it - is that they find all kinds of wonderful excuses for not wanting to come in on Christmas Eve when you have a problem. They will use this, and it will become an enforcement issue, I guarantee you. I mean, I am not saying that we shouldn't face up to the problem and do something about it, I am just saying don't be naive enough to believe that it is never going to be a problem.

Management is going to turn around and say you come in anyway, and I will make a determination as to whether you have had too much to drink.

MR. WARD: Dave, could I ask you a question about the first, the sale, use or possession of illegal drugs - that presumably is anywhere at any time. What is taken of evidence of that? Presumably there would be a state or local law that would have to be broken - would be broken in any case. Is conviction under state or local law what is required as evidence, that the operator has in fact been in possession of illegal drugs or is there some lesser standard?

MR. LANGE: Actually, under the sale, use or possession - for the use or possession, I guess he would have

to possess it to use it. Under the Part 26 program, you have the cutoff levels you have to bring into the program. Under the state and local levels, he could be picked up and tested under their requirements by a health and human service laboratory.

MR. WARD: No, I am not talking about use. I am just saying sale or possession. Let's say that someone accuses an operator or alleges that an operator has yesterday, sold some illegal drug somewhere over in town away from the plant. That evidence could be used in two ways. The local sheriff could use it to bring criminal charge against it, and it could be used by the NRC as evidence for taking action on his license.

MR. LANGE: Correct.

MR. WARD: Are those entirely separate? Does the NRC have a separate proceedings to determine whether this allegation is correct, or would they use whatever the sheriff finds out?

MR. LANGE: I will let Ed talk about that.

MR. BAKER: The answer is yes, there are. In fact, those would be referred to the Office of Investigation for determining whether or not and in fact they occurred. They may work in concert with a local law enforcement agency. At this point in time, as I see it, in an allegation like that, that would not be the point at which we would say your license is suspended, modified or revoked.

However, if there were charges brought by a law enforcement agency, I would suspect at that point we would take action perhaps to suspend or have him not perform those authorized duties. I don't think we would revoke without there actually being a conviction. We haven't really discussed all of that.

MR. WARD: What if there are charges brought and then the person is not convicted. In the interim, presumably, you have suspended the license. Then, what happens, does he get the license back?

MR. BAKER: I don't think we have gotten that far yet, to be honest, when someone has been found not guilty. I think a lot of that would depend on what other information we have as a result of our Office of Investigations. It is not something that we have addressed.

MR. WARD: You are probably going to have to.

MR. PERKINS: It think it is safe to say that if there was no conviction and the investigation did not bring evidence forward to cause us to believe that the individual was guilty, that the individual's license would be reinstated.

MR. BAKER: I think we have to be careful on whether or not the case was thrown out on a technicality or what the circumstances were. As I said, I don't know that we will ever really wrestle with that until it comes up, to be perfectly honest. Each case is going to be a little different.

MR. CARROLL: It's a geographic issue, too. In California nobody ever gets convicted on having a personal use amount of marijuana. I mean, the cops won't even deal with it.

MR. WARD: How will the NRC deal with that in California?

MR. PERKINS: The NRC already did deal with that with an individual. That was not a case of possession though, that was a three positive test results.

MR. LANGE: Three positive test results.

MR. PERKINS: And, we issued an order to show cause why that individual license should not be suspended or revoked and - let me ask Ted Szymanski. I know we got the decision back from the hearing, that the individual was in fact guilty of the three hits. It is my understanding that his license is being revoked; is that correct?

MR. SZYMANSKI: Yes.

MR. PERKINS: So, if there is evidence and it supports the allegation, we would proceed to take the licensing action.

MR. CARROLL: You are really into a big world here though, although I haven't seen it with licensed operators at the plant I was involved with, we had a lot of this going on with security guards. There were people making allegations against other people that were just totally out to lunch, but it was just a personal vendetta kind of thing. You are going

to have to greatly expand the Office of Enforcement if that sort of thing starts happening in the Office of Investigations.

MR. PERKINS: The Office of Investigation, yes.

MR. LANGE: The Office of Investigation and Enforcement realize that. We have talked to them about that. That is going to happen. Are there any other questions?

MR. WARD: No, go ahead, please.

MR. LANGE: Thank you. The next slide, I have addressed the failure to meet the fitness for duty requirements.

MR. KERR: Excuse me. Before you go to that, would -- I am sorry, that is the one. Somehow it is out of sequence.

MR. LANGE: Failure to meet the fitness for duty requirements, the enforcement sanctions, the Commission asked us to clearly state. I put a note there, 10 CFR Part 2, Appendix C will be amended when the proposed rule is made final.

In that task, the Commission has not amended a rule change to the enforcement policy along with a proposed rule. That is stated in the proposed rule. Basically what the enforcement sanctions are going to cover is, on a first offense the Commission may issue a notice of violation, a civil penalty or an order as warranted. On the second offense, the Commission will, at a minimum, issue an order to suspend the license for three years.

MR. KERR: How did you arrive at that?

MR. LANGE: This is parallel between this proposed rule and Part 26 for denying a person unescorted access. In Part 26 on the first --

MR. KERR: How did you arrive at three years on 26 then?

MR. LANGE: Loren, could you answer that?

MR BUSH: Well, I guess it was a couple of connections. The most salient one was that for a person to have fully recovered from drug abuse, medical history at this particular point indicates that abstinence for a period of at least three years is required. We picked that particular period as what we would require before you could consider a person for reinstatement.

MR. KERR: Thank you.

MR. LANGE: On a third offense, the Commission will issue an order to revoke the operator's license.

MR. KERR: The suspension for three years is tantamount to revocation; isn't it?

MR. PERKINS: No. Remember that these licenses now are six year licenses. So, it is feasible that the individual may have three years left on his license.

MR. KERR: Let's be realistic. If an operator can't perform his function for three years, he is not going to have a job, is he?

MR. LANGE: There are quite a few jobs. They may want to use him in the training organization off-site somewhere.

MR. KERR: I am simply saying he will never be an operator again.

MR. LANGE: Practically speaking, right.

MR. KERR: If he is, so there's not really much difference between two and three.

MR. CARROLL: We did reinstate some security guards that had gone through rehabilitation program, and they have worked out okay.

MR. KERR: I didn't think we were referring to security guards.

MR. CARROLL: No, I'm just saying that is my experience, not with operators. I mean, somebody because of a health problem for example, this happens once in a while, somebody gets a heart condition or something and can't perform as a licensed operator for a while and it gets straightened out and he goes back after a time period, that works out.

Let me ask this about this list of sanctions, and I guess my question probably applies to Part 26 as much as it does to this. Is there language in there so that this doesn't take disciplinary sanctions away from the utility? I am thinking of a case where I have a guy that is a real poor performer as an operator. I am just about ready to fire him.

He's been making a lot of mistakes, he's insubordinate and he's a real problem child.

All of a sudden, he gets nailed with a first offense for whatever reason under this thing. Does he and his union come back to me and I say this is it, I am canning the guy. Does he come back to me and say hey, you can't do that. The NRC says I get three chances. Have you got language in there that helps the utility in dealing with that situation?

MR. BUSH: Part 26 has an expectation of minimum actions on the part of the utility which are somewhat similar to what is characterized here on the board. The Commission decided early on, as I kind of inferred earlier, one of the backgrounds or parts of the considerations in Part 26 is that we weren't going to get involved in the hiring and firing determinations of the utilities.

MR. CARROLL: Good thinking.

MR. BUSH: The responses that we have had from the utilities though, is that a good many of them are planning on terminating employment after the first offense, and certainly after the second offense. So, a lot of the stuff that goes after that with many licensees are probably not going to have any bearing.

MR. CARROLL: My question really is, are there words in there that to you would make it very clear that a utility can - this is the minimum and that a utility can enforce these

sanctions more rigorously? You don't think there would be a legal challenge that somebody that had a drug-free workplace environment whose policy was first offense you are out the gate, could challenge that and say that's not what the NRC -

MR. BUSH: That concern has been expressed in many circles, that the unions are going to use the rule as a cudgel on the licensees, saying this was sufficient for the NRC and why need you do anything more stringent, that kind of consideration. There is nothing in the rule that prohibits a license - in fact, it is kind of encouraged that they have more stringent pr[illegible]ms.

MR. [illegible]KER: I think the other thing to consider is that the N[illegible]nsiders their rules in all cases, a minimum set of standa[illegible]. Licensees can always do something more restrictive.

MR. CARROLL: They end up in court as a result of it, but I am just saying have your lawyers really put the right words in here to make that point clear?

MR. BUSH: I think there have been more lawyers involved in this rule than I care to mention.

MR. CARROLL: All right.

MR. WARD: I have heard rumblings about the NRC wanting to regulate for excellence, which I don't quite understand what that means in those terms. That would seem to conflict with the general philosophy for regulation of some

minimum requirements, which does make a little more sense to me. That is kind of an aside, which is for another argument I guess.

MR. LANGE: I will try to summarize the changes, the significant changes. The proposed revision to Part 55 does go beyond the strict compliance with the 10 CFR 26 cutoff levels that the Commission specifically asked for in the staff requirements memorandum. We felt the fitness for duty standard was appropriate; that it covered more than just strict compliance to the cutoff levels.

The enforcement sanctions were extended to include impairment due to alcohol abuse. Part 26 doesn't specifically address enforcement sanctions for alcohol abuse. It prohibits performance of licensed duties while under the influence of any legal or illegal substance, and we talked about that earlier. We talked at length about illegal substances, and we defined under the influence for legal substances.

Again, that falls back to the facility program on written policies and procedures addressed to cover those prescription, over the counter and legal drugs. It places the responsibility on the Part 55 operator to know what those policies and procedures are, and to adhere to them.

The third thing, it prohibits the operators from the sale, use or possession of illegal substances on or off-site. The Part 26 Fitness for Duty Rule talks about the prohibition

of illegal substances on site. When we start talking trustworthiness and reliability, we have to consider on or off-site use.

MR. KERR: Does bullet number two include coffee?

MR. LANGE: Does it include coffee?

MR. KERR: Yes, sir. I understand coffee contains caffeine, which is sometimes considered a drug.

MR. LANGE: It is a legal substance.

MR. KERR: Yes.

MR. LANGE: It ought to be taken to --

MR. KERR: Most people take it because they like to be under the influence of coffee.

MR. PERKINS: Again, Dr. Kerr, that is a bullet and the regulation goes on to say under the influence in a manner that it would impair the individual's ability to perform his licensed duties. It makes it obvious -

MR. KERR: I first wanted to find out what you hand in mind, and then we talk about language. You don't mean -

MR. PERKINS: I would say to adversely affect performance of licensees.

MR. KERR: What about the use of caffeine in concentrated forms to stay awake?

MR. CARROLL: NoDoz.

MR. LANGE: Not specifically, it doesn't address that. It specifically addresses the adversely affecting

performance duties.

MR. KERR: I understand. It wasn't clear to me whether you would assume that a person who used it would be adversely affected. You hadn't thought of that?

MR. PERKINS: We had not anticipated that they would. If it make the individual a screamer and bounced off the walls, then -

MR. KERR: I was just curious as to whether you had looked at that possibility and had decided whether it would likely be adverse or not.

MR. BUSH: In NUREG 5227, we have documented a case where a person had overdosed from coffee and started hallucinating, from exactly what you are talking about, overdose in caffeine.

MR. LANGE: When we looked at that, we went back to the Part 26 program and how that would work with supervisor operation and all that.

MR. KERR: It may be well to leave that ambiguous. I was just curious as to whether, since you referred to legal substances coffee immediately occurred to me, since I use that legal substance fairly regularly.

MR. CARROLL: Making a parallel between this and the process that went into Part 26, at some point the Commission worked very closely with the industry on fitness for duty and NUMARC efforts and so forth. Have you done that yet in this

case, or are you going to rely on the public comment to do it, or how is your interface with NUMARC on this particular issue?

MR. PERKINS: That will take place once the Commission approves this for release as a public - release to the public as a proposed rulemaking.

MR. CARROLL: Okay. So, you have had no dialogue particularly with them on it.

MR. PERKINS: Other than to tell folks like NUMARC and INPO that this was being worked on, and that a proposed rule was forthcoming.

MR. KERR: Did you get any violent, negative reaction to that?

MR. PERKINS: I characterize it more as anticipation or anxiety to see --

[Laughter.]

MR. WARD: Okay, Dave, thank you very much. We have an hour scheduled for you at the Full Committee meeting on Friday morning from 8:30 to 9:30. An hour is almost as much time as you had here today. Unless some of the Committee members have something to suggest, I don't have any particular ideas on how you might want to shorten it a little bit.

One thing I will leave, and I will be lazy and leave it up to you is, think about the questions that we ask you today and try to maybe respond to those before they get asked again on Friday. If other members don't ask questions

something like those, I think the people who are here today will feel that they have to ask it again and bring it up again, if you haven't somehow ground that into your presentation or recognized a concern with it. I think that would probably help with being efficient with the use of the hour on Friday.

MR. CARROLL: In a couple of places you could clean up the slides and probably get rid of a whole bunch of questions.

MR. WARD: Very good. Thank you very much. I appreciate your coming down. Let's just take a quick couple of minute break while we change guard, really just until 4:10.

[Brief recess.]

MR. WARD: The next topic is the proposed Access Authorization Rule. We have a presentation from the Staff. Who is going to lead that off, Zoltan?

MR. ROSZTOCZY: I am going to start, yes. Mr. Chairman and Committee members, we are here today to assist you in your review of the Access Authorization Rule and Regulatory Guide which are presently being proposed for issuance. This issue, access authorization has been started many years ago, back in the early 1980's. In 1984, the Commission published a proposed rule for public comment. After evaluation of the comments, the Commission decided to go with a policy statement. They reissued as a policy statement and received a set of comments on that again.

Then in 1989, they asked for - earlier this year in 1989 they asked for an options paper how to proceed. The Staff provided that options paper, and the Commission elected an option would be a final rule to be issued on the basic requirements, and it will be accompanied by a regulatory guide which basically adopts the industry's guidelines which have been developed by NUMARC.

We have presented this to you back in September at our meeting, and at that time, we indicated the status where it stood. Since that, we have accommodated the CRGR comments we had just received prior to that meeting. We have also looked at your comments and what you have made at your meeting, and came up with a new version of the rule. We provided copies of that rule for you, and we are here today to summarize of what is the difference between this rule and the one that was in September. Also, we had a second meeting with CRGR, and we can report to you on the CRGR comments also.

With that much of an introduction, I would like to ask Sher Bahadur, the Branch Chief responsible for this rule, to make the presentation.

MR. MICHELSON: You said you looked at our comments. You didn't say you accommodated our comments. You are going to point out wherein you did not, or how are you going to do it?

MR. ROSZTOCZY: We accommodated it almost completely. We will point it out to you how we did that.

MR. WARD: Did we write a letter?

MR. MICHELSON: I don't think so. I don't believe that we did.

MR. WARD: I am not sure how you figured out what our comments were. I congratulate you if you did.

MR. MICHELSON: It's in the minutes of the meeting. Those were not necessary full Committee consensus comments. Those were just comments during the meeting.

MR. WARD: I hope you didn't do anything rash, is what I think Carl is saying.

MR. MICHELSON: There was a couple of things they did leave out, but I was curious to find out why and we will find out a little later.

MR. ROSZTOCZY: Since you mentioned the letter, we would like to receive a letter after today's meeting and the Full Committee meeting later this week, so we can proceed on our schedule and send it up to the Commission.

MR. WARD: All right.

MR. BAHADUR: Thank you, Zoltan. Mr. Chairman, as Zoltan indicated, I was here last September about maybe two months back. At that time, I mentioned to you that we were at a stage where I was here to give you a progress report and not actually presenting the rule. The reason was that CRGR had raised certain basic issues, and we were in the process of incorporating those issues at the time when I came here.

We have taken care of those comments. We met with CRGR last week, and what I propose to do today is walk you through the rules first and bring to your attention what the CRGR had to say about tne present package, and see where we go from here.

[Slide.]

MR. BAHADUR: One of the major concerns that the CRGR had between the previous meeting was the basis for the need for the rule. Although the Committee recognized that we were under the direction of the Commission to develop a rule, yet they wanted us to develop a rationale for the need for rule. What I tried to do in this slide is to summarize some of the reasons why we thought the rule is necessary and what the rule is going to accomplish.

The rule, along with the regulatory guide, would provide a substantial increase in the protection and would also achieve the following. First of all, the industry right now is following standards which are not uniform on the access authorization. There are NC1817 standards, which are followed by some of the people in the industry; there is ANS 3.3, but there is no standard that NRC has proposed or imposed on the industry that they can follow. This rule would achieve that.

We would ensure that those licensees which are not following the minimum requirement for the access authorization would bring their program up to that level.

MR. CARROLL: How many licensees are in that category?

MR. BAHADUR: We had an informal survey of 20 licensees some time back. Out of the 20 licensees, there were two licensees who did not provide us enough information for us to conclude that they were following even the minimum standard. So, I could say about 10 percent of the licensees could be out there, whose commitment we do not know.

MR. CARROLL: They didn't provide you enough information. Did you go back and say or ask them to provide the missing information?

MR. BAHADUR: No, we did not. This rule would also ensure that those industries who are voluntarily have raised the standards in the access authorization would continue to do so throughout the life of the license or the facility. The rule would provide a guidance for the future licensees, future applications, future plants. Because of the standardized program, this rule would provide a well defined mechanism for a very effective instruction and enforcement.

Of course, this rule does establish an industry-wide program, so there is indirect benefit to the industry too. For example, they can transfer access authorization from one plant to the other plant, from one vendor or contractor to the other contractor. So, there are some indirect benefits to the industry as well.

MR. KERR: It's interesting to me that this is going to result in a substantial increase in the protection of public health and safety, and then under the bullets, I guess I think that bullets two and three might result in increase. But, I can't personally see that bullets one, four, five and six necessarily provide any increase in public health and safety. That's not a question. I would feel better about the increase in public health and safety if all six were convincing.

MR. WYLIE: Let me ask, of the 18 that did provide information regarding their programs, were there any of those not acceptable?

MR. BAHADUR: Pardon, sir?

MR. WYLIE: You said that 18 out of 20 provided information regarding their program; isn't that correct?

MR. BAHADUR: Yes.

MR. CARROLL: Enough information for them to conclude that they had an acceptable program.

MR. WYLIE: You concluded that they all had acceptable programs, the 18?

MR. BAHADUR: Out of the 18 people who did provide us the information, 10 were following the ANS 3.3 Standards, the standards which indicate that they were going through the three attributes of the rule, which is the background investigation, psychological assessment, and the behavioral observation. In the background investigation they did commit to very specific

items like employment check, education and criminal records.

Five of them just committed to these three attributes with no details. The remaining three had gone through high enough to follow the NUMARC guidelines on the issue. That means, they were going through the background investigations which also did include the military history, the credit checks and enhanced educational background.

MR. WARD: Did that answer your question, Charlie?

MR. WYLIE: Well, I don't know. I mean, if 10 followed ANS and five had the commitment to the essentials of ANS I guess and three followed NUMARC, but were they all acceptable?

MR. BUSH: I might answer that. Loren Bush from Director of Safeguards Branch. Since we had no regulatory requirement other than an expectation that was in the statement of consideration, 7355 that was published back in 1977, that program that captured what was in the standard NG 1718, the 1973 version, would be acceptable in the interim.

Basically, the staff, because of that accepted whatever the licensees proposed. There was really no criteria other than that they commit to having a background investigation, some kind of psychological assessment, and behavioral observation.

MR. WYLIE: So really, you made no assessment of whether they come close to NUMARC or not, the industry.

MR. CARROLL: Help me out here. What is the status of the NUMARC document; why haven't more people said yes, I am going to follow that or am going to follow it or whatever?

MR. BAHADUR: When we came --

MR. WARD: They are waiting to see what the rule says I guess, wouldn't you?

MR. CARROLL: Okay.

MR. WARD: Is that a fair assessment? I said, I guess they are waiting to see what the rule is going to say.

MR. BAHADUR: Right. Actually, in 1984 when the proposal came out and soon after the NUMARC guidelines were developed, NUMARC was able to get the commitment from the industry, that if the NRC had gone the policy statement route, there would be substantial voluntary commitment to those guidelines.

But when the Commission decided to go the rulemaking route, then I understand that NUMARC did not have that commitment from the industry. The industry gave the impression that the commitment is no longer true. Right now, my understanding is that NUMARC as well as the industry is just waiting for the Commission to take an action one way or the other.

MR. ROSZTOCZY: May I make a comment here. There is a significant difference in what the industry is doing and what the industry has committed to. In the security plant, they are

committed to whatever they felt was appropriate or what was the minimum of what they could get the license with. However, in more recent years, they have done a lot more.

The study that Sher described was based on what are they committed to, and that is where they stand. In practice, many of them are doing a lot more but they did not go back to their security plant and did not change their security plant.

MR. BAHADUR: Thank you, Zoltan.

MR. CARROLL: Your statement was that there would be a substantial voluntary commitment to follow the NUMARC guidelines. I guess my impression was that it was 100 percent commitment, all utilities would follow it -

MR. BAHADUR: If it were in the policy statement.

MR. CARROLL: Is that right, 100 percent?

MR. BAHADUR: Yes. NUMARC had that understanding.

MR. CARROLL: Okay.

MR. BAHADUR: We did make a cost estimate on the programs that the industry is following right now, based on the NC and the ANS standards. A typical reactor was spending something like $12 million on the access authorization program, assuming this to be a 30 year present worth on a five percent discount rate. If you tag on to that the incremental requirements that the NUMARC guideline would place on the licensee, for example, the military history being there or the credit check being there, then the additional cost would come

out to be more, something like $150,000.00 per utility.

This, of course, takes into account the potential savings that the industry will have because of transferability advantages. Of course, the program would become more standard, the psychological testing that the industry is following would become a lot more standard. These savings have not been taken into account.

MR. KERR: The conclusion that a substantial increase will occur is based on sort of an incomplete assessment of what is out there already. Actually, the situation may be better than we think.

MR. BAHADUR: As Zoltan mentioned, the actuality - the actual practice could be very different than what the industry has commitment on the paper, on the physical security plants. At the same time, as you go through this and you see bullet number two and three which is going to provide you additional enhancement of safety, although that enhancement is not quantifiable, the delta cost is still very small. It is still only one to one and one-half percent of the total money that a typical reactor is spending right now on the program.

MR. WARD: Sher, before you leave this point, let me ask you, at the time of the Commission action that were reflected in the SRM back in April there was a split decision from the Commission; three of them favored option 2-C, I guess it was, and two of them favored option 2-B. Can you kind of

quickly explain the most essential difference between 2-C and 2-B?

MR. BAHADUR: The split came not on the need for the rule, but for the makeup of the rule itself. The majority of the Commission felt that the rule should be general, followed by your regulatory guide where a licensee could go for details and, therefore, would have the flexibility of meeting the requirement within the concept of the regulatory guide which would provide you one way by which you can meet the requirement of the rule.

The minority of the Commission felt that the rule should be more proscriptive; should have more specific details provided in the rule itself. That is where the basic difference in a nutshell was.

MR. WARD: That's good. Thank you very much.

MR. KERR: Which one do we have, the proscriptive or the non-proscriptive?

MR. WARD: Non-proscriptive.

MR. BAHADUR: We went through the, in order to meet the intent of the SRM that we received from the Commission which asked us to develop a rule, a very general rule which falls back on the regulatory guide for its detail, a regulatory guide which in turn endorses the industry guidelines. That is the rule package that you have in your hand.

This rule package has a performance objective, as I

mentioned earlier, that a high assurances there for the individual that goes in the vital and protected areas to be both reliable and trustworthy, and that he should not be posing any threat to health and safety from the inside sabotage.

MR. KERR: Does that include the deliberate saboteur who is rational but devious, because I didn't see anything in the psychological testing or otherwise that would protect one against that. At least a psychologist to whom I have talked and it's not a major fraction, tell me there isn't any psychological test that will reveal the likelihood that the intelligent determined saboteur is going to do something.

MR. BAHADUR: Right. The only thing that one can do in such cases where, looking into somebody's mind is not an exact science -

MR. KERR: I am simply saying that I think it is unfortunate if the staff believes that you can catch that certain individual with this parenthetical phrase including the radiological sabotage. I just was curious as to what the staff's thinking was that was expressed in that parenthetical statement.

MR. BAHADUR: That was the main concern of the insider rule, was that a person who had the access to the vital and the protected area should not be able - should not have the inclination of committing the radiological sabotage.

MR. KERR: This is not the insider rule, is it? Is

this also called the insider rule?

MR. BAHADUR: Originally this was one of the three parts of the insider rule package.

MR. KERR: I thought the intent of the insider rule was that you didn't have to have people who were trustworthy and reliable, they would watch each other.

MR. WARD: We don't have that.

MR. KERR: Okay. I just don't think that the rule, as I interpret it, and maybe it is misinterpreted, provides a lot of assurance against the determined saboteur. I don't know of anything else that will either.

MR. WARD: I would like to get clarification this too. Sher, the minutes of our September 27th meeting may be inaccurate and may not have reflected what you said or what you meant. Let me quote from the minutes. It says: "In response to a Subcommittee question, he stated - and he is you - that terrorist sabotage will not be addressed." What you seem to be differentiating is between radiological sabotage as carried out by an unstable individual versus radiological sabotage carried out by a stable individual but who has some political terrorist motivation.

The rule is intended to help deal with the first but not with the second; is that what you are saying?

MR. BAHADUR: That is correct. That is the radiological sabotage which comes with the political activity

is not assured against by this rule. This rule is meant for an employee who is in your employment, just to make sure that he under pressure, does not commit something.

MR. WARD: Do you appreciate that distinction, Bill?

MR. KERR: The distinction he is making is between an outsider and an employee, and it is my view that an employee could also be a determined terrorist.

MR. WARD: Yes, a mole or something. I think they are admitting that they really don't have the tools here for dealing with that sort of person; isn't that correct?

MR. BAHADUR: That is true. This rule has been directed mostly - only to a person who comes to your employ and shows their stability and reliability during his employment. If he isn't either, his chances are that he might get into a situation where he may commit the act that may lead to the radiological sabotage.

MR. WYLIE: I guess the controversy is whether you can pick up somebody with a psychological assessment. At least my experience in a former utility, abhorrent behavior assessments pick up people that do have problems and do it quite frequently, whether they are under stress of some sort or have other problems. I guess to that extent, this is designed to do that.

MR. WARD: The distinction seems clear to me. I am not sure it is to Bill yet. Is it to you, Bill, or should I

just not worry about it?

MR. KERR: The distinction that I am hearing is that it will pick up people who are employees but it won't pick up people who are not. I said the distinction that I heard. I may be hearing incorrectly.

MR. BUSH: I think that is an over simplification, because there are outsiders who could pose a threat by seeking employment and so on, that the screening process would - I think your point is right on the head. If the adversary is indeed the very highly trained professional that is dedicated, they are going to find some way to circumvent your protection system.

MR. KERR: That is not my point. My point is that people in psychology have told me there isn't any psychological testing that will pick that person out.

MR. CARROLL: And what you are saying is, adversary could - there are two kinds of employees; one is the employee who might be psychologically unstable and his boss picks on him one day and he says I am going to get even and do something bad in the plant. The other is the employee who is the professional terrorist who is working in your plant. You trust him, he seems like a good guy, and he is really just sitting there waiting for the day when he is going to do something bad.

MR. BAHADUR: You can extend that with more, sir. It is also talking about an employee who, because of his financial

commitment, has undergone so much of debt that right he is out for temptations of large sums of money. Therefore, he can be easily influenced by the outside forces who might ask him to do something to commit acts in those lines.

So, those kinds of things could be caught in the credit checks, for example. You could also have an employee who may have taken an extended period of time away and he had gone somewhere on a training someplace, maybe he became friends with somebody somewhere in a terrorist region.

MR. KERR: I guess I am skeptical about the credit check, because if you are going to be suspicious of everybody who has over spent his credit cards - I mean, you are going to be looking at --

MR. BAHADUR: The credit checks will also show not only the credit cards but, also, your financial history. If you have large sums of loans, for example, it will be shown in your credit checks.

MR. KERR: I recognize this. I am simply saying to me, there is unlikely to be a very high correlation between that and the inclination toward sabotage, but that may be due to my inexperience.

MR. BAHADUR: We are trying to gage into the characteristics of a human being whom we actually do not know through his direct action whether he or she would be committing that act. But there are attributes in the rule, background

investigations, psychological assessment, then the behavior monitored by the supervisor - all these three attributes together might give you a synergistic affect, whereby you may be able to make a judgmental case whether or not the person is reliable or trustworthy.

Of course, there is no foolproof method by which it can be said that aye or nay this person is going to do this. This one attempt of going through a three-prong approach, whereby you are trying to probe into the actions, the behavior, the background and the thinking of a man to make a conclusion whether or not he is stable and reliable. The rule is not an exact science, and I say this over and over. It is only a judgmental rule, based on right now, tools which are available to us, those being the three attributes that the rule has.

Based on that thinking, the package that you have shows that there are three major attributes in the rule; background investigation, psychological assessment and behavior observation. When I came to you last September, the package you had, there were certain requirements within the rule under these attributes. When I went to CRGR, the view of the Committee was that the rule was too proscriptive already. We were trying to ask the licensee to do so many definite things. Therefore, we should go back and revise that and make it into a very general rule.

So, the package that you have in front of you today

does not ask a licensee to do any specific thing under these three attributes, but just ask a licensee to develop an access authorization program which will have these three attributes in it; background investigation, psychological assessment and the behavioral observation.

Now, there is one acceptable way of meeting these requirements, which we propose in the regulatory guide. The licensee can go back to the REG guide to get the detailed guidance. The REG guide does endorse NUMARC guidelines with some partial exceptions. According to that, the background investigation would require such elements of maybe true identity, employment history going back to five years, education history going back to five years, credit history, military background and, of course, the criminal history.

MR. KERR: There was some discussion apparently in the comments from the public about the amount of information that you needed on educational background. Apparently, you need more than just the fact that a person has finished high school or has a degree or doesn't have a degree.

MR. BAHADUR: Right. The education history right now is being asked as the last five years.

MR. KERR: You want a detailed listing of courses and have that verified; how much detail do you anticipate?

MR. BAHADUR: For example, if the person says that he has a B.S. in chemistry and biology from such and such

university, an employment history means have verification of that degree that he has.

MR. KERR: All you would expect one would ask for is verification that he had the degree, and not that he had taken course X?

MR. BAHADUR: That much detail, the regulatory guide does not go into. The psychological assessment, the REG guide asks for a personality test or any other professionally acceptable clinical method. The test is not a requirement by the rule. If there are other acceptable methods available in the professional society, then that could be used. If there are adverse results in this screening process, then a clinical interview would be required in the regulatory guide.

MR. KERR: The education check was not with the idea that one would be more stable if one had more education, but rather whether somebody would lie about their degree?

MR. BAHADUR: That was the basic premise. The education was not considered measurement of the stability of a person.

MR. KERR: Thank you.

MR. MICHELSON: Some of our past discussions on this subject brought to light the question of what happens to a person, in a case of a person who has recently come to this Country, and to what extent you are going to check the background back for five years, four of which might have been

in some other country. How did you finally come out on that? What happens in a case when an employee who has only been in this country for one year, is that all the checking you do?

MR. BAHADUR: That's a good question.

MR. MICHELSON: We asked this several times before, so it shouldn't be new to you. I think it is a good question.

MR. BAHADUR: The question as I recall previously was posed as, if a person takes a foreign travel -

MR. MICHELSON: That was one aspect, yes.

MR. BAHADUR: -and how does this process check into that possibility. If a person is new in this Country, from my own experience, I would like to mention that what happens is, if a person comes here as an immigrant, he has to complete a five years of stay before he gets to a citizenship status.

MR. MICHELSON: That hasn't been true in recent years, though, I don't think. I mean, we have a large number of immigrants who haven't waited somewhere else -

MR. KERR: I think he said where he could get status as a citizen. I think that is the case.

MR. MICHELSON: That's true. As a citizen, yes.

MR. KERR: Isn't that what you said?

MR. BAHADUR: Right.

MR. MICHELSON: You have to be a citizen before you can work at a nuclear power plant?

MR. BAHADUR: No, I am not sure if that is true. I

am saying that is --

MR. MICHELSON: I don't think so.

MR. BAHADUR: That is one way - Loren, do you have any -

MR. ROSZTOCZY: Let me add a few words to that. The present wording in the guide is that they have an investigation back to five years. In a case like somebody who has been in this country only portion of that time, then it is a best effort type of investigation. So, our expectation is that they will do the best that can be done under those circumstances.

MR. MICHELSON: What do you think the utility is going to do, since it is always much more difficult and expensive to check the information and background from another country? There is no requirement that the utility do it at all.

MR. ROSZTOCZY: The difference in checking something here and outside the country are getting smaller and smaller. To request any information what you do in writing, you can request it just as well from there as you can request it from here, even telephone calls like interviewing people on the telephone.

MR. MICHELSON: But you do expect the utility then to do this?

MR. ROSZTOCZY: We would expect the utility to do a best --

MR. MICHELSON: It is not clear from the rule.

MR. ROSZTOCZY: -best effort background check.

MR. MICHELSON: It wasn't clear from my reading of the rule, as what you expected. In fact, it wasn't even discussed in the rule.

MR. ROSZTOCZY: The rule is very general. The rule doesn't come anywhere close to this type of --

MR. MICHELSON: It is understood that you check the background no matter where it might be coming from.

MR. ROSZTOCZY: Make a best effort to check the background, independent from where it might be.

MR. MICHELSON: That might be well to be a little more explicit about, but I guess maybe it is understood.

MS. FRATTALI: For your information, it is specifically addressed on page five of the NUMARC Guidelines, which is part of the regulatory guide in your package, the exact words.

MR. WARD: Would you identify yourself?

MR. BAHADUR: That is Sandy Frattali.

MS. FRATTALI: Excuse me. Sandra Frattali from the Office of Research.

MR. MICHELSON: Yes, I read page five. I will have to go back and re-read it and see why I missed it. Thank you.

MR. BAHADUR: The behavioral observation is also indicated in the regulatory guide. It mentions that an

employee would be observed through its management and supervisory tools. The supervisor would be observing any changes in the behavior, and the training is also suggested for supervisors to be sensitive to those kind of needs.

MR. MICHELSON: Let me comment on page five of the NUMARC Regulatory Guide. It doesn't really address what happens if you can't go back because it is another country and, therefore, perhaps more difficult. It only addresses what you do. It had one other statement in here which I was going to ask for clarification, and will now. It says under no circumstances may an unescorted access be granted based on an employment check of less than three years.

What does that mean? Apparently at least three years, no matter what country he came from is needed; is that the correct interpretation of that statement?

MS. FRATTALI: That is for the employment history.

MR. MICHELSON: That is part of what we are talking about.

MS. FRATTALI: Sandra Frattali from the Office of Research. Yes, that is correct for the employment history. That is the way the guidelines read and we have not taken any exception to that.

MR. MICHELSON: NUMARC realizes that might mean that checking on employment from other countries as well?

MR. ROSZTOCZY: That would be our expectation.

MR. MICHELSON: Okay.

MR. WARD: Wait a minute. Is that the employment history just as stated by the employee, not necessarily as -

MR. CARROLL: No, the verification of it.

MR. MICHELSON: Verification is all I assumed, yes. But they would go back to the country of origin of that experience, at least for three years always.

MS. FRATTALI: That is how the guidelines read, and we have not taken exception to that.

MR. MICHELSON: I didn't read any best efforts or anything in reading this. I read it rather hard.

MR. CARROLL: Best effort the first three years.

MR. MICHELSON: No, I am reading this sentence right here. Under no circumstance - I don't care what it said anywhere else - it has to be at least three years, the way I read it.

MR. CARROLL: That is correct. The five years is where the best efforts come in.

MR. MICHELSON: Okay, yes. At least three years, you would always have, no matter what the source of origin, unless he hadn't yet worked three years. I assume it meant checking everything up to three years, if he had worked that long.

MS. FRATTALI: Yes.

MR. BAHADUR: Just as a matter of side interest, NRC was able to get my background from India before they gave me

the Q-Clearance. They went through my background check in India.

MR. MICHELSON: Q-Clearance is a whole lot different. We are not talking about anything equivalent to Q-Clearance here.

MR. BAHADUR: What I was trying to bring upon is that there is, therefore, some sort of procedure in place whereby people can get the information.

MR. MICHELSON: Government to government, yes. In a private company to foreign employment, I don't know. That is why I am asking. I don't even know that you can do this easily as a private employer. As a government, there is no doubt in my mind. The government can check around the world.

MR. ROSZTOCZY: I think we have some representatives here from NUMARC if you want to check with them whether the private enterprise has any problem in this background checks. Maybe they could be of some help.

MR. MICHELSON: Yes, it would be worthwhile to hear their understanding.

MR. INCHABALDT: I am Rich Inchabaldt from NUMARC. You understand correctly, Dr. Michelson. We expect that they will do a foreign check, as it says in the guidelines.

MR. MICHELSON: Well, it didn't say it in the guidelines.

MR. INCHABALDT: It doesn't limit where they do the

check. It says you will do the check until there is no -

MR. MICHELSON: You have given me the clarification.

MR. WYLIE: What happens if you can't get the information?

MR. INCHABALDT: If you can't at least verify three years, the person will probably not be employed.

MR. MICHELSON: That seems to be the inference of your guidelines.

MR. INCHABALDT: Yes, sir.

MR. WARD: What about the practicality of a private company, a utility seeking this information overseas; are there practical problems in doing that?

MR. INCHABALDT: I have no information on that, sir.

MR. WYLIE: Say from Iran?

MR. MICHELSON: Yes, they have nuclear reactors over there or Iraq.

MR. WARD: That might be difficult, yes. They have former residents from over there too.

MR. KERR: If NUMARC arrived at it, and presumably in consultation with utilities, they must accept it as reasonable. I see no reason to disagree with it.

MR. MICHELSON: I don't either. I think that three years is an adequate check, if it is mandatory.

MR. BAHADUR: The rule requires licensee to develop a program with these three attributes in it. At the same time,

the rule - the licensee, that in any event, the individuals which are certified by NRC would be given access authorization without going through these.

MR. CARROLL: But not the inspectors from the State of Illinois. That was one of their questions. They wanted to be exempt from that also.

MR. BAHADUR: There are provisions for special cases in the rule. For example, there are cases where, if the authorization is already existing when the rule hits, or if the authorization has to be reinstated, if it has to be transferred from one place to another, or a temporary access authorization has to be given, the rule provides that the licensee can provide access authorization in such cases. The regulatory guide goes into the detail of the conditions that one has to meet in each of these cases.

MR. MICHELSON: Excuse me. Just so that I might understand what some of this might mean, would you reiterate who all will be covered by this rule? By that, I mean contractors and consultants, and so on and so on. Who will be covered by this rule?

MR. BAHADUR: The authorization is given by the licensee and, therefore, this rule is meant for licensee to follow. But he can give this access authorization to an employee, he can give it to the vendor, can give it to the contractor, as long as these people have gone through the

process which has been stated in the rule.

MR. MICHELSON: In order to grant it to anybody, they have to follow the requirements of the rule?

MR. BAHADUR: Right, except the NRC certified individuals.

MR. MICHELSON: Okay. I just want to make sure that we were together. Thank you.

MR. BAHADUR: The four special cases that I mentioned on the earlier slide, I just want to take them one by one and just highlight the requirement, the relaxation that the regulatory guide provides in these cases. If you had the access authorization on the day the rule is published, the grandfathering of the case, what will happen. The last time when I came, there was a considerable discussion on this issue. The way the rule was worded before was, if you had the authorization on the day the rule hits, although you may have the authorization for just one day, you would be grandfathered.

We had long discussion on that one. We have now incorporated the thinking of the subcommittee, and we have mentioned that the grandfathering would be to the individual's who have had uninterrupted access authorization for at least six months before the rule hits. What happens is, the six months of the time when this person has had the access authorization, the rule hits the ground here and then there is a one year period - six months period before the licensee has

to implement this program in his physical security plant.

In effect, a supervisor would have a chance of performing or monitor the behavior of that person for a year before he can be grandfathering that particular individual.

MR. MICHELSON: That was part of the concern, I believe, but another aspect of the concern was the goodness of the program that the individual utility might have had at the time in determining access authorization - let's say he had no program at all. If the fellow had been there more than six months, it looks like he can still be grandfathered.

MR. BAHADUR: That is a very legitimate concern, but at the same time, suppose there is an industry out there whose program is really in shambles, yet we do not have any action against that person. An inspection has not indicated that their program is in such shambles -

MR. MICHELSON: You don't have a rule with which to provide guidance for such inspection.

MR. BAHADUR: Right. At the same time, the commitment shown by the industry on paper and the assurance of their actual practices does not indicate that any or most programs are not meeting at least the minimum intent of the rule. And then, these additional six months of the behavior monitoring would provide the supervisor and the management sufficient tools to decide whether the individual should be grandfathered or not.

MR. MICHELSON: What is the minimum intent of the rule? Is that the NUMARC guidelines?

MR. BAHADUR: The minimum intent of the rule is the three attributes, namely the psychological assessment, background investigation and the behavioral observation.

MR. MICHELSON: So, if any utility - that would make some sense. You are just saying that every one of these utilities already has such a program with those three elements in it; is that what you are saying?

MR. BAHADUR: That is my understanding. Loren, do you have any addition to this?

MR. BUSH: Based upon our limited surveys, the answer to that is no.

MR. MICHELSON: By limited, you mean how many -

MR. BUSH: The 20 licensees.

MR. MICHELSON: The same 20 that you looked at for this other part? Of course, two of those gave you no reply.

MR. WARD: What about sort of a subset of that question; what about in that survey, what would you say about the existence or the quality of training programs for supervisors who are supposed to be doing this behavior observation for a year or whatever? Are those in good shape in the sample of 20?

MR. BUSH: In that sample of 20, we could not look at the quality of the training program. I can answer the

question, however. In the development of the fitness for duty rule over the past couple of years, I did look at a number of licensees' fitness or duty programs that also included behavioral observation requirements in training therefore. We did find some problems and we did have concerns about the quality of the training in that regard. That was one of the things that we addressed quite strongly in the Part 26 fitness for duty rule.

MR. MICHELSON: What kind of background checks has this sample of 20 utilities been doing, how far back have they been going?

MR. BUSH: From the survey --

MR. MICHELSON: We are talking about here in the future, at least a minimum of three years checking back. I don't know how you - I guess those checks won't be done ever for the people that are grandfathered.

MR. BUSH: Okay. I think you probably ought to be told that there is some thinking consideration, if you would, to an additional rulemaking which we would call reinvestigation. That is something in the future, after we get this out of the way, rather than include that in this.

MR. MICHELSON: How far back will that reinvestigation go?

MR. BUSH: The standard is typically once every five years. So, that would go back to when the last --

MR. MICHELSON: That will just pick up since the fellow went to work for you after having been grandfathered and because of previous employment, so you will never check that previous employment.

MR. KERR: How far back do you think one should go?

MR. MICHELSON: Well, I think three years ought to be a minimum all right, but I don't believe in grandfathering anybody. I don't think there should be anybody on the site that hasn't had a three year check. Under this rule, you can. You can have plenty of people that will never get checked all the way back.

MR. BUSH: There is another rule, 7357, the Fingerprint Rule, which was mandated by Congress. That gets the FBI Fingerprint check.

MR. MICHELSON: That is for everybody.

MR. BUSH: For everybody that has unescorted access to the power reactors. There are over 225,000 people in the industry that had fingerprint cards submitted and processed.

MR. MICHELSON: That helps some.

MR. KERR: How many people were thrown out as a result of that?

MR. CARROLL: I guess I was Bill. I had my fingerprints taken the day I retired, because that's what the rule required.

MR. BUSH: I think the number of people with arrest

vary by utility, which I guess has some implications for the quality of their existing program. But, as far as how many were terminated, we don't have that particular data.

MR. KERR: It would be sort of interesting. It would give you some idea of how much the fingerprint rule accomplished, but maybe you don't want to know since Congress mandated it.

MR. BUSH: One other point that I guess you should recognize, and this probably leads into an issue that you will have later on in the cold shutdown, licensees can devitalize. When they devitalize, they would not submit the fingerprint card on those particular people.

MR. CARROLL: Carl, going back to your concern about grandfathering, historically that is what has been done in the industry.

MR. MICHELSON: I realize, yes.

MR. CARROLL: In the case of the utility that I came from, if you worked anyplace for three years and you got a clean bill of health from your supervisor, you were grandfathered. It was just new employees that were subjected to these three attributes, as they call them.

MR. MICHELSON: Of course, you don't have to work three years somewhere else to be grandfathered either.

MR. CARROLL: That's right.

MR. MICHELSON: You can work there one week and get

grandfathered under this.

MR. CARROLL: No, you have to have six months.

MR. BAHADUR: You have to have a minimum of six months, regardless. And, you are assuming that you got your access authorization the day you joined the company, which may or may not be possible. It is quite likely that you may have to have stayed in that company, got your access authorization, did your six month time, that's when the rule hits you.

Now the licensee has another six months to implement that. In effect, if you believe in the system and you believe in the supervisor management control then, in theory, there is a window of 365 days under which this person could be under scrutiny before he would be given --

MR. KERR: By the time the check is completed, he will probably have been three two or three years.

MR. CARROLL: It isn't quite that bad.

MR. BAHADUR: The second special case that the rule provides for and the regulatory guide gives the details on, is the reinstatement. The reinstatement provision is that, in case you had the access authorization interrupted for a period of time, it could get reinstated provided that interruption was not more than 365 days. It just gives you a provision so you don't have to go back and do the entire requirement of the rule before you reinstate that authorization, of course, the condition being that your previous - when your authorization

was over, it was terminated under favorable conditions.

MR. MICHELSON: Is there any requirement to check on what he did for that 356 days?

MR. BAHADUR: It happened to be a number of days per year, and that's why we came to 365.

MR. MICHELSON: No, I say, do you have to investigate as to what he was doing during that period of 365 days when he was not authorized access?

MR. BAHADUR: The requirement is not there. As long as he had a clean authorization before that, and as long as your authorization was not terminated unfavorably, that is the only requirement.

MR. MICHELSON: Well, how about taking a trip over the Libya for a year to get trained; would that be revealed when he came back to work somehow, or would he even be checked to see what he had done for the last year? He did have authorization before and then he left for a year.

MR. BAHADUR: That type of dictate is left to the utility to decide on.

MR. MICHELSON: It looks like that is a rather large loophole in the process. I would think when he came back there should be a minimum requirement that there be some kind of a check on what he did for the year that he was gone before you reinstate him. I don't know what that check should be, but it should have some kind of a few minimum requirements.

Does the NUMARC guideline cover a case like that?

MS. FRATTALI: The NUMARC guideline is general. It simply says as Sher put it on the board, that is the NUMARC guideline.

MR. MICHELSON: That a person can be gone for a year and get reinstated, but no definition of what reinstated might require in terms of some type of additional check?

MS. FRATTALI: It just had to be a favorable termination to begin with.

MR. MICHELSON: That looks like a very large hole in the system, but just an observation.

MR. BAHADUR: As I mentioned earlier, because of the standard practice that this rule would largely provide in the industry, it may also be possible to transfer authorization from the utility to utility, and the guidance do provide some relaxation in that area. For example, you may transfer from one utility to the other, provided first of all that there was not a break in the authorization for more than 365 days. In this case, you do check the identity of the person, the written authorization from wherever it was and, also, the information on the interrupted time. That is, the time in which you were from one utility to the other.

The previous case, the reinstatement, assumes most likely the person was in your own employ. You had the employee who had the authorization and then you transferred him maybe to

a fossil plant somewhere, and his authorization got discontinued. You could get him back and reinstate that.

In this case where you are getting completely an unknown commodity, somebody coming from a different utility, you would like to know what happened in that time period where his authorization was discontinued.

MR. MICHELSON: Well, in the first case which was, I assume, you meant the previous slide; is that right?

MR. BAHADUR: Yes, sir, the reinstatement.

MR. MICHELSON: On the previous slide, it doesn't say that he was employed during those 365 days. It just says that he didn't have access authorization. It could be because he took a leave of absence or it could be because he went over and worked in a fossil plant, I don't know.

MR. BAHADUR: If he worked --

MR. MICHELSON: It would make quite a difference though, I think, in how one would view it. If he was continued to be employed and, therefore, indirectly observed anyway, that is one matter. But if he left the company for a year and came back, that's quite a different matter. I would see that no different than for a contractor.

MR. BAHADUR: Let's say he left the company and came back. I mean, there are various scenarios that we can go through. The first scenario would be that this man had the authorization, he went someplace to work where he did not need

this authorization and therefore it got discontinued, but he still remained in your own employ. Or course, you knew his whereabouts.

MR. CARROLL: Not necessarily, because most companies have a provision for leave of absence also.

MR. MICHELSON: You would just be plain gone.

MR. BAHADUR: Yes, that is true. If he went on a leave of absence somewhere and then came back, then yes, it does not provide for the background check. If he came from another utility, then of course, it would be a transfer provision.

The last special provision that the rule provides for is the temporary access, an access authorization which could be provided for a 180 day period, maybe during special construction going on in the plant or whenever you need in a hurry some requirement of an access authorization on a temporary basis, then the rule does provide a relaxation.

For example in the background investigation, the employment needs to go only as far back as one year and not five years. Similarly, the character and reputation could be based on one reference and not the four references that were in the full scale of rule. If you had the psychological assessment in the last one year, then you don't need to do the psychological assessment. Of course, the behavioral monitor would be continue the way the rule provides for.

MR. MICHELSON: Is there some assumption here that a temporary employee is less dangerous than a permanent one and, therefore, you don't need to check on them as much? Or, he just doesn't have as long a time in which to do his thing, although 180 days for instance would be quite a long time in which to plan an appropriate scenario.

MR. BAHADUR: There is a pretty specialized thinking behind this. Loren, I would like you to address that.

MR. BUSH: You really should refer to Rich Inchabaldt from NUMARC. Yes, I do recognize that it is an issue. People with temporary access could constitute a hazard, but I think that the logic that went into this provision in the rule and the NUMARC guideline is the fact that in order to do business you have to be able to bring people on, and the way to do that was to characterize minimum elements of the program that could be doable within a short period of time to bring them on under some limited conditions and start utilizing them and then complete the rest of the process.

MR. MICHELSON: Wait a minute. Nothing says in here that you will ever complete the processing, you just check one year of employment. I mean, you won't go and check two and three years later. You are just going to check one year. This, I assume, temporary means that you are bringing them on for a particular application and not because he is going to be a permanent employee.

I was just trying to figure out the logic of why temporary employees are less dangerous than permanent employees and, therefore, don't have to be checked as much.

MR. BUSH: I would not make the conclusion that they are less dangerous. In fact, I think personally I would make the --

MR. MICHELSON: I would make -- quite right. What is the logic on the

MR. CARROLL: I think they are less dangerous in general, because they are usually working on a specific job in a specific area of the plant, and really don't have as much unescorted access as say an operator does or whatever.

MR. WARD: Okay, but is there something - could there be or should there be something that constrains them in that way to compensate? I see this is sort of parallel with the L-Clearance as compared with the Q-Clearance. But for people who are L-Cleared, there are some constraints on what they have access to and what they can do in a plant to compensate for the lesser clearance.

MR. KERR: They are not getting zero investigation. I mean, one could make a case that this is enough investigation for unescorted access period, it seems to me. Fingerprinting and employment credit --

MR. WARD: They haven't made that case though, Bill.

MR. KERR: No, they haven't made it, but it seems to

me that we are talking as if no investigation has occurred at all, and that's not the case.

MR. WARD: No, but I am saying for the L/Q Clearance parallel, I mean there is less background investigation done for an L, but there is something to compensate for that, in that there are some constraints on what they are authorized to do.

MR. CARROLL: Administratively though, that would just be a nightmare to try to define what they can do. I guess in general, my statement is true. They don't either have the knowledge of the plant or they don't have really the amount of access.

MR. KERR: You do like cubscouts do, where the cubscout has to hold the rope all the time he's in the Q, you know, so you could have - the guy has to have one hand on a rope all the time he is working with the other hand or something like that.

MR. CARROLL: You do essentially that, when you have people in that are not cleared for unescorted access. It is really wild. You have somebody taking them to the bathroom.

MR. WARD: Yes, but that is something different. You are saying there is no intermediate --

MR. CARROLL: I don't know how to define it.

MR. WARD: - constraint that is practical.

MR. CARROLL: I really don't know how to define it.

Maybe somebody is smarter than I am.

MR. MICHELSON: Well, with the number of days that you would be allowed temporary unescorted access were a very limited number of days, 10 days or something, that would make sense. But, 180 days is a long time, plenty of time in which to plan a number of different kinds of scenarios that you couldn't possibly do maybe in 10 days. This is a long term. The 180 days is a long time. There is an easier way in.

If you wanted to get in and do this, this would be the way to go, do the temporary. Just go in as a temporary employee.

MR. CARROLL: You would be more likely to be challenged though, Carl, because if I see you as the temporary employee in some part of the plant that you don't belong even though you have "unescorted access" as a regular plant employee I am going to say what the heck are you doing here.

MR. MICHELSON: Well, hopefully, this guy is a temporary janitor. Then he has access to everything. He has to sweep the floors everywhere. Cleaning and janitoring work, that sort of thing, or instrument mechanic is a good one too. You can get around an awful lot.

MR. WARD: Sher, has anything been considered? I mean, what is the justification for this?

MR. BAHADUR: The justification can be summed up only as that this is only a partial relaxation of the requirement.

It is not something that you are picking a person completely green from the street. It is more like meeting the requirements of the industry, at the same time providing the - the requirement of the rule is that they are going to go through the fingerprinting, they are going to go through the employment check for a year, they are going to go through the character history.

There is going to be a character or reference type of verification on them. They are making sure that their psychological assessment is no longer than a year. Of course, they are always, continuously, monitoring for their behavior change. So, it is not a relaxation which seems like we are picking up people and letting them go in the plant with this grave danger. It is just that because they are there for a very specific purpose, maybe in a very confined space of the plant at that time or come in large numbers, and would a lot more closely supervised because they are only temporary. They are not somebody that is reliable and trustworthy on whom you give a job of responsibility.

That was the thought process behind allowing this relaxation for temporary access. But NUMARC is here, and --

MR. MICHELSON: What page is that discussed in the NUMARC guidelines?

MS. FRATTALI: That is on page eight.

MR. CARROLL: Pragmatically, if you required much

more than this, you just simply wouldn't be able to get people in on an emergency basis that you might need. I mean, that is the compromise that you are making. To do more, it takes a lot more time.

MR. WARD: Is the 180 days really necessary? I mean, do emergencies of this sort last 180 days? I mean, what if this were 30 days?

MR. CARROLL: What you are dealing with here Dave, are outages, where you have a construction crew coming in to make major modifications or supplemental INC or technicians or something. I think you need more than 30 days. I think if the utility started to see hey, I am going to need at the end of 100 days, I am going to need these guys another 100 days, I think they would get busy on getting them permanent unescorted access authorization. You don't wait until 180 days.

MR. WARD: Rich, do you have anything that you would like to say on this?

MR. INCHABALDT: What Mr. Carroll said is the reasoning behind the industry's position. You won't get the work done unless you have that temporary access authorization.

MR. MICHELSON: Let me ask the staff, on doing a background check for the fulltime employee, how many character references do you normally have to explore?

MR. BAHADUR: The regulatory guide requires four.

MR. MICHELSON: On temporary, I notice that only one

is required.

MR. BAHADUR: Right.

MR. MICHELSON: It's not quite like you are doing all the elements.

MR. BAHADUR: But just on a reduced basis.

MR. MICHELSON: Yes, you are not doing all the elements on a - you are only looking at one reference, for instance.

MR. WARD: Go ahead, Sher. Carl, is there anything else you wanted to say?

MR. MICHELSON: No, thank you.

MR. BAHADUR: Having talked about some of the elements and requirements in the rule, I would like to summarize for you, the exceptions that the regulatory guide has taken of the NUMARC guidelines. As I mentioned earlier, the rule is very heavily depending on the regulatory guide and the thinking was that the requirements should be based mostly on the NUMARC guidelines which the industry has developed, and has assured that they would be embracing voluntarily at time.

However, when you review some of the requirements of the NUMARC guideline, it became necessary for us to take exceptions to a few items. I will go one by one. The first item is the review process. The NUMARC guidelines indicate that if an access authorization is denied to an individual, and because of that denial that individual loses his employment,

then that person would have right to appeal only if he is an permanent employee and also if he is an employee of the utility.

The exception that we have taken is that this right should be available to both permanent as well as temporary employees, and should not just be limited to the utility employees only but should be extended to vendors and contractors also. So that, if a person is denied an access authorization, and as a result of that his or her employment is terminated, then that person has a right to go back and appeal and see what particular element caused that denial.

The second exception that we have taken is in the cold shutdown, and I will get to that in a moment. Let me just go to the other two, and there is a detailed discussion on the cold shutdown. The third exception we have taken is on the grandfathering, and the reason we have done that is as a result of the discussions with you last time when I came here. We have modified the grandfather conditions now, requiring six months at least a time period for the authorization before a person can be grandfathered.

MR. MICHELSON: Is there any provision for grandfathering contractor employees that have at the time, say access authorization, are they grandfathered or are they treated differently?

MR. BAHADUR: No. The grandfather clause would be

applicable to anybody who has had the authorization for six months until the day.

MR. MICHELSON: But the authorization might have been under some contractor's program to decide on authorization. The utility doesn't have a program to check the contractor, they require the contractor to have a program, I assume.

MR. BAHADUR: Authorization is granted by the utility.

MR. MICHELSON: Only by the utilities.

MR. CARROLL: Who has to have look at the contractor's program if he is going to take advantage of it.

MR. MICHELSON: Okay, a contractor can't do this at all.

MR. BAHADUR: The contractor may develop a program which the utility may recognize. However, the authorization has to be granted by the utility for the unescorted access into the facility.

MR. MICHELSON: Okay, only by the utility. Thank you.

MR. BAHADUR: That last exception, number four, that we have taken is on the audit procedures. The NUMARC guidelines says licensees program would be audited once in two years. The contractors program would be audited once every year. The exception that we have taken here is that, if the licensee subcontracts a portion of its program, like for

example, in its program of access authorization, background investigation is given to some contractor like TRW for example. Then, that program should also be audited every year. That is an exception that we have taken.

When I came here in September, I did have two exceptions -

MR. CARROLL: On the point you just covered, on the Q/A world we got into a situation where vendors were just being swamped by individual utilities having to audit the vendors Q/A program, a vendor that supplies a valve. A whole bunch of utilities got audited by "x" utilities if he supplied "x" of these valves. Are we falling into the same trap here? If there are companies that provide things like background investigation, is it permissible for the utilities to get together and have a common audit that they all buy into, sort of the case concept or whatever it is; is that okay?

MR. BAHADUR: This requirement is not in the rule. It is in the regulatory guide. There is a flexibility of this thing in the system, whereby a utility could come to us - that could convince to us that by taking this action the overall intent in the performance objective of the rule is not jeopardized. That would be perfectly all right.

When I came here last September, I did not have the exceptions on the cold shutdown as well as on the grandfathering. But I did still have four exceptions, and the

other two were the military history and the psychological test being both reliable. We have dropped both of these exceptions since then.

MR. MICHELSON: What is your requirement now?

MR. BAHADUR: The military history exception was, where the NUMARC guideline required only five years of military history versus we proposing the total military history. The basis for that was that because on the civilian side we were going through the criminal history of the person forever, while on the military side we were going for five years only. So, there was a disparity between the two.

We understand the MOU coming up between the FBI and the Army, whereby the Army records of any criminal offense would be transferred onto any FBI. Therefore, we understand that if the FBI check was made on an individual, they would pick up the crime which might have been committed during the military.

MR. MICHELSON: Is the FBI check also a part of this program?

MR. BAHADUR: Yes. The criminal history is a part of the program.

MR. MICHELSON: That's what you meant by FBI check.

MR. BAHADUR: Yes.

MR. WARD: You are telling us that two agencies of the Federal government are going to cooperate?

[Laughter.]

MR. BAHADUR: A case very well taken.

MR. MICHELSON: What do you do in a case where the military history is a foreign military history? A fellow worked in some other -

MR. BAHADUR: This rule does not address that possibility.

MR. MICHELSON: What do you do then? Of course, that's some of the better potential candidates, are those that are familiar with handling explosives and other kinds of devices. Those are good potential candidates. What do you do if -

MR. CARROLL: Candidates for what? You mean, as terrorists?

MR. WARD: Radiological sabotage.

MR. MICHELSON: That's the --

MR. CARROLL: I thought you meant for a job.

MR. MICHELSON: That's most of what this is pitched toward, is radiological sabotage, I assume. If he has been employed in a foreign military establishment, then you don't have to check that?

MR. WYLIE: You have to check it for five years.

MR. MICHELSON: That's what I am trying to find out. I asked if it is U.S., but if it is foreign, you have to check it still for five years?

MR. BAHADUR: I don't know if the rule specifically talks about a person being employed by a foreign army or forces. But Loren, do you have any thought on this?

MR. BUSH: It's just the basic, fundamental expectation that the licensee do the best they can do --

MR. MICHELSON: I would assume they would check whether it was a domestic or foreign army that he was a member of.

MR. CARROLL: I don't read that on page five of NUMARC. It makes it sound like it is geared to someone that served in the U.S. Armed Forces, because it is talking about specific records.

MR. MICHELSON: Yes, DD 214 only comes from the U.S.

MR. ROSZTOCZY: I believe the clause what we discussed earlier on the employment is the one which will apply the same way on this.

MR. MICHELSON: You consider that employment.

MR. ROSZTOCZY: If employment if in the past five years, if he was employed by an Army.

MR. MICHELSON: You would check that for only three years then.

MR. ROSZTOCZY: Yes.

MR. MICHELSON: If that's your interpretation, that seems reasonable. If that is what will be checked, that is reasonable.

MR. WARD: Sher, could I ask you a question? The NUMARC guidelines, apparently there may be more than one version of those. The page two of the draft paper refers to Rev. 8 of those guidelines, page three refers to Rev. 8(b). And the copy that we were supplied is August of 1989. Are those all the same thing, or what?

MS. FRATTALI: I am afraid that you picked up a typo. I am sorry. It should read Rev. 8(b). I am sorry, Sher. There is always an uncorrected typo. We are referring to Rev. 8(b), the version that was published by NUMARC in August of this year, 1989.

MR. WARD: That is 8(b) then.

MS. FRATTALI: Yes.

MR. MICHELSON: It would sure be nice to insert that in the NUMARC document, at least of what I can see -

MR. INCHABALDT: What Rev. 8(b) turned into the document that you have there, which is NUMARC 8901 of August, 1989.

MR. MICHELSON: That is the right one.

MR. INCHABALDT: That is the correct one, and that is identical to Rev 8(b).

MR. MICHELSON: That is the one that ought to be there. That one, I have no trouble with at all.

MR. WARD: Okay, good.

MR. BAHADUR: The second exception that we dropped

was the requirement that the psychological testing should be reliable and valid. We had a long discussion our last meeting. The way the rule is worded right now, psychological testing is not even a total requirement if there is any other professionally acceptable clinical method of achieving the same results in the regulatory guide.

Therefore, we have dropped that exception.

MR. WARD: What would a generally accepted clinical method be; give an example?

MR. BAHADUR: What could be, other than a psychological testing?

MR. WARD: Yes.

MR. BAHADUR: Nothing comes to my mind at this time, but if the -

MR. WARD: When you say clinical, is that an interview but with a qualified -

MR. BAHADUR: The interview is to follow. There is a psychological testing. If during the screening process you do see some bad apple in the sample, then you would go through the follow of a clinical interview. So, clinical interview is a requirement but the psychological testing could also be substituted by any other acceptable clinical method.

MR. WARD: I am still puzzling over what another accepted clinical method might be though.

MR. BAHADUR: I would like to go back to my bullet

number two, the cold shutdown.

MR. KERR: Excuse me. There is also some indication from notes supplied to us that CRGR raised an issue which you must have settled on why is a rule needed if the utilities are doing well, and why not endorse the industry guidelines in total rather than taking some exceptions. You apparently satisfactorily answered both of those questions when you met with CRGR.

MR. BAHADUR: Yes. As I mentioned earlier, what this rule would do would be to ensure that those plants which are doing as good as they say they are and they would continue to do so, right now, there is no commitment.

MR. KERR: I wish you would say make it more likely rather than ensure. Maybe you feel more comfortable saying ensure.

MR. BAHADUR: That is the intent of the rule. Right now, there is no definite requirement in the rule, but once these requirements are made the physical security plans are modified. Then, this would be the commitment that the industry would be making.

MR. KERR: I am just not saying as you are, that if there are only two out of 20 that aren't doing a good job that those two are automatically, when a rule comes into existence, going to be better, nor am I all together certain that the other 18 may not be worse.

MR. CARROLL: Or, the two even have a problem based on what the survey was about. But, I probably should have more faith in the process than that.

MR. BAHADUR: There was a discussion on the cold shutdown also during our last meeting. The thinking was that there was too much relaxation in the cold shutdown period for NRC to encompass the industry guidelines and let the industry follow whatever the NUMARC guideline. We have taken an exception to this because of two reasons.

First, the NUMARC guidelines do not differentiate between the protected area and the vital areas. They have given the guidelines, assuming - well, let me just back off a bit. The guidelines talk about the visual inspection to detect tampering or sabotage in the protected area. And then for the vital areas, we talk about the procedures which are required for the start up and the safe operation of plant system. But we are not clear what is really meant and what these procedures, these visual inspection would lead us into.

At this time, the staff felt very uncomfortable accepting the NUMARC guidelines as it is, and providing that blanket relaxation during the cold shutdown to the industry. Therefore, the present rule does not have or does not include in the regulatory guide any relaxation for the cold shutdown. What we have done is, we have provided a case-by-case plant specific ways by which the cold shutdown provisions could be

made possible. If, for example, the utilities do have in their present physical security plan requirements, the conditions for the cold shutdown which has already through the NRC review and certification and then status quo, they will be allowed to do so.

If they come to us on a case-by-case plant specific basis, we are willing to look into it. But in the meanwhile, the staff is going to develop their own position on the cold shutdown. So, we have decoupled this effort completely from this rulemaking, and the staff -

MR. MICHELSON: Is that another rulemaking or something then?

MR. BAHADUR: Pardon?

MR. MICHELSON: Is that going to be another rulemaking?

MR. BAHADUR: Well, Loren or Phil, would you like to talk on that?

MR. McKEE: Phil McKee, with Reactor Safeguards Branch. I don't think there has been a determination on that. The staff is looking maybe within the structure in the current rule, how the rule is structured. It may be dealt with by revisions to the regulatory guidance or other mechanisms, not necessarily a different or unique rulemaking effort.

MR. MICHELSON: You mean, you might modify the regulatory guide that endorses the NUMARC -

MR. McKEE: That is correct. That is one possibility.

MR. WARD: This regulatory guide, we are talking about today?

MR. MICHELSON: Yes.

MR. McKEE: We might make revision to this regulatory guide sometime in the future. It would be Rev. 1, or whatever some future revision to the reg guide.

MR. WARD: I thought when you said decoupled, it doesn't seem to me that that issue is uniquely related to access authorization. I mean, you got into it this month, this year because of that. But that is an issue that should be dealt with in the definition of vital areas and the security plans, wherever that is defined, it seems to me. What is wrong with that argument?

MR. BAHADUR: That is what the current thinking is, as Phil had mentioned. There are, right now, we are in a sort of flux and we haven't been able to decide which rule might go. When we talked to CRGR, the CRGR was of the opinion that we should go ahead with this rule, allow the status quo on the cold shutdown situation, and then start another effort, and effort which take the vitalization, devitalization issue in a lot more detail and see as to what is the best way of dealing with this particular subject.

But right now, the staff is still wrestling with this

issue, and we haven't come to a conclusion yet.

MR. MICHELSON: Would you clarify again what is the status quo?

MR. BAHADUR: The status quo means that if the industry - if the utility has a cold shutdown provision already in their physical security plan.

MR. MICHELSON: Even though it is not a part of this rule yet, because the rule --

MR. BAHADUR: Right. The existing physical security plan may have a cold shutdown provisions.

MR. MICHELSON: You are sort of grandfathering that until something better may come along.

MR. BAHADUR: That is correct.

MR. CARROLL: If they have it.

MR. MICHELSON: Yes. If they don't have it, then it is not grandfathered except apparently, you can go and make a case out of that.

MR. BAHADUR: They can come to us on a case-by-case, plant specific basis. The staff can then review and then say yes, okay, go ahead and do it. There is no blanket relaxation during the period of cold shutdown as was proposed by the NUMARC guidelines.

MR. MICHELSON: Thank you.

MR. BAHADUR: I would like to conclude this presentation by bringing to your attention, the five issues

which were raised by the CRGR during our meeting last week. The first issue was on meeting the backfit requirement. The CRGR expressed their view, and because we have not received the minutes of the meeting yet, so I would like this to be taken only in that spirit. It may be possible that I may be restating some of the issues a lot more strongly than perhaps eventually will turn out in the memo.

But the thinking of the CRGR was that this rule really does not provide the increased assurance of safety. Yes, it is needed, and it is needed because the NRC does not have standard on the access authorization. Yes, it is needed just to ensure that the utilities which are doing that minimum level of work will continue to do so. Yes, it is needed because some of those bad actors or some of those utilities that we suspect are not up to par maybe also likely to come on the same level. Of course, it will be a good guidance for the future plans also.

So, the rule is needed. Also, because there is a very definite direction from the Commission. The CRGR was of the opinion that although it does not need the backfit requirement of providing the enhanced safety. Nevertheless, go ahead with the rule, give it to the EDO, give it to the Commission, give it to ACRS, but bring it to their attention that it is a possibility that they may have to take an exemption of their own 5109 rule on the backfit.

MR. KERR: That also calls for significantly enhanced safety doesn't it, not just enhanced safety?

MR. BAHADUR: That is correct, a significant increase in safety. In the same breadth, the CRGR also mentioned that however, if the cold shutdown provisions were included in this rule, it would make a very strong case for enhanced increased in safety because right now that is a big unknown. But they also recognized that that is a major effort, has to be decoupled from this rulemaking activity and, therefore, should be taken separately.

MR. KERR: It is difficult for me to see how one is going to make any sort of quantitative record that this will enhance safety. I mean, this is one of those areas where the Commission is going to have to make a judgment. That is, after all, why they are there. It seems to me that it has to occur. You can't do a quantitative demonstration here that is a cost benefit analysis to this. It seems to me to weaken the case if you try to do it.

MR. BAHADUR: As I mentioned before, the detrimental of cost is only one percent of what the industry is spending right now on the access authorization.

MR. CARROLL: That doesn't mean anything though.

MR. BAHADUR: And, it is so difficult to quantitatively evaluate the enhanced increase in safety, something that I cannot put a number on. It is a judgmental

call. I made my case for the need for a rule based on the slide that I showed you earlier. If the Committee has other opinions on this then, of course, we would like to hear that.

MR. WARD: Do you want to expand on the comment that you made?

MR. KERR: No.

MR. WARD: They talk about the need for cold shutdown provisions. Also, if you do that, it will enhance more towards the case that it gives us the enhanced increase in safety. They mentioned that the rule is too bare-boned now. We took the rule the first time, it was very proscriptive. We came and back and repaired it down, and the feeling in the CRGR was that now perhaps you have taken more than the fat. You have taken out some of the meat out of it.

The suggestion was that we should reinstate or put back the performance objective for each of the three elements that we talked about, the background investigation, the psychological assessment, and the behavioral observation. We should put some words in there so that we can say this background investigation should be designed to attain, and then give the performance required by that particular attribute. The reason they said we should do that, so it is easier for the inspector to enforce that particular action.

The CRGR mentioned that we should not take the exception for audit, we should let the licensee's program be

audited every two years, contractor every one year, and if the licensee decides to subcontract some portion of its program that should also be audited once in two year and not once a year like we have taken an exception for.

Their last suggestion was that we should increase the implementation period from 180 days to one year. In other words, when the rule hits the street, when it is published out there, we should give a utility at least a one year period to implement the entire rule. The thinking was that the rule is very involved, and it does require modification of existing programs or the reinstatement of some new programs, and the utility may take that kind of time to mobilize their work into this.

Those were the five major issues that the CRGR brought to our attention last week. That concludes my formal presentation.

MR. ROSZTOCZY: Maybe an additional remark on that. As Sher mentioned, we have not yet received the letter from CRGR. Nevertheless, from the concluding statements of the meeting, it is our understanding that CRGR is recommending to the EDO to send the rule up to the Commission with some of these suggested changes and with a different treatment of the backfit rule.

MR. WARD: Thank you. Are you looking for something from us?

MR. ROSZTOCZY: Yes, we would like to have --

MR. BAHADUR: Yes, we would like a letter.

MR. WARD: What sort of letter would you like?

MR. BAHADUR: A letter saying that the rule looks good.

MR. KERR: I have no reservations about most of the things that are being proposed, I think they are worthwhile. I wish I were more convinced than I am that a rule was needed. Maybe the incentive for this comes from the Commission and the staff is just doing what the Commission says, but it appeared to me that NUMARC was on its way toward a quite workable solution to the problem. I wish that could have been given an opportunity to develop.

MR. WARD: Bill, it seems to me that it is. I had the impression NUMARC wasn't really objecting to the concept of a rule of this sort, of the general sort. Is that a fair - Rich?

MR. INCHABALDT: As Dr. Kerr said, that is the way we wanted to go. When the Commission voted back in April that it had to be a rule, we had no basis to say it shouldn't be a rule, other than to say we had already made that pitch. What the industry is interested in, is that we finish this project in some manner and don't leave it hang on for many, many more years as it has been. If that requires it to be a rule, then so be it. We would still prefer to have the policy statement

with the NUMARC guidelines, yes, sir.

MR. WYLIE: I just have a comment. There is nothing in the proposed rule or the NUMARC guidelines except for the utilities background investigation and assessment of that, that would prevent aliens from foreign countries to get unescorted access; is that correct?

MR. BUSH: Nothing that prevents --

MR. WYLIE: Hostile or otherwise.

MR. BUSH: There is nothing that would prevent - first of all, there is nothing in the rule which prohibits a licensee from hiring anybody they want to.

MR. WYLIE: That's what I get, as long as the paper is okay. It's the judgment of the utility.

MR. MICHELSON: As long as they don't have a criminal record.

MR. WARD: Let's see. Sher and Zoltan, we appreciate your coming down. We need to ask you to come back on Thursday for the Full Committee. We have, at 8:45, we have actually two and one-quarter hours scheduled, which is rather long. Does the Committee have any -

MR. MICHELSON: Are you going to have a letter to look at by that time? Are we going to spend part of the time on the letter?

MR. WARD: Yes, we could. They have spent less than two hours, an hour and one-half today. Do you have any

suggestions for their presentation?

MR. KERR: You might talk more slowly. But other than that, no.

MR. WARD: No, shorten it, or do you think that is about right? What advice should we give to them?

MR. CARROLL: I think it could be streamlined a little bit, and probably be presented in less than one hour.

MR. ROSZTOCZY: We can certainly do that.

MR. MICHELSON: Do you want to include this fitness for duty business too?

MR. WARD: That is a separate item.

MR. MICHELSON: Yes, but as a part of the presentation for the Full Committee?

MR. WARD: That is a different day.

MR. MICHELSON: That's a separate item on the Full Committee too.

MR. WARD: Yes. We are very generous.

MR. MICHELSON: Yes, they have lots of time.

MR. WARD: Rich, I guess I would appreciate it if you could come.

MR. INCHABALDT: Yes, sir, I will be here.

MR. WARD: And answer questions.

MR. INCHABALDT: Yes, sir.

MR. WARD: Thank you.

MR. BAHADUR: Would you like me to walk the Committee

through the rule then, or shall I just highlight the issues that we have taken for the rule? Or, may I do both?

MR. WARD: I think you are really going to have to do both. Jay, you thought he could streamline it, but how would you suggest?

MR. CARROLL: I think just talk faster.

MR. MICHELSON: From our recent discussion of a week or so ago, I got the impression that the Committee doesn't have to be brief on all the details. They are supposed to read the briefing papers and we just hit the issues. On that basis, I think you could streamline it considerable. But, that's up to them.

MR. WARD: What is in the rule has changed, and despite that Carl, I don't really expect the rest of the members to have read all of this.

MR. MICHELSON: I don't either.

MR. CARROLL: They did hear a presentation in September.

MR. WARD: Yes. I think that just maybe describing the rule by difference from what they heard in September would be -

MR. BAHADUR: In September I came before the Subcommittee, sir, not the Committee.

MR. WARD: That's right.

MR. CARROLL: Maybe we do have to say more.

MR. ROSZTOCZY: We probably should keep a summary of the rule, but we will streamline it.

MR. WARD: Yes. You have two hours. In particular, as we mentioned to the group that was here earlier, if you could try to react and sort out what you heard from the Subcommittee here today and include comments on the questions or comments we raised in your presentation, otherwise we will feel constrained or members will feel constrained to ask the same questions so that the same points get aired by the full Committee.

MR. CARROLL: I am frankly getting tired of the Libyan- MR. WARD: If you could just proactively deal with those points, I think it could be more efficient and not take as much time. I think there are some important points raised, and you want the other Committee members to hear them or think about them. It would probably just be more efficient if you would bring them up instead of waiting for us to bring them up again.

MR. ROSZTOCZY: We would be happy to do that.

MR. WARD: Okay.

MR. CARROLL: One final question of NUMARC. Assuming that this thing goes through as we are seeing it today, you believe that the industry will embrace it fully and nobody has any huge problems with it as it presently exists?

MR. INCHABALDT: Yes, sir, I believe that will be the

case.

MR. ROSZTOCZY: They have a choice in terms of the NUMARC guidelines, they have a choice that they could do something else instead. But the expectation is that they will be embracing the NUMARC guideline.

MR. KERR: How many additional inspectors will have to be employed in order to inspect for this rule, do you suppose?

MR. ROSZTOCZY: That is left entirely to NRC to decide. We don't have to inspect every rule.

MR. McKEE: We say we wanted one FTE.

MR. WARD: One FTE per the whole -- good.

MR. McKEE: There is some inspection in that same area. So, in fact, when the rule comes out we may be able to have efficiencies in redesigning our inspection without a total additional FTE there to cover those areas. We have to look at that, and how best we can do that.

MR. WARD: It is called scale, when the more rules you make the less you need.

MR. CARROLL: I would however caution that one should be careful about this Marine Corps analogy, since some people would consider that a very sexist sort of a position here. Your FTE's could be female also, right?

MR. WARD: So could Marines.

MR. CARROLL: Yes, but they only want a few good men.

MR. BUSH: I have a comment. At least in our thinking in the earlier development of the rule was that the audit requirements - in other words, if the assumption was that the licensee would be doing adequate and timely audits of their program, and that self-inspection effort if you would, would in theory relieve us of some of the theoretical burden. We felt that this area had been a problem long enough, and that the number of licensees had started to appreciate some of the problems and were starting to do audits, not in all cases but in some cases, and that our inspection effort and the licensees audit effort would dovetail together to achieve results.

MR. WARD: Thank you, Loren. Thank you gentlemen, very much. Let's go off the record now, and I would like about 10 minutes for a discussion with the Committee.

[Whereupon, at 6:05 p.m., the Subcommittee on Human Factors was recessed.]

REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission

in the matter of:

NAME OF PROCEEDING: ACRS Human Factors

DOCKET NUMBER:

PLACE OF PROCEEDING: Bethesda, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Mary C. Rosenberg

Mary Rosenberg
Official Reporter
Ann Riley & Associates, Ltd.

REACTOR OPERATOR TRAINING
AND
REACTOR SAFETY

PRESENTATION TO ACRS

DECEMBER 12, 1989

by
ROBERT G. STATER

OUTLINE

I. INTRODUCTION
- A. Tom Peters
- B. Background
- C. Outline

II. WHY IS SUBJECT IMPORTANT ?
- A. Reactor is major component
- B. Quality of material limit
- C. Key Prerequisite
- D. Diagnostics require understanding

III. THE WAY WE ~~WERE~~ *StiLL ArE*
- A. History

IV. WHAT'S WRONG?
- A. Course Title -- Theory
- B. Coverage
- C. Omissions and Errors
- D. Ten Misconceptions

V. HOW TO FIX IT
- A. Chain reaction model
- B. Equations
- C. Diagrams
- D. Operational Application

VI. CONCLUSION

I. INTRODUCTION

A. Tom Peters -- "If it ain't broke -- fix it anyway!"

Path of progress -- leading to EXCELLENCE -- demands continuous effort toward improvement.

B. R. G. Stater -- 36 years experience as nuclear engineer / 33 years GE/KAPL

Publisher of Reactor Operator training letter / Consultant on training matters

C. Outline

- Why Is Subject Important ?
- The Way We Were
- What's Wrong ?
- How to Fix It

II. WHY IS SUBJECT OF REACTOR BEHAVIOR IMPORTANT ?

A. The reactor is the major plant component, the heart of the system -- the core is the centerpiece.

The complexities of overall plant behavior can never be truly grasped until the character of the KEY component is established and understood.

B. The success of any educational program is inherently limited by the QUALITY of the material taught.

INSTRUCTORS + STUDENTS + MATERIAL

C. The ClassRoom study of Reactor Behavior is the KEY prerequisite for

- Plant Transient Studies
- Plant Accident Scenarios
- Operating Procedures
- Simulator Exercises

A poor prerequisite experience has adverse consequences in all training for which it prepares the way.

D. Diagnosing requires understanding

It is not prudent to expect and rely upon unerring diagnosis in the control room -- of complex events that threaten Reactor Safety -- while ClassRoom training promotes false concepts about Basic Reactor Behavior.

III. THE WAY WE ~~WERE~~ *StiLL ArE*

A. History

- 1949 -- Manhattan Project
- 1959 -- Scavenged Early Work
- 1979 -- TMI -- NRC Sanctioned
- 1989 -- Today using vintage 1950 material

IV. WHAT'S WRONG?

A. Course Title -- Reactor Theory -- ain't much help

In today's climate of Task Analysis, being labeled "Theory" is like the Kiss-of-Death.

Is it theory? -- probably -- mixed with other subjects and no application.

B. Coverage

Lacks ingredients for student understanding

Lacks integration -- fragmented

- Source Multiplication : S-C region NO D-C region
- Reactor Rate : D-C region NO S-C region

Entire subject can be condensed into one Equation.

C. Omissions and Errors

- Key Equation -- Reactor Rate -- in error by 1300% (see next page)

D. Ten Misconceptions

- Current material promotes numerous misconceptions (see next page + 1)

V. HOW TO FIX IT

A. Four Steps to Teaching Reactor Behavior (see last page)

- Model -- Physical Process (visualize)
- Equations -- math description of model
- Diagram -- graphic overview -- link principles to application
- Operational Application -- rate vs time -- meters

Takes subject from ClassRoom to Control Room

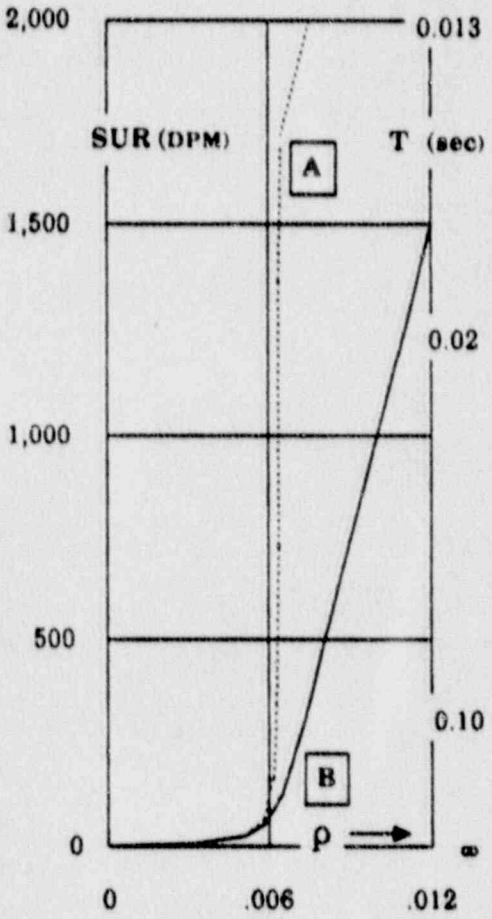
RO-INFOGRAM

THE 1300% ERROR

by Robert G. Slater

The Classroom material used for training Reactor Operators in the basics of reactor behavior is seriously flawed, as is exemplified by the reactor rate equation being both incomplete and incorrect.

The adjacent graphic compares the positive stable reactor rate from the equation currently used for Reactor Operator qualification, (**A**), with the correct rate, (**B**). For this example, the reactor rate at prompt criticality by the current equation is +1700 DPM, (**A**), whereas the actual (correct) rate is +130 DPM, (**B**).



The error is 1300%.

To experience a comparable 1300% error in driving your car at exactly 55 mph, a glance at the speedometer would find it to be reading 700 mph. You would immediately be aware that something was radically wrong. Likewise, be aware that something is radically wrong here.

As it turns out, it isn't so much that *an* equation is wrong. Or, even that it happens to be the *principal* equation used for RO training in reactor behavior. And it isn't so much that this equation is *wrong* by such *a wide margin*. No. It's none of these.

What it is ... the real *hurt* ... is that this is just a **SYMPTOM**.

The reason that the reactor rate equation is wrong, and has stayed wrong for 40 years, is that major misconceptions exist, and are being taught, about the fundamentals of reactor behavior. It is the important underlying concepts that are wrong.

Is it prudent to expect and to rely upon unerring diagnosis in the Control Room ... of complex events that threaten reactor safety ... while Class Room training promotes false concepts about basic reactor behavior?

(518) 399-1072 SURTCO Associates 105 Pashley Road, Scotia, N.Y. 12302

RO-INFOGRAM

10 COMMON MISCONCEPTIONS
DISCLOSED

by Robert G. Stater

1. k-effective is NOT directly applicable to the propagation of chain reactions.
2. BETA is NOT the delayed neutron fraction.
3. NON-FISSION NEUTRONS are NOT the primary "neutron source" in the reactor core.
4. GENERATION TIME is NOT a valid concept for explaining either reactor behavior or controllability.
5. SOURCE MULTIPLICATION is NOT limited to the Sub-Critical Region.
6. PROMPT JUMP is NOT different in magnitude from power change by reactivity ramp input.
7. REACTOR RATE is NOT defined correctly by the qualification exam equation.
8. REACTOR RATE is NOT limited to the Delayed-Critical Region, as implied by the current equation.
9. DELAYED NEUTRONS are NOT "insignificant" at prompt criticality.
10. CHAIN REACTIONS are NOT individually self-sustaining at criticality.

CLASSROOM REACTOR THEORY does NOT provide the basics of operational Reactor Behavior needed by Reactor Operators in the Control Room.

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A. Chain Reaction Model

Numeric Model -- less abstract -- sequence of fission events in time
Transient state consists of 2 phases

Current -- basic concept of transient unknown

B. Equation Representation

Symbolic Model -- more abstract
Two equations -- from model by simple algebra

- Magnitude of Power

Current -- use half -- S-C region only

- Rate of Change of Power

Current -- use half -- D-C region only

C. Diagram

- Steady State Power Curve: Equil Power + Criticality

Current: criticality not recognized as source multiplication

- Transient Rate Diagram (2 Diagrams -- D-C region and S-C region)

Current: stable (broken into 2 curves); no transient; no S-C region

D. Operational Application

- Rate vs time — Direct from rate diagr
- Recognition — 3 Cases -- initiate / accelerate / decelerate
- Meter vs time
- Synthesis — Basic to Complex

Current: no application used

E. Summary -- Needed vs Current — ~30 % needed material now covered
~50 % on quality - err & misconception

EFFECTIVENESS = 30 × 50 = 15 %

VI. CONCLUSIONS

A. Ideas sketched out here -- today -- would take us a long way in the direction Chairman Carr wants to go.

B. Reactor Behavior must be the Reactor Operator's special area of expertise.

C. Quality training of Reactor Operators is the best assurance of Reactor Safety.

MODEL

CHAIN REACTION NUMERIC

STEADY STATE

8 →	4 →	2 →	1 →	0
	8 →	4 →	2 →	1
		8 →	4 →	2
			8 →	4
				8
8	12	14	15	15

TRANSIENT STATE

8 →	4 →	2 →	1 →	0
	16 →	8 →	4 →	2
		32 →	16 →	8
			64 →	32
				128
8	20	42	85	170

EQUATION

MATH DESCRIPTION SYMBOLIC

$(S+D) \rightarrow (S+D)\times k_p \rightarrow$

$(S+D) \rightarrow$

$$P = -\frac{S + \lambda \times C}{\rho - \beta}$$

$$P = -\frac{S}{\rho} \qquad \text{EQ MULT}$$

$$P = \frac{\lambda \times C}{\beta} \qquad \text{CRIT}$$

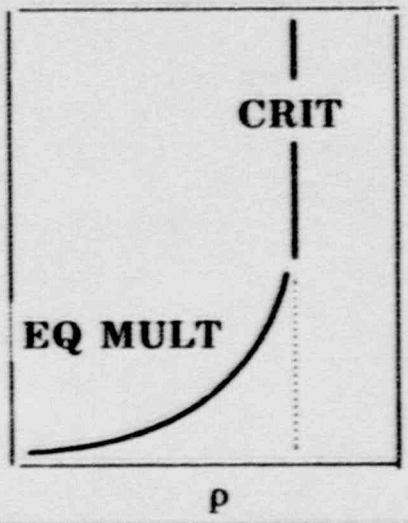
REACTOR RATE

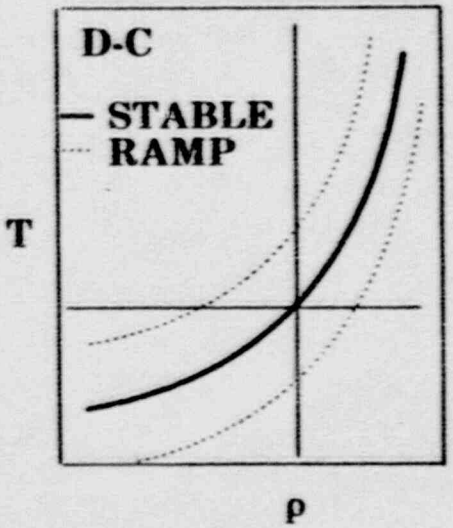
$$P = P_0 \times e^{t/T}$$

$$T = \frac{\beta - \rho}{\dot{\rho} + \lambda \times \rho + \lambda \times (S/P)}$$

DIAGRAM

GRAPHIC OVERVIEW

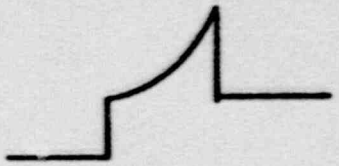




OPERATION

APPLICATION DIAGNOSIS

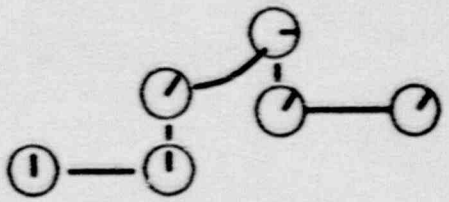
1. RATE vs TIME



2. RECOGNITION

1. INITIATE
2. ACCELERATE
3. DECELERATE

3. METER vs TIME



4. SNYTHESIS

1. STARTUP
2. EST CRITICAL
3. SHUTDOWN

MODEL

CHAIN REACTION NUMERIC

STEADY STATE

$8 \rightarrow 4 \rightarrow 2 \rightarrow 1 \rightarrow 0$

$8 \rightarrow 4 \rightarrow 2 \rightarrow 1$

$8 \rightarrow 4 \rightarrow 2$

$8 \rightarrow 4$

8

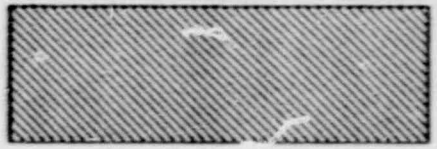
8 12 14 15 15

EQUATION

MATH DESCRIPTION SYMBOLIC

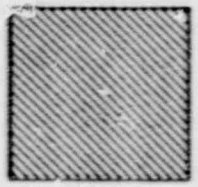
$(S) \rightarrow (S) \times k \rightarrow$

$(S) \rightarrow$



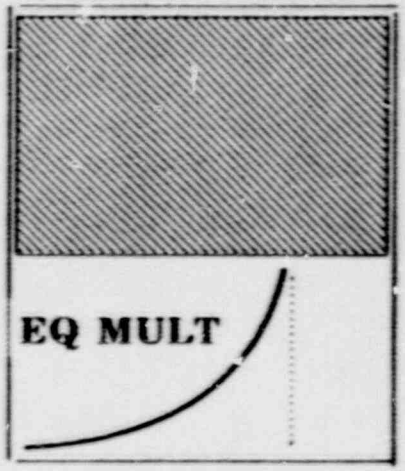
$P = -\frac{S}{\rho}$

EQ MULT



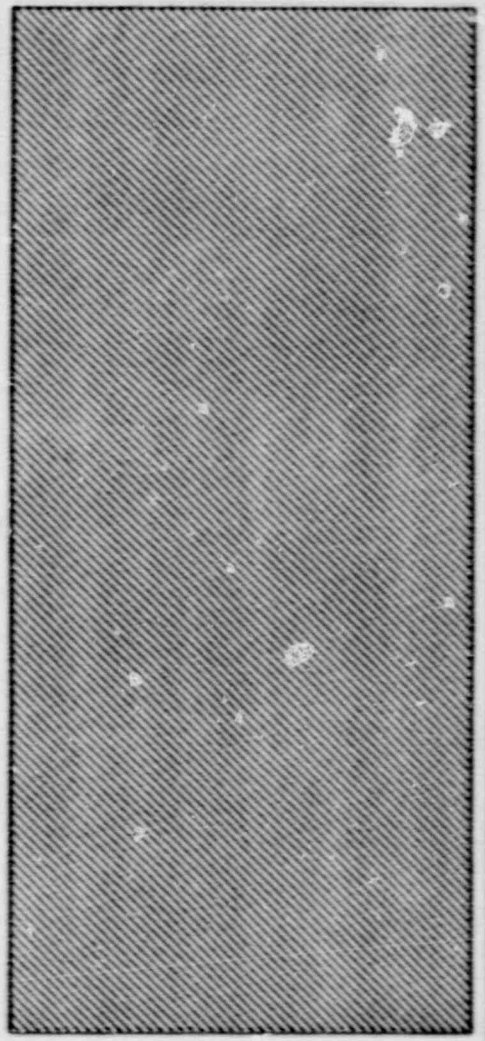
DIAGRAM

GRAPHIC OVERVIEW

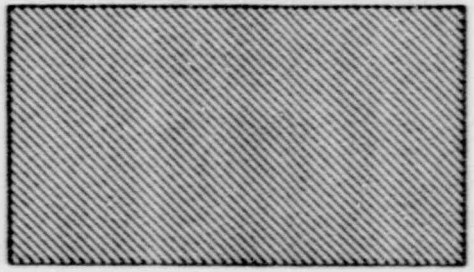


OPERATION

APPLICATION DIAGNOSIS



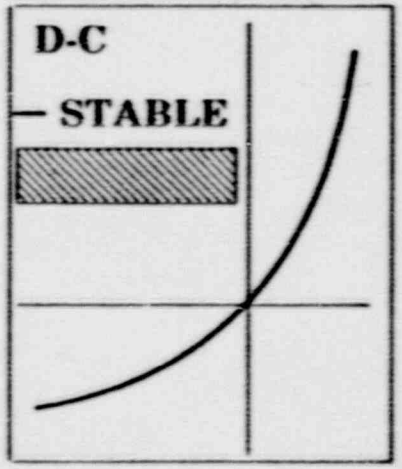
TRANSIENT STATE



REACTOR RATE

$P = P_0 \times e^{t/T}$

$T = \frac{\beta - \rho}{\rho + \lambda \times \rho +}$ 



OUTLINE

- **Why Is Subject of Reactor Behavior Important ?**
- **The Way We ~~Were~~ *StiLL ArE***
- **What's Wrong ?**
- **How to Fix It**

WHY IS SUBJECT IMPORTANT ?

- Reactor is the major plant component, the heart of the system
- Success in education is limited by the QUALITY of the material taught.
- ClassRoom study of Reactor Behavior is KEY prerequisite
- Diagnosing requires understanding

THE WAY WE ~~WERE~~ *StiLL ArE*

- 1949 -- Mannattan Project
- 1959 -- Scavenged Early Work
- 1979 -- TMI -- NRC Sanctioned
- 1989 -- using vintage 1950 material

WHAT'S WRONG?

- Course Title
- Coverage
- Omissions and Errors
- Misconceptions

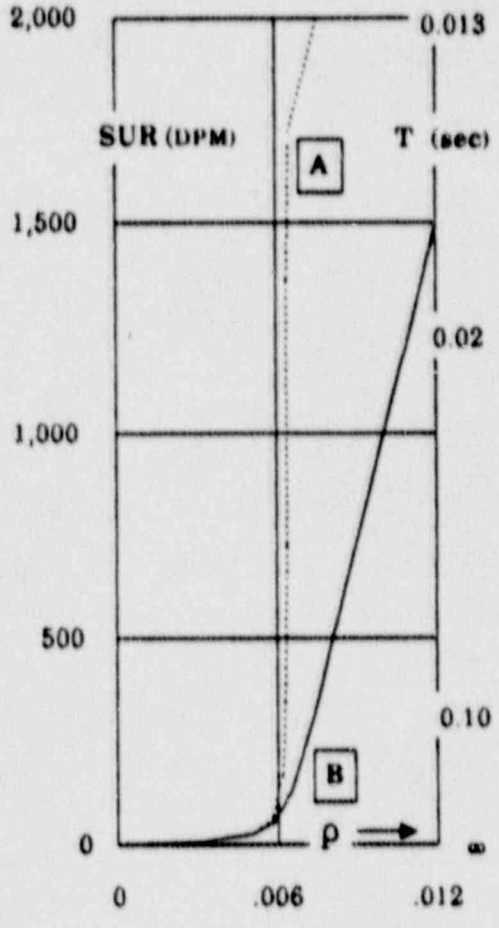
RO-INFOGRAM

THE 1300% ERROR

by Robert G. Stater

The Classroom material used for training Reactor Operators in the basics of reactor behavior is seriously flawed, as is exemplified by the reactor rate equation being both incomplete and incorrect.

The adjacent graphic compares the positive stable reactor rate from the equation currently used for Reactor Operator qualification, (**A**), with the correct rate, (**B**). For this example, the reactor rate at prompt criticality by the current equation is +1700 DPM, (**A**), whereas the actual (correct) rate is +130 DPM, (**B**).



The error is 1300%.

To experience a comparable 1300% error in driving your car at exactly 55 mph, a glance at the speedometer would find it to be reading 700 mph. You would immediately be aware that something was radically wrong. Likewise, be aware that something is radically wrong here.

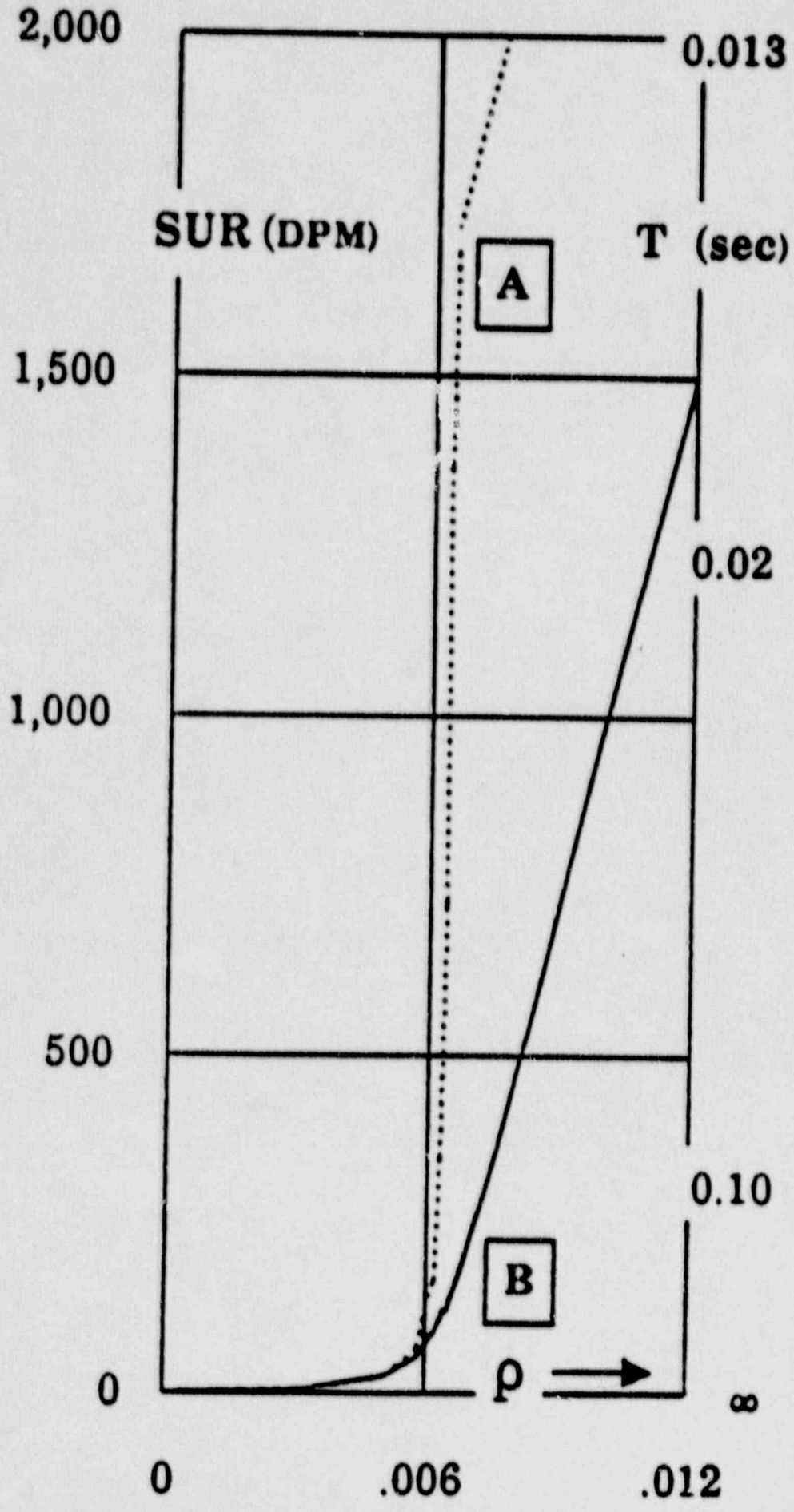
As it turns out, it isn't so much that *an* equation is wrong. Or, even that it happens to be the *principal* equation used for RO training in reactor behavior. And it isn't so much that this equation is *wrong* by such *a wide margin*. No. It's none of these.

What it is ... the real *hurt* ... is that this is just a **SYMPTOM**.

The reason that the reactor rate equation is wrong, and has stayed wrong for 40 years, is that major misconceptions exist, and are being taught, about the fundamentals of reactor behavior. It is the important underlying concepts that are wrong.

Is it prudent to expect and to rely upon unerring diagnosis in the Control Room ... of complex events that threaten reactor safety ... while Class Room training promotes false concepts about basic reactor behavior?

(518) 399-1072 SURTCO Associates 105 Pashley Road, Scotia, N.Y. 12302


2,000
0.013
SUR (DPM)
T (sec)
A
1,500
0.02
1,000
500
0.10
B
0
ρ
∞
0
.006
.012

10 COMMON MISCONCEPTIONS
DISCLOSED

1. k-effective is NOT directly applicable to the propagation of chain reactions.

2. BETA is NOT the delayed neutron fraction.

3. NON-FISSION NEUTRONS are NOT the primary "neutron source" in the reactor core.

4. GENERATION TIME is NOT a valid concept for explaining either reactor behavior or controllability.

5. SOURCE MULTIPLICATION is NOT limited to the Sub-Critical Region.

6. PROMPT JUMP is NOT different in magnitude from power change by reactivity ramp input.

7. REACTOR RATE is NOT defined correctly by the qualification exam equation.

8. REACTOR RATE is NOT limited to the Delayed-Critical Region, as implied by the current equation.

9. DELAYED NEUTRONS are NOT "insignificant" at prompt criticality.

10. CHAIN REACTIONS are NOT individually self-sustaining at criticality.

MODEL

CHAIN REACTION NUMERIC

STEADY STATE

neutrons

$8 \rightarrow 4 \rightarrow 2 \rightarrow 1 \rightarrow 0$

$8 \rightarrow 4 \rightarrow 2 \rightarrow 1$

$8 \rightarrow 4 \rightarrow 2$

$8 \rightarrow 4$

8

8 12 14 15 15

TRANSIENT STATE

8 →	4 →	2 →	1 →	0
16 →	8 →	4 →	2	
32 →	16 →	8		
64 →	32			
128				
8	20	42	85	170

EQUATION

MATH DESCRIPTION SYMBOLIC

$(S+D) \rightarrow (S+D) \times k_p \rightarrow (S+D) \rightarrow$

fission delayed

power

$$P = -\frac{S + \lambda \times C}{\rho - \beta}$$

$$P = -\frac{S}{\rho} \qquad P = \frac{\lambda \times C}{\beta}$$

EQ MULT CRIT

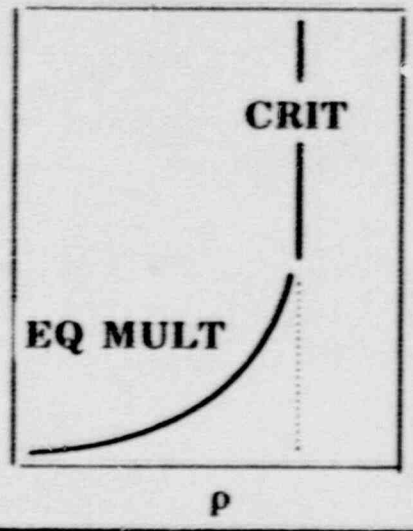
REACTOR RATE

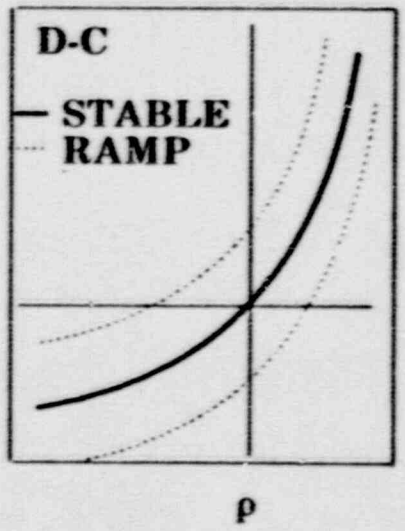
$$P = P_0 \times e^{\omega T}$$

$$T = \frac{\beta - \rho}{\rho + \lambda \times \rho + \lambda \times (S/P)}$$

DIAGRAM

GRAPHIC OVERVIEW

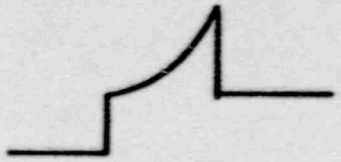




OPERATION

APPLICATION DIAGNOSIS

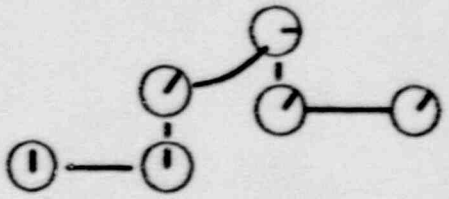
1. RATE vs TIME



2. RECOGNITION

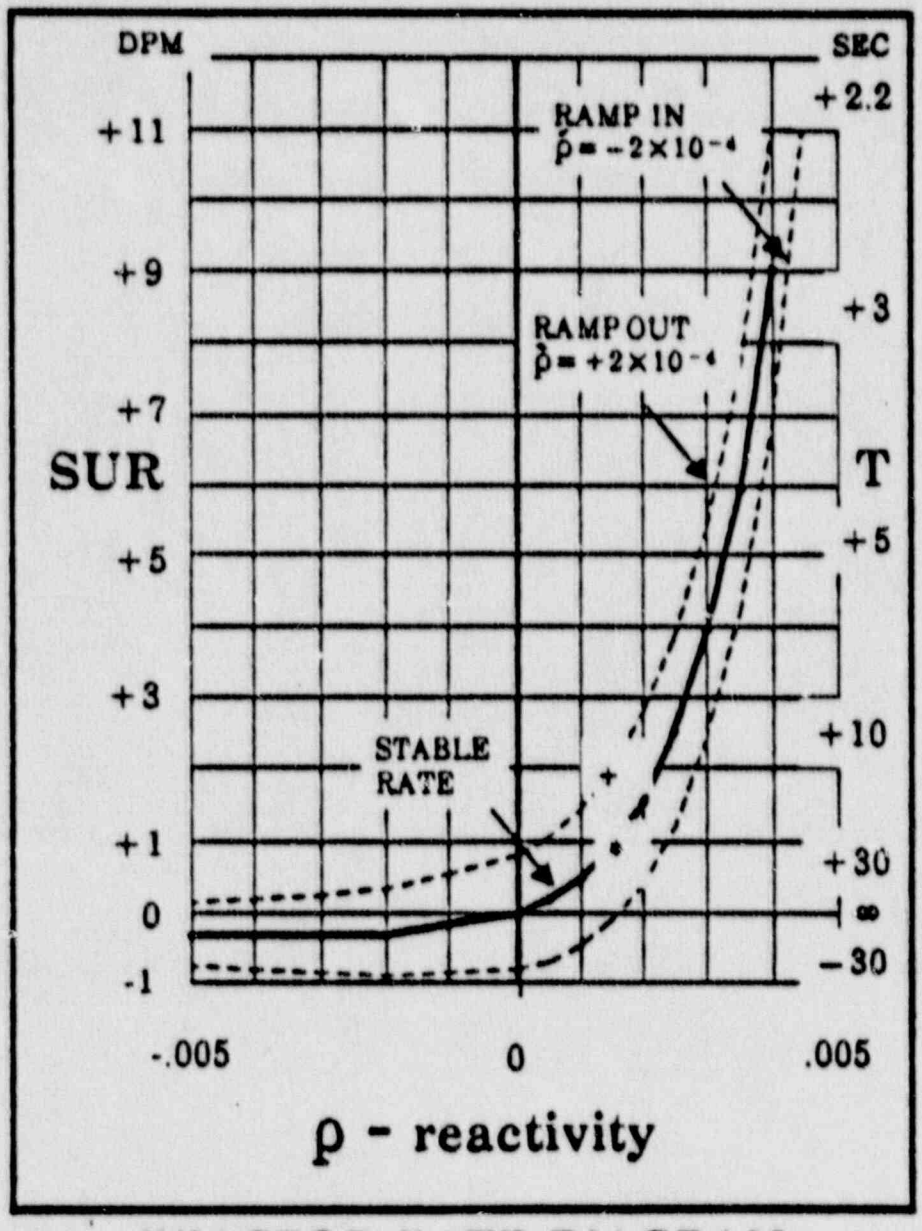
1. INITIATE
2. ACCELERATE
3. DECELERATE

3. METER vs TIME



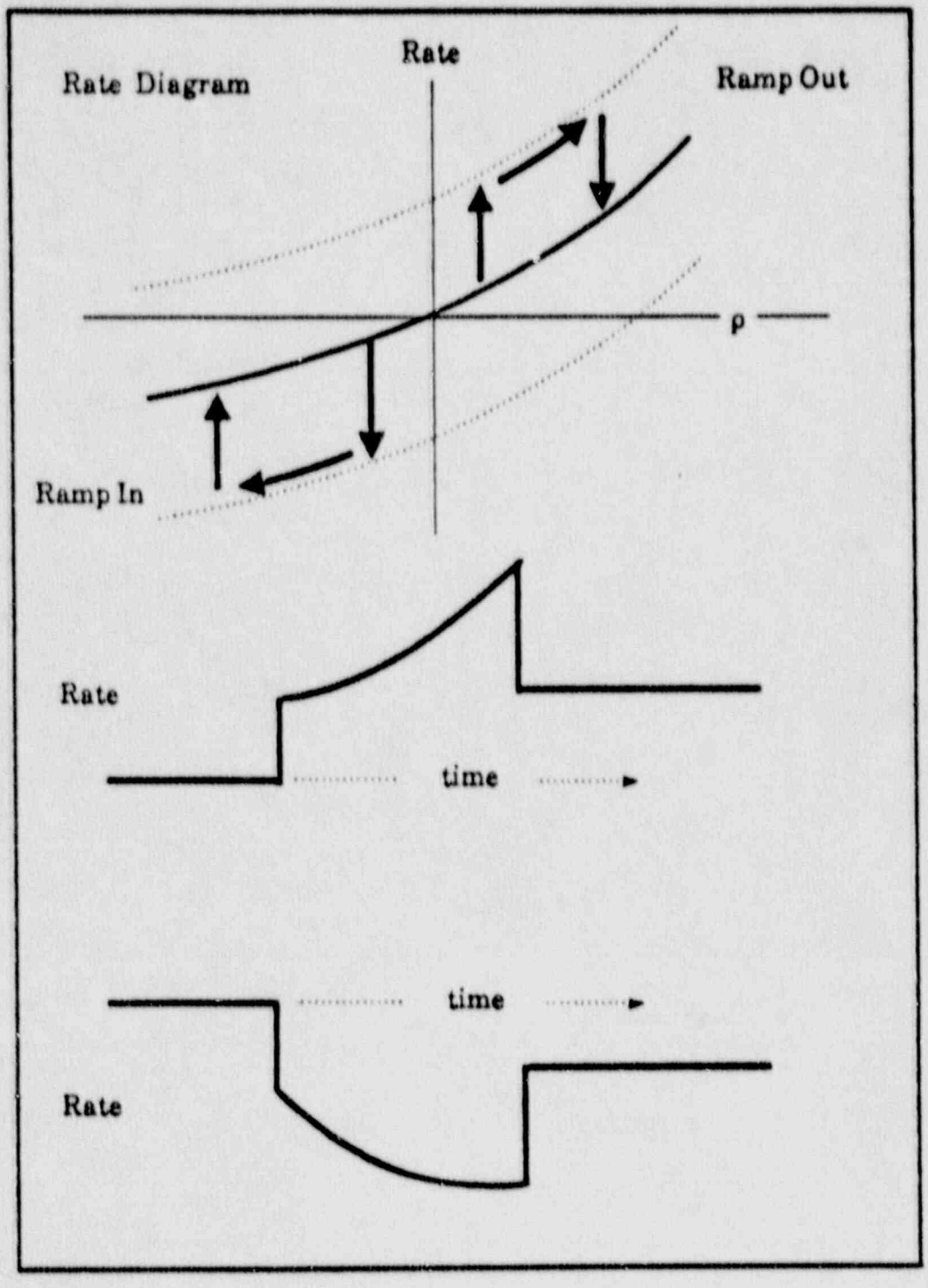
4. SNYTHESIS

1. STARTUP
2. EST CRITICAL
3. SHUTDOWN



REACTOR RATE DIAGRAM

REACTOR RATE vs TIME



MODEL

CHAIN REACTION
NUMERIC

STEADY STATE

$8 \rightarrow 4 \rightarrow 2 \rightarrow 1 \rightarrow 0$
$8 \rightarrow 4 \rightarrow 2 \rightarrow 1$
$8 \rightarrow 4 \rightarrow 2$
$8 \rightarrow 4$
8

8 12 14 15 15

EQUATION

MATH DESCRIPTION
SYMBOLIC

$(S) \rightarrow (S) \times k \rightarrow$
$(S) \rightarrow$

[redacted]

$P = -\frac{S}{\rho}$

EQ MULT

[redacted]

TRANSIENT STATE

[redacted]

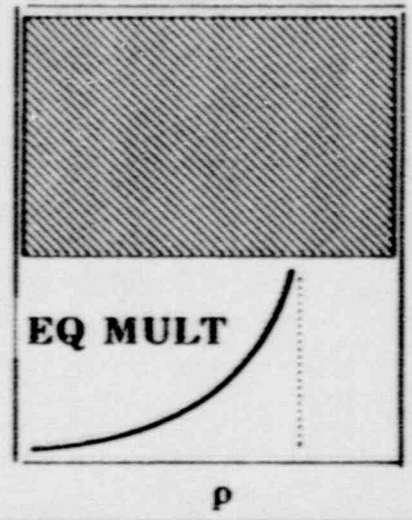
REACTOR RATE

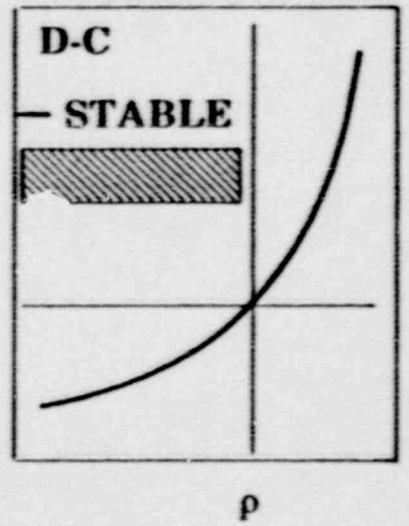
$P = P_0 \times e^{\omega T}$

$T = \frac{\beta - \rho}{\rho + \lambda \times \rho +}$ [redacted]

DIAGRAM

GRAPHIC
OVERVIEW





OPERATION

APPLICATION
DIAGNOSIS

[redacted]

~ 30 % NEEDED MATERIAL COVERED

~ 50 % ON QUALITY -- ERR + MISCPT

EFFECTIVENESS = 30 × 50 = 15 %

PROPOSED REVISION OF 10CFR55

FITNESS-FOR-DUTY REQUIREMENTS

FOR

LICENSED OPERATORS AND SENIOR OPERATORS

BACKGROUND

MARCH '89	SECY 89-30 - FINAL RULEMAKING (PART 26) APPROVED BY COMMISSION WITH STAFF REQUIREMENTS MEMO (SRM)
APRIL '89	OPERATOR LICENSING BRANCH (OLB) ASSIGNED TO DRAFT REVISION TO 10CFR55 IN RESPONSE TO SRM
JULY '89	PROPOSED 10CFR55 REVISION TO EDO
DECEMBER '89	PROPOSED 10CFR55 REVISION TO THE COMMISSION

STAFF REQUIREMENTS MEMORANDUM

(MARCH 22, 1989)

DIRECTED THE STAFF TO PREPARE A NOTICE
OF PROPOSED RULEMAKING TO:

1. AMEND 10CFR55 TO ESTABLISH 10CFR26 CUTOFF LIMITS AS AN OPERATOR LICENSE CONDITION. PENALTIES SHALL BE CLEARLY STATED TO INFORM OPERATORS OF THE GRAVITY FOR EXCEEDING CUTOFF LEVELS.

2. AMEND 10CFR2, APPENDIX C, TO REFLECT INDIVIDUAL OPERATOR ENFORCEMENT SANCTIONS.

PROPOSED REVISION TO 10CFR55.53

(CONDITION OF LICENSES)

- SHALL NOT USE ALCOHOL WITHIN (POWER REACTOR) PROTECTED AREA OR (NON-POWER) CONTROLLED ACCESS AREA.

- SHALL NOT USE, POSSESS OR SELL ANY ILLEGAL DRUGS.

- SHALL PARTICIPATE IN AND COMPLY WITH THE FACILITY DRUG AND ALCOHOL TESTING PROGRAM
  - POWER REACTORS - PURSUANT TO PART 26
  - NON-POWER REACTORS - PER FACILITY ESTABLISHED PROGRAM (AS APPLICABLE)

PROPOSED REVISION TO 10CFR55.53 (cont)

(CONDITION OF LICENSES)

- SHALL NOT PERFORM LICENSED DUTIES WHILE UNDER THE INFLUENCE (•) OF ANY PRESCRIPTION, OVER THE COUNTER OR ILLEGAL SUBSTANCE WHICH COULD ADVERSELY AFFECT PERFORMANCE.

(•) DEFINITION

o ALCOHOL AND ILLEGAL DRUGS	EXCEED PART 26 CUTOFF LEVELS OR FACILITY LEVELS IF LOWER
o PRESCRIPTION AND OVER-THE-COUNTER	LICENSEE COULD BE UNDER THE INFLUENCE (AS DETERMINED BY THE MEDICAL REVIEW OFFICER) IN A MANNER TO ADVERSELY AFFECT PERFORMANCE

FAILURE TO MEET FITNESS-FOR-DUTY REQUIREMENTS

[10CFR55.53(j) AND 10CFR55.61(b)(5)]

NOTE: 10CFR PART 2 APP. C WILL BE AMENDED WHEN PROPOSED RULE IS MADE FINAL

ENFORCEMENT SANCTIONS

FIRST OFFENSE	COMMISSION MAY ISSUE NOTICE OF VIOLATION, CIVIL PENALTY, OR ORDER AS WARRANTED.
SECOND OFFENSE	COMMISSION WILL, AT MINIMUM, ISSUE ORDER TO SUSPEND LICENSE FOR THREE YEARS.
THIRD OFFENSE	COMMISSION WILL ISSUE ORDER TO REVOKE OPERATOR'S LICENSE.
REFUSAL TO PARTICIPATE (SUBSTANCE TESTING)	COMMISSION MAY SUSPEND, REVOKE OR DENY A LICENSE APPLICATION OR APPLICATION FOR RENEWAL.

PROPOSED REVISION TO 10CFR55.61

[MODIFICATION AND REVOCATION OF LICENSES]

- COMMISSION MAY MODIFY, REVOKE OR SUSPEND A LICENSE FOR:
  - SALE, USE OR POSSESSION OF ILLEGAL DRUGS
  - REFUSAL TO PARTICIPATE IN FACILITIES DRUG AND ALCOHOL TESTING PROGRAM.
  - CONFIRMED POSITIVE TEST RESULTS FOR DRUGS OR ALCOHOL.
  - USE OF ALCOHOL WITHIN (POWER REACTORS) PROTECTED AREAS OR (NON-POWER REACTORS) CONTROLLED ACCESS AREAS.
  - DETERMINED UNFIT FOR <u>SCHEDULED</u> WORK DUE TO CONSUMPTION OF ALCOHOL

SUMMARY

PROPOSED REVISION OF 10CFR55 GOES BEYOND STRICT COMPLIANCE WITH 10CFR26 CUTOFF LEVELS:

- ENFORCEMENT SANCTIONS EXTENDED TO INCLUDE IMPAIRMENT DUE TO ALCOHOL ABUSE.

- PROHIBITS PERFORMANCE OF LICENSED DUTIES WHILE UNDER THE INFLUENCE OF ANY LEGAL OR ILLEGAL SUBSTANCE.

- PROHIBITS OPERATORS FROM SALE, USE, OR POSSESSION OF ILLEGAL SUBSTANCES ON OR OFF SITE.

BRIEFING FOR

SUBCOMMITTEE ON HUMAN FACTORS

ADVISORY COMMITTEE ON REACTOR SAFETY (ACRS)

ACCESS AUTHORIZATION PROGRAM FOR NUCLEAR POWER PLANTS

BY

DIVISION OF REGULATORY APPLICATIONS

OFFICE OF NUCLEAR REGULATORY REASEARCH

ZOLTAN ROSZTOCZY X23760
SHER BAHADUR X23775
SANDRA FRATTALI X23773

DECEMBER 12, 1989

BACKGROUND

- MARCH 1984 — PUBLISHED PROPOSED RULE
- MARCH 1988 — PUBLISHED PROPOSED POLICY STATEMENT
- MARCH 1989 — PRESENTED OPTIONS TO THE COMMISSION
- APRIL 1989 — RECEIVED COMMISSION DIRECTION TO:

  (I) DEVELOP THE FINAL RULE
  (II) DEVELOP THE REG GUIDE ENDORSING INDUSTRY-GUIDELINES WITH APPROPRIATE EXCEPTIONS

- SEPTEMBER 1989 — REPORTED PROGRESS TO ACRS SUBCOMMITTEE

NEED FOR A RULE

THE RULE AND ASSOCIATED REGULATORY GUIDE WILL RESULT IN A SUBSTANTIAL INCREASE IN THE PROTECTION OF PUBLIC HEALTH AND SAFETY AS FOLLOWS:

- DEFINE A STANDARD ACCEPTABLE TO NRC.
- ENSURE THAT LICENSEES NOT COMMITTED TO BASIC STANDARDS IMPROVE THEIR PROGRAM.
- PROVIDE ASSURANCE THAT VOLUNTARY AND IMPROVED PROGRAMS ARE NOT DROPPED.
- PROVIDE PROPER GUIDANCE FOR FUTURE PLANTS.
- PROVIDE A WELL-DEFINED MECHANISM FOR EFFECTIVE INSPECTION AND ENFORCEMENT.
- ESTABLISH AN INDUSTRY-WIDE STANDARD ON ACCESS AUTHORIZATION PROGRAMS.

THE RULE

PERFORMANCE OBJECTIVE

THE UNESCORTED ACCESS AUTHORIZATION PROGRAM IS DESIGNED TO PROVIDE HIGH ASSURANCE THAT INDIVIDUALS GRANTED UNESCORTED ACCESS TO PROTECTED AND VITAL AREAS ARE:

- TRUSTWORTHY AND RELIABLE
- NOT AN UNREASONABLE RISK TO THE PUBLIC HEALTH AND SAFETY (INCLUDING THE RADIOLOGICAL SABOTAGE)

CHARACTERISTICS

- THE RULE IS VERY GENERAL
- DETAILED GUIDANCE IS INCLUDED IN A REGULATORY GUIDE
- REGULATORY GUIDE ENDORSES THE NUMARC GUIDELINES WITH SOME EXCEPTIONS

MAJOR ATTRIBUTES IN THE RULE

- BACKGROUND INVESTIGATION
- PSYCHOLOGICAL ASSESSMENT
- BEHAVIORAL OBSERVATION

NOTE:
MUST GRANT AUTHORIZATION TO ALL INDIVIDUALS CERTIFIED BY NRC.

PROVISIONS FOR SPECIAL CASES

RELAXATION IS PROVIDED FOR SPECIAL CASES OF ACCESS AUTHORIZATION:

- EXISTING ACCESS AUTHORIZATION
- REINSTATEMENT OF ACCESS AUTHORIZATION
- TRANSFER OF ACCESS AUTHORIZATION
- TEMPORARY ACCESS AUTHORIZATION

EXISTING UNESCORTED ACCESS AUTHORIZATION

GRANDFATHERING PROVIDED FOR ALL INDIVIDUALS WHO ARE ALREADY AUTHORIZED DURING THE SIX MONTHS PRIOR TO THE DATE OF PUBLICATION OF THE RULE.

REINSTATED UNESCORTED ACCESS AUTHORIZATION

REINSTATEMENT PROVIDED FOR ALL INDIVIDUALS WHOSE AUTHORIZATION IS NOT INTERRUPTED FOR A CONTINUOUS PERIOD OF MORE THAN 365 DAYS, AND WHOSE PREVIOUS AUTHORIZATION IS TERMINATED UNDER FAVORABLE CONDITIONS.

TRANSFERRED UNESCORTED ACCESS AUTHORIZATION

INDIVIDUAL'S AUTHORIZATION MAY BE TRANSFERRED FROM CONTRACTOR, VENDOR, OR ANOTHER LICENSEE PROVIDED:

- AUTHORIZATION IS NOT INTERRUPTED FOR MORE THAN 365 DAYS.
- INFORMATION ON INTERRUPTED TIME, TRUE IDENTITY, AND AUTHORIZATION IS VERIFIED.

TEMPORARY UNESCORTED ACCESS AUTHORIZATION

TEMPORARY UNESCORTED ACCESS AUTHORIZATION PROVIDED ON AN INTERIM BASIS FOR 180 DAYS:

- BACKGROUND INVESTIGATION

  FINGERPRINTING; EMPLOYMENT (1YR) AND CREDIT (CURRENT) HISTORY; CHARACTER AND REPUTATION (1 REFERENCE).

- PSYCHOLOGICAL ASSESSMENT

  NOT REQUIRED IF ALREADY COMPLETED WITHIN A YEAR.

- BEHAVIORAL OBSERVATION PROGRAM

  SAME AS IN THE RULE.

EXCEPTIONS TO THE INDUSTRY GUIDELINE

THE REGULATORY GUIDE ENDORSES THE NUMARC GUIDELINES WITH THE FOLLOWING EXCEPTIONS:

- REVIEW PROCESS EXTENDED TO ALL EMPLOYEES, NOT JUST FOR PERMANENT EMPLOYEES OF THE LICENSEE.
- A RELAXATION FOR COLD SHUTDOWN PROVIDED ONLY ON A CASE-BY-CASE, SITE-SPECIFIC BASIS.
- INDIVIDUALS GRANDFATHERED WITH AN UNINTERUPTED ACCESS AUTHORIZATION FOR AT LEAST 180 DAYS ON THE DATE THE RULE IS PUBLISHED.
- THE CONTRACTED OUT PORTION OF LICENSEE'S PROGRAM AUDITED EVERY YEAR.

EXCEPTIONS DISCARDED FROM THE SEPTEMBER, 1989 VERSION:

- MILITARY HISTORY TOTAL, NOT JUST FOR 5 YEARS.
- RELIABLE AND VALID PSYCHOLOGICAL TESTS, NOT JUST RELIABLE.

ISSUE: COLD SHUTDOWN

NUMARC GUIDELINES

- DO NOT DIFFERENTIATE BETWEEN THE PROTECTED AND VITAL AREAS.
- NOT CLEAR ABOUT THE PROCEDURES FOR START-UP AND SAFE OPERATION OF PLANT SYSTEMS.

NRC PROPOSED RULE

- NOT PREPARED FOR A GENERIC ENDORSEMENT OF NUMARC GUIDELINES.
- RULE PROVIDES FOR A CASE-BY-CASE PLANT SPECIFIC AUTHORIZATION.
- STAFF CONSIDERING DEVELOPING APPROPRIATE PROCEDURES FOR VITAL AREAS THROUGH PUBLIC PROCESS.