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BRIEFING ON THE IMPLEMENTATION OF PART 26

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TRANSCRIPT OF PROCEEDINGS

Public Meeting

Before the U.S. Nuclear Regulatory Commission:

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Kristine L. Svinicki, Commissioner

George Apostolakis, Commissioner

William D. Magwood, IV, Commissioner

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P R O C E E D I N G S

CHAIRMAN JACZKO: Well good morning everyone. The Commission meets today to discuss the implementation of our Part 26 Fatigue Management requirements. Most of us here probably recall the tremendous efforts that went into the rulemaking that's the underpinning of the regulations we are dealing with. It took more than a decade; there was extensive research and a very high level of stakeholder involvement. Fundamentally I think as we are into the implementation it's clear that the rule is achieving its intended aim of reducing fatigue and improving safety. And I think, while we may hear criticisms of the rule today, that it can be difficult to implement, no one has, as far as I am aware, argued that the plants are less safe because of this rule. And I think that's an important, an important point, and if there are issues related to that, I certainly hope that we will hear that today.

So given that, I think it's important that we're cautious in considering potential changes to any of the aspects of Part 26, without going through an extensive and, I think, efficient rulemaking process. But certainly if there are possible ways to make the rule easier to implement, and there very well may be, I think we have an opportunity to try and explore those options today. But I think as we look at the rule that we have, we should be very judicious in how we look at issues like enforcement discretion, and changing the provisions of the rule without going through a very comparable noticing comment process that we used when we developed the original rule.

So I think today will be a very interesting discussion, and I hope to get a better sense of what some of the implementation challenges are, and if there are ways that we can accommodate those within the existing framework of

the rule. So, I would just note that everyone has 10 minutes. Right now I think this meeting is scheduled to last three hours and 20 minutes. Not all of you will have to sit here. I think the only people that have to sit here the entire three hours and 20 minutes is everybody starting with Steve, going around to Annette. So, you don't have to use your 20 minutes --

[laughter]

CHAIRMAN JACZKO: -- I'm sorry, your 10 minutes, and if you can say what you're going to say more succinctly, that leaves more time for the Commissioners to ask questions, which is where we often, I think, get most of the interesting information. So with that, we'll begin with Tony Pietrangelo. Oh, I'm sorry, anybody like to make any comments?

COMMISSIONER SVINICKI: Well, Mr. Chairman, and I appreciate, and you just admonished us about time so I'll be mindful of that, but I appreciate your comments about the complexity of this rule. I was even, I knew it was complex, but I was amazed when I looked back at what – and you're the only currently serving member of the Commission who was here for that – I read, of course, your vote, and other votes.

But I did think that Commissioner Merrifield was a bit prophetic, and he said, “I believe that we must continue to look at the implementation of this rule to evaluate whether the requirements we have imposed are creating a burden without a commensurate benefit, and I would expect the staff and the industry to discuss with the Commission the practical application of this rule, and to propose improvements or modifications that become apparent after some period of implementation.” So, just to follow on what you said, I think that that brings us where we are today, and looking at, we've had some time with implementation of

the rule, so I look forward to hearing from the presenters. Thank you.

CHAIRMAN JACZKO: Any other comments? OK, Tony.

MR. PIETRANGELO: Chairman, Commissioners, good morning. First, I appreciate the opportunity to be with you today, this is an important issue for the industry. As you mentioned, there's a long history to the development of Part 26, but I got to tell you this is an issue that's probably number one on our radar screen, because it impacts the quality of life of workers at the plant. There's a lot of covered workers under this rule that are affected by it, so we think, again, we, appreciate the Commission's attention to it. I'm going to go through a little history, go to slide two, please.

First, in terms of industry implementation, that began on October 1, 2009, when the rule was implemented. In June, 2010, we sent out a survey to our membership on any rule implementation issues. That led to us submitting a petition in the fall of last year, a petition that addressed the unintended consequences that came out of that survey, and on September 23 of last year, we submitted a request for enforcement discretion from the minimum days-off requirements of the rule. Next slide, please.

I wanted to start with a problem statement on this, and I'm not going to read it, but it's really about the complexity and rigidity of this rule that's the issue, that's, I think, restricting us from getting the intended safety-beneficial practices that the rule was intended to achieve. We're going to go through some examples; Mitch and Eric are going to share their experience, so I'm not going to go deep-dive into the unintended consequences of the rule. But I think our November 18 meeting where we had, with the staff, four different industry panels, one on operations, one on maintenance, one on security, and one on unions and

contract workers, that the minimum days off requirements were posing a real challenge to the sites, in terms of being able to schedule people appropriately, and it was curtailing many safety-beneficial practices. That's the basis for our petition, and also the basis for our request for enforcement discretion. Can we go to the next slide, please.

Justification for the change, again, longstanding safety-beneficial practices have been adversely impacted. Several examples here. We actually sent, after the November 18 meeting, a kind of a transcript of that meeting, with the speaker's notes, to Fred Brown here at NRC. I wanted to wave it, I forgot to bring it as a kind of a prop here, but about that thick, quarter-inch thick, of comments from those panels, I think we had four or five people on each panel, maintenance workers, security officers, operational supervisors, plant management. We tried to get everybody who was impacted by the Part 26 minimum days off requirements at that meeting, and I think the staff conducted itself very professionally in that meeting and I think at the end of the day, there was a real feeling that these minimum days off requirements were really challenging us to continue the safety-beneficial practices that I think have led to very outstanding operation of the industry.

The next two are also justifications for the change. I talked about quality of life adversely impacted, schedule uncertainty, forced overtime, inability to trade shifts, family impacts. We have to schedule 365 days a year, 24 hours a day, and when a rule changes how that's been done over time, obviously change is difficult, and change management is difficult, but this has been a case where a lot of the practices that led to, I think, the safe operation of the facilities were being curtailed. That's really what we're trying to restore with the interim

approach that we've proposed.

The last slide is another justification for change with respect to the bargaining unit agreements that have been adversely impacted, over 1,000 grievances filed across the industry, and other unintended consequences. So Mitch and Eric will go into more detail on these unintended consequences, but I think there's a substantial record of that from the November 18 meeting, and I'm not going to go into any great detail on it.

Let's go to slide seven. We've reached agreement with the NRC staff as a result of three meetings, on a 54-hour per week average for all covered workers over a rolling period not to exceed six weeks. This is a compromise from where we started with our enforcement discretion request. The work week average would be applicable to all covered workers, which also reduces some of the complexity in the rule. But we think with this proposed interim approach we can restore the safety-beneficial practices that were restricted by the minimum days off requirements.

The benefits of that approach on slide eight. A lot more flexibility in scheduling due to no minimum days-off would allow us to restore the practices, we get rid of the eight, 10, and 12 hour shifts, it's the same limit for all work groups, and workers will be able to track their own hours, which is very, very important. We heard a lot of examples of people not knowing whether they were in compliance with the rule because you were relying on a computer program to check and see whether you were complying with the break requirements and minimum days off requirements of the rule. So this simplifies that to a great extent, and allows workers to track their own hours.

Slide nine, the “Authorization to Proceed.” We met with our chief

nuclear officers last week. There's a clear industry preference for enforcement discretion from the minimum days off requirements of the rule, and really the simplest definition I can think of with regard to enforcement discretion is when compliance is not in the interest of safety; that's when enforcement discretion should apply. And clearly, a lot of these safety-beneficial practices have been curtailed or restricted. Enforcement discretion will allow a timely restoration of those practices. It would also minimize the administrative burden on the NRC staff and facilitate our transition to this interim approach.

So, last slide, “Going Forward.” We strongly urge the Commission to consider issuing a Staff Requirements Memorandum to authorize this interim approach, hopefully coming out of this briefing. We will monitor and trend implementation of the approach going forward, we'll continue the dialogue we've had with the NRC over the last several months, and we look forward to the timely consideration of the petitions for rulemaking this year. That concludes my presentation.

CHAIRMAN JACZKO: Thank you. Done in five minutes and 24 seconds, or six minutes and 24 seconds. We'll start with Mr. Taggart, who is here as President of the Professional Reactor Operator Society.

MR. TAGGART: Good morning. So I get to use Tony's three minutes he left over, right?

[laughter]

MR. TAGGART: My name is Mitch Taggart, I'm a shift manager at Calloway Plant. I'm also the President of the Professional Reactor Operator Society, better known as PROS. My role today is to represent PROS. I take that obligation seriously. I will be speaking for approximately 550 covered workers.

PROS has been involved with the process for a while, we even submitted a rule-change request for “Unit Outage” and “Outage Unit” definition change. Next slide, please.

A little history of PROS, for the individuals who are not familiar with it. PROS was founded in the early 80s by licensed operators for licensed operators. PROS has a national board consisting of a President, Vice President, Secretary, Treasurer and International Coordinator. It further is structured with regional presidents that coincide with the four NRC Regions, and each site has a site representative. Next slide, please.

I'll discuss four consequences that PROS has experienced with MDO. The first, at one site an SRO was called in for an urgent one hour meeting. After putting the one hour meeting into the tracking software, the one hour meeting resulted in an MDO violation. The SRO was completely unaware of the violation prior to the meeting or even the possibility of a violation prior to putting the time into the computer software. Next slide, please.

Calculating MDO requires sophisticated software. Without the MDO limitation, individuals and supervisors could monitor compliance without the computer program. Operators must now rely on a computer program to ensure their workers', and their own, compliance with MDO limitations. If the computer program happened to fail, the effort to manually verify compliance is too time consuming. Operators are not comfortable relying on a computer program to ensure compliance of a federal law. Next slide, please.

The second consequence, several field operators at one facility were told they would have to cancel overtime to roll onto an outage schedule. The field operators strategically took four hour blocks of vacation on their regular

schedule to lower the MDO work hour limitation. They were able then to work additional overtime. All work hour limitations were observed, and in the end, five field operators exceeded the 54 hour average after the adjustment, when only one would have exceeded the 54 hour average prior to that adjustment. Next slide, please.

Third consequence, many important meetings and briefings have been directly impacted by MDO. Some of those include shift manager and licensed operator meetings, infrequently performed test or evolution meet-briefs, training preparation review meetings, training oral boards, and qualification review meetings. Next slide, please.

A little more detail about the shift manager meetings and licensed operator meetings, which have basically stopped or been diluted by only a portion of the population of affected persons being able to attend. MDO limitations directly impact the number of individuals who can attend these meetings. Without these meetings, internal OE, which is usually the best OE available, is not effectively shared. Next slide, please.

Infrequently performed tests or evolution briefs are intended to induce more management attention and involvement in activities that are either complex or infrequently performed. The target audience for these meetings are often licensed operators or non-licensed operators, and other covered workers. Given the inability to gather this group prior to the scheduled activity many RO briefs are being done on critical path. This negatively impacts the quality of the brief, because we're rushed, and impacts the restoration time for vital equipment, both negative consequences. Next slide, please.

And more about the train, train-prep, preparation review meetings

and just-in-time training are impacted. Since the best individuals to prepare and address training are the people being trained, MDO has limited the operator influence on this process. Without this input, the training qualification has the potential to be negatively impacted. Just-in-time training has become extremely difficult to schedule, for scheduled and unscheduled activities. Next slide, please.

The final consequence, the short-term watch relief coverage encompasses a large portion of the supervisor's time. The time frame required to arrange short-term watch coverage has increased by as much as a factor of five. The complexity of the process has prompted peer checks at many facilities. At one site, two unit supervisors spent one hour each determining the Fatigue Rule compliant replacement for an operator that called in sick, when this activity usually took one supervisor 20 minutes before. Next slide.

In closing, the Fatigue Rule doesn't make it impossible for present operating staffs to comply, it just makes it difficult. The existing operating staff simply have to absorb the new administrative burden. Next slide, please. PROS members do not feel comfortable relying on a computer program for compliance with federal law. Further, our members who are supervisors of covered workers feel vulnerable being placed in a position requiring computer software to show compliance for their crews. Next slide, please.

The PROS body of operators feel we have been put into an undesirable environment formed by the complexity and rigidity of the MDO limitations. Our members feel there has been an unnecessary burden placed on the very body of people the rule was intended to protect. The replacement of the MDO limitation with a work hour weekly average would greatly reduce this

burden while still meeting the objective of limiting worker fatigue. Thank you.

CHAIRMAN JACZKO: Thank you. We will now turn to Erik Erb, who is a Security Officer at Nine Mile Point.

MR. ERB: Thank you, Chairman. I don't have any slides today. Hello, my name is Erik Erb, and I would like to say thank you for the important opportunity to be here and speak about this important topic. I would also like to point out that I am here today as a member of the general public and an independent petitioner of the NRC. My views, concerns, and opinions are my own, as well as my coworkers who signed my petition, and I, nor they, do not represent Constellation Energy Nuclear Group or Nine Mile Point, LLC.

Since implementation of 10 CFR Part 26, I have seen unintended consequences in my position as a nuclear security officer. The availability of overtime has been significantly decreased, and has resulted in many officers losing a substantial amount of income. I myself have taken on additional outside employment as a result of this loss, and know of others who are exploring this option. I limit my outside employment to about a day per week, so that I am not fatigued when I return to my position as a nuclear security officer. It is conceivable, I believe, to assume that others may not follow this guideline, and could return to their position fatigued.

With our current schedule at Nine Mile, we are only able to predominantly work up to two unscheduled days per 28-day fixed cycle. This limits the availability of officers to be able to cover for required training and support plant operations that may arise. Worker morale has also been negatively impacted. Officers who previously chose to work overtime willingly are now limited a great deal. These officers are able and willing to work, the work may be

there, in their own assessment they are not fatigued, but they are told they have reached their MDO limit, and are unable to work. In contrast, officers who choose not to work much overtime are now having to work it, mainly because officers who would otherwise work are now limited, and the overtime has to be taken by someone who has not reached their MDO limit. This has created morale issues and quality of life issues for both of these types of workers.

The fatigue software that Nine Mile Point uses, EmpCenter, requires a security shift foreman and a security supervisor to evaluate a security officer's availability for overtime. This task can sometimes take hours, and detracts from the other duties that these key individuals can devote to the field.

All these issues have the possibility of impacting safety negatively. Having officers working too many hours at outside employment, having officers with low morale due to lost income, having foremen and supervisors devoted to a software program, and having officers being forced to work overtime are all inherently adverse to safety. Mandating a number of days off for nuclear security officers does not guarantee that these officers will use these days to get restorative rest to mitigate cumulative fatigue. In theory, this sounds like it would work. In practice, however, this isn't always the case. Any number of situations may arise that could make a day off work as fatiguing, or more so, than a day at work.

MDO accomplishes shifting the onus of getting rest out of the officer, however, I believe the current MDO requirement for Nuclear Security Officers is too stringent. Being able to work two days of unscheduled work, essentially per month, I believe, is too restrictive. The proposed change for MDO allows more flexibility of overtime amongst the security force without allowing

some officers to take all the available overtime and some officers to take none. Having worked as a nuclear security officer for nearly seven years, I fully understand the importance of a well-rested, alert security force at a nuclear facility. I also understand the importance of oversight and regulation of this industry. Workers must be protected from being unfairly worked, or overworked, to ensure the public health and safety. Further, I understand the significance of mitigating against cumulative fatigue and ensuring adequate staffing levels in the Nuclear Security Industry.

The current Fatigue Rule, it is not written or enforced for nuclear security officers. It is simply too restrictive and inflexible to the point of being counterproductive. By lowering the MDO for security, or going to an average of hours worked instead of MDO, I believe it would do much to alleviate the unintended consequences of the current Fatigue Rule. Cumulative fatigue is a genuine concern, and one not to be taken lightly. Having stated that, I believe there is common ground the industry and the Commission can agree upon to address this issue.

In closing, I would like to acknowledge the Commission for their concern and effort to address this important issue, and also for their willingness to listen to our concerns on the unintended consequences that have arose over the past year-and-a-half or so that the MDO has been in effect. I believe that we all can agree on some fundamentals, and can find common ground to address these issues. Thank you.

CHAIRMAN JACZKO: Thank you. I will now turn to Doctor – I'm going to ask you to pronounce your name.

DR. DINGES: Dinges.

CHAIRMAN JACZKO: Dinges, who is with the University of Pennsylvania School of Medicine.

DR. DINGES: Thank you very much. My name is David Dinges, I am a Professor at the University of Pennsylvania School of Medicine, and I am a funded scientist, for the last 32 years. What I am going to talk about regarding just a very quick overview of the science of fatigue, and why it may be relevant here, is, this is where I should say funded by the National Institutes of Health, by NASA and the National Space Biomedical Research Institute, heavily by the Office of Naval Research and the Air Force Office of Scientific Research, in addition to the Department of Transportation, the FAA, and Homeland Security.

The underlying issue here is, what is the source of fatigue as best we know it, and what should one be concerned about? The 10 CFR Part 26, as I have read it, is concerned about acute fatigue, chronic fatigue, and Circadian phase contributions to fatigue, and those are all the reasonable and appropriate things to be concerned about from the standpoint of what the science shows. The first slide I'm going to put up shows you, just in general, this is not about your industry, this is not data from power plants, but in general, in the United States at least, looking at the Time Use Survey, Americans will trade primarily paid work time and travel time for sleep, that's their primary trade-off. The more hours they work paid usually the less they'll sleep, in general, and the more the commute time, in particular, is long, the less they'll sleep. So to the extent that those are relevant issues in your industry, those would be of concern. But again, this is not data on workers in NRC plants, so it's just, just making a point in general, about what Americans will trade for sleep.

The next slide shows something probably most of you know, but

just to state the obvious, and there's a great deal of scientific work on this, and I should say that there are thousands of scientific papers on this, this is not a small issue from a government standpoint, trying to understand how much sleep people need to be alert, and this just shows you what happens when you don't get adequate sleep, and there are two ways that can happen. One is you have a disorder that prevents you from getting sleep, a common one is sleep apnea, this breathing disorder most of you hear about, these are all treatable, and one of the fatigue mitigation strategies in most industries is to make sure their health care system or their occupational health or something takes care of workers, gets them treated for any disorder that would erode their alertness on the job.

In addition though, if you just simply do not sleep enough, you can have a problem. That happens naturally when people work the night shift, they have a very difficult time maintaining a long enough sleep duration in the daytime. It's a worldwide problem, not unique to any industry. There are other challenges; trying to be alert at night, people rarely make a full biological adjustment to the night shift and as a result their days off are not terribly helpful, and I think there's been some feedback from the industry that the night shift workers don't feel the day off was very helpful at all. That's probably because of the lack of biological adjustment.

There's not much we can do about that, there's no solution to that, it is what it is. I will mention as an aside, and because of the obligation to disclose, that the World Health Organization has declared night shift work as a carcinogenic activity because of the high rates of breast and prostate cancer. But that's worldwide, that's epidemiological data, and that doesn't tell us what to do, or it doesn't tell us we can get rid of night shift work, given the sheer number

of people on it.

The cumulative fatigue issues, the more restricted sleep is, and that's the next slide, if I could just see that. The more you restrict sleep, the more performance deficits emerge, and this is, these are really large-scale studies done on 100s of people in the laboratory for many, many days. The top graph is one that we did based on funding from the National Institutes of Health, where we randomized people to four, six, or eight hours time in bed a night, and measured their performance across the day, every day after that. The bottom graph is from Walter Reed, it's a Department of Transportation funded study that the Army did. They did the odd-number hours, we did the evens, they went one week, we went two. Both studies show the same thing, the deficits begin to appear when sleep gets below seven hours time in bed. The deficit zone is the equivalent of one night without any sleep, being awake 36 hours. The severe deficit would be two nights without any sleep.

And it's the cumulative nature of these effects that has drawn the attention of both science and industry sort of worldwide; what do we do about this? And what we do about it is provide recovery. The problem we have is, could we know it by asking people, that's the next slide, and this is particularly problematic, and I wish it wasn't so, because it would make fatigue management so much easier. The more you're under a chronic condition, the harder it is to tell somebody whether you're fit for duty. So standards that say it's up to a worker to say if they're fit for duty are certainly reasonable things; the problem is, under chronic conditions, some people have a very difficult time doing it. And in general, they will tell you, the more deficit they develop, the more they will tell you they're good to go. So that has led to, and you should just be aware, but I'll

mention at the end, that has led to an emphasis on trying to find technologies that will detect whether someone's impaired, and if you want to know about that, we can talk about it at the end.

The final slide regarding data is the next one, and that just is the recovery slide. People were put on, on the left-hand column, the “sleep debt,” there's a control group in the laboratory, for a couple weeks continuously, getting adequate sleep at night. And then the line that's going up there on the left is the deficit in performance that's occurring with those who are getting four hours of sleep a night. And by the way, the most sensitive metrics here are vigilance metrics, this is the tendency to lapse paying attention, that's the root cause of a lot of disasters. It isn't that someone made a bad decision, they just missed a key signal or lapsed at a critical time, and it's part of the biology that tends to become unstable early on when you have a sleep debt. What we did was randomize these people to varying amounts of recovery sleep, from none at all up to 10 hours for one night, and we can almost get them back at eight or 10 hours, but not quite.

Now, the reason this is important is not because my lab did it and it was just published. We have very little data on recovery and recycle in humans. The very things that most regulatory bodies would like to know, we don't have enough data on. So there's no easy guidance here, except to know that you need some recovery sleep, and it should be enough to try to get you back so you're good to go again on whatever tough schedule you're going to go on, or whatever work activity.

Let me just wrap up with some general statements about fatigue management strategies. Fatigue management is the way that a lot of areas are

going, certainly transportation modes, but not exclusively, medicine, training of residents, hospital errors. The first slide of fatigue management says that work schedules that avoid acute and cumulative sleep loss are a good way to go, and so I applaud any desire on the part of the industry and the regulatory bodies to try and find the right thing for a given industry. The second is to treat sleep disorders, so these are sort of, they start there.

What else could we do? Well what about interventions, power naps and caffeine; the military's spent a lot of money with science, trying to figure out how to max those, and they are good, but they're not a fundamental substitute for getting adequate sleep. In other words, they have a shorter time constant to their benefit, and they can actually come with a cost, sleeping anywhere on the job, a North Sea oil rig, or in the cockpit of an airplane in the sleeper berth, you have a sleep inertia period after you wake up where you can actually be more impaired than before you slept. It takes 20 minutes or so, or 10, to get over that, so you have to calculate all that in when you use power naps. But they have advantages, they just have limited utility.

Another way to go is prediction, mathematical models that model the biology and its effect on performance are very popular now, you read about them, a lot of the regulatory bodies are looking at them, and you're going to hear more about that. The hope is that you could try different schedules and run them through these models and they would say where the risks are for fatigue. It's promising, but they're in development, they are not ready for prime time. They'd have to show, if they're going to be used as a safety device, in my opinion, that they really are safe, and they're not going to cause unintended consequences, that they really will tell you where your risks are. And the hope is, I think in many

areas they'll go there.

And then the fatigue detection is the next area, the last slide. Detection refers to the ability to know whether someone's getting enough sleep or they're not alert on the job. And this area is quite far along, but it's controversial in some ways. It's the ability to use machine vision or something to know what your status is, we have some of this on space station now, we're doing it with astronauts, et cetera, and we can monitor how much sleep people get with a watch. The problem we face here is, number one, we have to make sure that detection technologies are really reliable, and we're close to that, but the real problem is, what do we do with that data, who gets it, is it private, what's the nature of the feedback to the individual. So I just told a captain on a flight, "You're tired, you haven't looked at the console, your eyelids are drooping." Now what does the captain do? And you can appreciate this problem we just are confronted with what's the next step? So that's not ready either. So really it comes back to what you do as a regulatory body working with an industry to try to minimize acute chronic fatigue and deal with the problems of night shift. Thank you.

CHAIRMAN JACZKO: Thank you. I will now turn to Dave Lochbaum, who is the director of the Nuclear Safety Project with the Union of Concerned Scientists.

MR. LOCHBAUM: Good morning. UCS appreciates this opportunity to share its thoughts on the working hour rule. Slide three, please. Worker fatigue is a relatively new issue for UCS, dating back only a dozen years. It's a baby compared to older issues like GSI 191, Security and Fire Protection, which are decades old. Since we issued this report last century, our logo has

changed once, our D.C. office has relocated twice, and I've changed jobs twice. Bon Jovi may be right. The more things change, the more they stay the same. Slide four, please.

Our concern in this area is rooted in science. Studies have shown that discernable declines in cognitive abilities can be detected when humans are awake more than 11 hours. At 17 hours, the performance impairment is comparable to that resulting from 0.05 percent blood alcohol concentration. Slide five, please.

FAA and DOT regulations do not allow individuals with a 0.05 percent blood alcohol concentration to pilot an aircraft or drive a bus. But NRC's regulations permit individuals who equal or greater impairment to be at the controls of a nuclear power plant. Thus real science and political science would argue for Part 26, Subpart I to be strengthened, not relaxed. Slide six, please.

Why do we have Part 26, Subpart I in the first place? Because some owners, not coincidentally none of those owners at the table today, abuse their workforces and would not voluntarily curb those excesses. Slide seven.

This is a slide chart from an NEI document from August, 1999, or 2000. Some plants were simply understaffed and owners refused to correct this situation until the NRC made a federal case out it. Slide eight, please.

Some plant owners have demonstrated a Rhett Butler approach to working hours. The NRC must avoid creating loopholes that allow past abuses to be recycled into future abuses. If the rule must be tweaked, enforcement discretion is the absolutely wrong way to go about doing it. Enforcement discretion deprives the public our participation in developing the relaxed requirements and also deprives the public of its rights in legally opposing them,

once applied. Please don't shut the public out and negotiate some closed-doors rules agreement with the industry. Slide nine.

The original petition for rulemaking submitted over a decade ago sought working hour limits for all individuals granted unescorted access to protected areas in nuclear power plants. In other words, all workers subjected to the fitness for duty rule -- provisions of the rule, would also be covered by the proposed working hour limits. The industry contended that this wide coverage included workers lacking a direct link to nuclear safety, and therefore the cost of implementing working hour limitations would be an undue burden. The NRC accepted this position and the final rule narrowed the scope to only those workers with essentially hands on assignments. Slide 10.

The justification for the scope reduction was that the excluded workers either did not directly affect safety and coupled with the fact that the remoteness afforded one or more opportunities to detect and correct fatigue-induced errors before safety margins were compromised. A subset of the workforce lacked that protection afforded by these barriers, and therefore needed the protection against fatigue-induced errors that the working hour limits provided. Slide 11.

The process leading to the final rule established groups of workers that have direct and short term connections to nuclear safety with few independent barriers between their actions and safety outcomes. The final rule protected against impairment of those workers and the bad safety outcomes impaired workers might cause. Having explicitly and formally defined this safety risk and the means to properly manage, it would be irresponsible now to let that guard down. Slide 12.

I reviewed the materials from recent letters and meetings and found nothing that has not been raised and discussed usually numerous times by numerous parties during the decade-long rulemaking process. The final rule and its regulatory analysis reflected all these issues and their resolutions. All of the allegedly new issues were discussed at length in NUREG-1912, the staff report on public comments during the decade-long rulemaking process. Been there, done that. Let's not go back and revisit it without a really good reason. Slide 13.

UCS voiced our share of concerns during the rulemaking process. Plenty of our desired measures did not make their way into the final rule. For example, we believe that the regulations providing protection against fatigued workers should be the same whether the reactors are operating or not. The current regulations relax protection during outages, but NRC Information Notice 2000-13 documented a Region IV study of refueling outages. It stated, "Plants accumulated the equivalent of about 10 percent of their annual at-power risk in essentially one day of midloop operation." Thus having documented the risk during an outage may be significantly greater than the risk from a day at-power, the regulation provides less protection. That's risk-deformed regulation, not risk-informed regulation.

But we lost that battle, and we have to live with -- we thought we had to live with the final rule the way it was agreed upon. Absent new issues, recycled rants are not sufficient grounds to revise a rule developed by an open decade-long deliberative process. To do so would transform the rulemaking process into a farce, a mockery of justice, or some blend thereof. It took nearly 10 years to develop the rule. The regulatory analysis said that the rule was necessary for safety. Now, people are contemplating a fast track fix, not for

safety, but for business alone. Why is safety always taking a back seat to business at this agency? Thank you.

CHAIRMAN JACZKO: Thank you. We will now start our questions with Commissioner Ostendorff.

COMMISSIONER OSTENDORFF: Thank you, Mr. Chairman. I appreciated Chairman Jaczko's comments at the introduction to this meeting today that were acknowledging the positive aspects of trying to take a rule and where appropriate, make it better and make improvements where it makes sense. And so that's the spirit with which I think I'm very pleased to see the staff and the panel looking at these issues. None of us are devoid of our own experiences and so many things that were said in this first panel resonated with my own personal experiences, but from a very different perspective. I know that the military has different standards and different work environments than perhaps nuclear industry, but I can -- listening in great interest with Dr. Dinges, as your -- Dinges, as your analysis -- and I can recall my first time going on shifts back in 1977.

And over a period of 20-something years military spent many, I'd say probably the equivalent of two years on shift work and in shipyards. And I've operated extensively in your severe deficit category at sea, recalling when I was commanding officer of a submarine for three years. When I was at sea, the longest that I ever slept over that three-year period -- not all of that was at sea, part of that was in port -- but I'd say about 18 of those 36 months were underway, the longest I ever slept was five hours. And that was part of the responsibility of a commanding officer to receive watch reports from the off-going watch officers, both in general, watch officers of the deck, et cetera. And I will just tell you that

the fatigue management aspect of running a submarine as engineer officer, executive officer, and commanding officer was extraordinarily significant and a big part of our -- how we did business.

And so it's from that perspective that I'm reacting to some of the comments that were made today and that I will be pursuing the questions, but I thought it was important to share that a little bit, but also one other very important factor that I did not hear anybody mention, which surprised me, and that is I don't see that there is a notion of backup by other watch standards. There are the individuals -- and I'm going to ask this question to Dr. Dinges -- I don't disagree with any of your slides there necessarily, but I don't see where the fact that you're not talking about truck -- you know, we're not talking truck drivers here in isolation, we're talking about people that are part of a watch team, that are part of an organization where somebody can say, "Joe, you know, let's -- go take a walk around if you're tired. Go get a cup of coffee. Go walk back out into the plant," or those kinds of notions. I didn't see any of that in your briefing. I didn't know if that was a -- if the factors of backup by other people played an element into your analysis of fatigue. Could you possibly address that?

DR. DINGES: Well, it's a very important point and one of great interest, to what extent teams or systems that involve multiple individuals provide some redundancy for protection. And aviation's actually had it a long time, you know, the two officers in the cockpit. You really only need one to fly the airplane 90 percent of the time; the other one's there to provide that redundancy. What we don't know is whether it's being used, how effectively it's used. So when it works well, for example, on submarines and -- how do we make it work that well in power plants or anywhere else? Or is it already working that well? And this is

an area where there's a lot of interest in understanding how we protect ourselves from that kind of system redundancy, and how well is it working, and when doesn't it work? But I have to tell you, by and large, there are very few studies of trying to understand it. That's only happening now and it's primarily driven by NASA's interest in this.

COMMISSIONER OSTENDORFF: So is it -- that aspect I'm talking about as far as backup, because I think it's a significant difference between what I understood from your graphs and the actual reality of operating any kind of a facility where you have multiple people on watch and that opportunity for backup -- so I understand that that's an area that has not been fully explored, is that --

DR. DINGES: It hasn't. There are just a few studies that have appeared on whether a distributed team knows somebody is impaired and how they compensate for that in their overall performance. But there is not near enough work in this area. On the other hand, there are systems that try to hold people accountable for being vigilant and they check on them regularly. That generally won't stop fatigue from manifesting biologically. The question is what is the frequency with which you need to check, or what could you do? And because manpower is expensive, that's why there's this push towards technology to do that. So there's something -- the machine you're sitting at is watching you too. And that may sound otherworldly, but that future's here now.

COMMISSIONER OSTENDORFF: OK. And let me -- if I can -- on that same notion go to Mr. Lochbaum here for a moment. I'm kind of looking at your slide four and I was really struck -- and I disagree with your assessment there about the 17 hours being awake equivalent to 0.05. I'm not going to go into that, I'll just register I disagree with that. But one thing I'm just -- that really

shocked me, is there any notion of this backup piece playing into your assessment here on this slide?

MR. LOCHBAUM: No, but it -- the backup piece was discussed during that decade-long process that led to the final rule. The continuing behavior observation program that the rule does require was mentioned quite a lot as being part of that backup mechanism, which has some positive attributes in it -- there are times when a supervisor detects someone who's not -- just not acting normal or acting -- and it could be fatigue, it could be a number of other factors as well. And that's an opportunity to ask that question and deal with whatever the answer is. But the flipside of that as the staff has pointed out is that a lot of times there are for-cause or random tests of personnel's drug use. The catch is somebody who's in the CVO program didn't detect that that person was impaired due to drugs or alcohol abuse. So CVO is part of the backup, but it's not a fully reliable backup to the provisions of the working hour limits rule.

COMMISSIONER OSTENDORFF: OK. Well, I'll just register this as a strong, you know, reaction on my part, but that's something that's based on decades of experience operating nuclear propulsion plants that I think is a key factor that I think everybody needs to keep in mind.

MR. LOCHBAUM: And I had one other --

COMMISSIONER OSTENDORFF: Sure, please.

MR. LOCHBAUM: For the control room operators where there is a group generally at all times, there are limits -- you know, you can't just wander away from there. There are other parts of the plant that the rule covers that doesn't have that team -- there are not always teams of workers --

COMMISSIONER OSTENDORFF: I understand that.

MR. LOCHBAUM: -- doing it. So that concept, whatever value it has, isn't universally applied.

COMMISSIONER OSTENDORFF: Very fair point. Thanks for raising that. I want to ask Mr. Taggart a question, again, going back to the importance of shift turnover and shift manager meetings and so forth, am I hearing from your presentation that under the current Part 26 formulation that the operators are finding it challenging or not possible to conduct these effective -- these meetings in an effective manner?

MR. TAGGART: Yes, sir. Basically the shift manager meetings that were conducted prior to the rule implementation have not been performed at Callaway Plant. I can't really speak for all other facilities, but I know that other facilities are impacted similar from the PROS members that are also at those various places.

COMMISSIONER OSTENDORFF: Would that ability to conduct these meetings be rectified or addressed by this proposed 54-hour rolling average over a six-week period?

MR. TAGGART: Yes, sir. It should be able to accommodate the shift manager meetings. Right now the rule implies that if you have a meeting that's longer than a scheduled meeting, it is MDO. If you have an incidental meeting that is greater than 30 minutes, it counts as an MDO restriction. And that's one of the reasons we can't have all the shift managers participate in a shift manager meeting. This would eliminate that concern and we would be able to gather for typically an hour to an hour and a half is what a shift manager meeting, depending on the subject matter, could last. So right now we're restricted from having those.

COMMISSIONER OSTENDORFF: Thank you. Mr. Pietrangelo, I'd like to ask you a couple questions here in the very brief time that we -- these should be very short -- but I assume there have been some positive aspects of this rule to date. Is that a fair statement, or -- there have been some --

MR. PIETRANGELO: I think it's dealing with acute fatigue very well with the breaks that are codified in the rule.

COMMISSIONER OSTENDORFF: Is it my understanding that the industry position on this is really looking at the MDO piece in isolation as being the area that needs to be addressed but other aspects of the rule are working fairly well? Is that --

MR. PIETRANGELO: It primarily addresses the MDOs during non-outage time. We do have a concern with outage time; it's a little bit more complex than non-outage time. We intend to address that during a rulemaking period, but this was the real meat of the concern was the minimum days off during non-outage time.

COMMISSIONER OSTENDORFF: OK. I'll stop there. Thank you. Thank you, Mr. Chairman.

CHAIRMAN JACZKO: Commissioner Svinicki.

COMMISSIONER SVINICKI: I want to thank you all for your presentations and there's been some reference to the series of public meetings that were conducted between various industry representatives and the NRC staff. I would note that I sat in -- and I wanted to go to more of them, but I was given some limits on my time -- only able to come to the one that was in November.

And I sat in the audience of that public meeting. I came a little late, and I would note that it was a standing room only, so it was extremely well-

attended and I think there also might have been a bridge line for the public to listen in to the presentations as well. And the reason that I did that is that although I tour a lot of nuclear plants, and I hear a lot about Part 26, my concern was that that was a very anecdotal, so the November meeting was structured to be panels of different types of plant representatives; there were operators, there were maintenance representatives, maintenance managers, and other groups. And what I heard there was -- I drew some observations from it.

I thought at the public meeting that the similarity of experiences across the units, and kind of across the function was similar concerns that were raised about some of these practices that it had to be tabled or curtailed based on complying with Part 26. And I think Mr. Taggart, Mr. Erb, I think that you were both at that meeting and participated. So I also heard from the presentations an acknowledgment of the importance of addressing fatigue concerns, so I, you know, I felt it was something that there was a clear acknowledgement of the importance of the issue. But a bringing forward of specific implementation challenges and what I -- the last and final thing I observed for the time I was at the meeting was the NRC staff, I think, did a lot of very receptive listening about the concerns which I compliment them on because I think that there has been a tremendous development period, a lot of investment of the NRC staff in what was eventually promulgated. I think as just an element of human nature, it's always hard to listen openly when people tell you, "Here, you know, after a year or so of implementing it, here are some of the challenges that we're having."

So, you know, from what I've observed, I think that this has been a constructive engagement that I hope will continue. And the ability to kind of look at the runtime and look at what's happening out there, I think as someone noted

earlier, is just a part of having such a complex regulation be put out there. So that's kind of a long prelude, but I did have a couple of specific questions. So, I think the industry first was talking about averaging over a calendar quarter, and now we're talking about six weeks. I want to be sure that I understand that. I'm viewing that very, very simply as it's nothing more than over six weeks you would have a shorter duration of time during which you would be able to spread the amount of time worked. So mathematically, I'm seeing it as it's really no more complicated than that --

MR. PIETRANGELO: That's correct.

COMMISSIONER SVINICKI: -- is there anything more to it?

MR. PIETRANGELO: That's correct. There's more flexibility, obviously, with a longer time period than the shorter time period.

COMMISSIONER SVINICKI: OK. Is there any -- and I'll ask this of the staff as well -- is there anything else, I'll call it magic, about six weeks versus the calendar quarter? And I think I read in the industry's petition and letters that calendar quarters were the more the way you track time, and so -- but it sounds like there's now discussion of six weeks. Is there anything you can comment about six weeks versus a calendar quarter? Or is that best addressed by the NRC staff since that was their --

MR. TAGGART: Typically our schedules are a longer term. Six weeks is kind of short. That's how we kind of rotate our shifts, but over hours averaged, we like to look over a longer period. It gives us more flexibility to adjust when if we're having somebody get close to that, we're able to move the schedule and not impact -- because when you move one person, you impact somebody else. So if you're trying to do it in a six-week period, you're affecting

more people in a shorter period of time. So if we had the quarter to average over, we could make those adjustments if necessary, or foresee them, and make the adjustments on the individual's schedule that's impacting more than one person.

COMMISSIONER SVINICKI: And there were comments made about the complexity of the tracking software and I guess I have a couple of questions about that. First of all, is it getting any better over since you first introduced the software packages, the ability to work with them and, perhaps, have it take a little bit less time to analyze which workers are available to come in should an emergent need arise? The second question would be regarding the discomfort of individual worker's ability to discern whether or not they themselves are eligible. Is there anything that their employers are doing to help them -- to have greater visibility in that? It's just as a practical matter I, you know -- I certainly can understand why it would be difficult, in terms of responding to your spouse or your family. You know if you can't even tell someone we can't plan for personal activities because I am uncertain about this. But are there any tools like smart phone apps or anything, you know, that they could basically have reference to something to help them know?

MR. TAGGART: As long as your schedule is not deviated you have a pretty good idea of what you could work with respect to overtime if it's necessary or how your schedule will be impacted. But what's -- I've seen at Callaway, and I can only speak to that, is we have the people that learned it, understand it, and basically help everyone else through it. So you either go to those people and they use the program to help you through it, or you really have no clue until you put the time into the program. And anybody making a schedule

change, it's required you use the program. It's not a question of "Do you think you can do it?" You use the program regardless.

COMMISSIONER SVINICKI: OK. Mr. Erb, is that also true of the security personnel?

MR. ERB: Thank you Commissioner. I'll refer that question to Mike Kunzwiler; he's our EmpCenter guy at Nine Mile.

COMMISSIONER SVINICKI: OK. If you'd like to go up to that microphone.

MR. KUNZWILER: Yeah, it's very complex and I agree with Mr. Taggart. We have different levels. We have department administrators that I train to a higher level as a site administrator. But for the basic average security officer to know where he's at as MDO is virtually impossible to calculate those hours. You go to maintenance with a rolling schedule; it makes it even more difficult because you can average up and down. You can be an eight hour worker, work so much overtime, average up to a 10 hour worker with a half hour extra of work. And it can happen -- snap of a finger. So it is very complex and it does make it very difficult to calculate for the average person to say, "Yeah, I know where I am at in the fatigue world, right now." So it is very difficult.

COMMISSIONER SVINICKI: OK. Thank you very much. And I appreciate very much that we have augmented this panel with someone who is looking at sleep research and I appreciate having an opportunity to add that; I think it's added to our discussion this morning.

A comment was made though that -- I want to be sure I understood -- and it had to do with the potentially disruptive occurrence of having a day off when you are, maybe, a nightshift worker and all of a sudden you get a day -- I

think the comment had to do with the power of having restorative sleep during the day. I don't -- Dr. Dinges could you elaborate a little bit on that?

DR. DINGES: Well the problem a nightshift worker has is it's -- even though they may be very, very tired when they get home and they can fall asleep, they cannot stay asleep and they wake prematurely. Many of them try to then to nap before they go back on the nightshift. So typically -- and there are a great many published scientific studies showing that nightshift workers just simply get less sleep. And because of that they have a more rapid cumulative rate of deficit. And add to that the fact that they're awake at night because it's very hard to make a biological adjustment to that when the sunrise and sunset -- the light period is always forcing you to go back to biologically diurnal. When you fly to Europe, you know, the light's in your favor. You make a slow adjustment to the new time zone. But nightshift is much tougher because of that.

It's not that their sleep isn't beneficial; it's still their primary recovery and I wouldn't want to suggest anything other than what we know is that the essential thing is to make sure that people on any schedules are getting recovery sleep and it's adequate because that's their best defense against being alert on the job. And so this comes down to -- and this makes it tough because regulatory-wise you regulate work hours; you don't regulate what people do when they're not there. So this illustrates, or amplifies, on the fact that it's a shared responsibility, what regulators do, what industry does, and what workers do. And one may see it as advantageous to do one thing versus another, but what everyone can agree on is you want people maximally alert and capable of doing their jobs at work.

COMMISSIONER SVINICKI: Would it be fair to conclude from that

the body of research that has been done on nightshift workers that, in general keeping them on whatever schedule they're on and, perhaps, grouping then this period of time off so that they can kind of have a little time to adjust to that, which is different than their nightshift schedule, and then go on for a long duration to the nightshift schedule. Does that research kind of argue for that? Once they're on that shift, whether or not it provides the same amount of sleep, it's better to keep them on that?

DR. DINGES: It's a very tough question to answer. We know that there's a natural self-selection. Usually people who can tolerate nightshift work better will stay on it and prefer it. But I don't know what happens in your industry. I don't know enough to be able to answer your question in a way that provides any real insight. I don't know if people have an option to select that shift, if it goes to the lower paid worker, or the newer worker, or the more senior worker. I just don't know enough. But in general, it is a migration of what we think of as survivor populations to the nightshift. And those who cannot tolerate it then won't do it.

COMMISSIONER SVINICKI: OK, thank you. Thank you Mr. Chairman.

CHAIRMAN JACZKO: Commissioner Apostolakis?

COMMISSIONER APOSTOLAKIS: Thank you, Mr. Chairman. Looking at the slides and listening to you gentleman, I -- the research that Dr. Dinges has presented to us regarding fatigue and downsides of the current rule as you presented them, so I was looking for help and I must say that Mr. Pietrangelo, Mr. Taggart, Mr. Erb didn't help me at all. You didn't say anything about the research findings. I mean, why is that? Do you think they are not valid

or --

MR. PIETRANGELO: Let me answer that. I am glad Dr. Dinges is here. He's doing very important work, not only for our industry, but for other industries in the country. I'm glad he's so well funded as well.

DR, DINGES: Thanks to the Taxpayers.

[laughter]

MR. PIETRANGELO: Now to your question, Commissioner. We're using the same science that the rule was based on. No different. There may be new studies that come into the proposed rule, but the 54-hour limit is based on the current science that was the basis for MDOs. And it results in the same average hours. That there was a 54-hour average that was going to be looked at on a yearly basis, what we had proposed in our letter was to move that up to a quarterly basis. And what's on the table now is on a six week rolling average basis. So it's the same science.

COMMISSIONER APOSTOLAKIS: So in other words, your proposals do take into account the research findings --

MR. PIETRANGELO: Absolutely.

COMMISSIONER APOSTOLAKIS: -- and you don't think there is any issue with fatigue.

MR. PIETRANGELO: No, let me comment on what Mr. Lochbaum said. There's no relaxation here, OK? We're not getting more hours because of this. It's the same averages we were working to under the existing rule.

COMMISSIONER APOSTOLAKIS: I've heard the word rigidity several times; that the rule is rigid. So what does that mean?

MR. TAGGART: The flexibility associated with just what we spoke

about at the shift manager meetings. We cannot have a group of six individuals for Callaway come together to have a meeting because of the restrictions for at least two of those individuals over a half an hour period; they can't be there. So that rigidity associated with that -- those restrictions limit our ability to gather people for certain activities, including the IPT briefs, the training that we talked about. That's the rigidity we're speaking of.

COMMISSIONER APOSTOLAKIS: So the way we take care of rigidity is by introducing the average value? That's a --

MR. TAGGART: No the --

COMMISSIONER APOSTOLAKIS: -- they're saying 54 hours on the average.

MR. TAGGART: Right the average would give us the flexibility

COMMISSIONER APOSTOLAKIS: So sometimes you're not -- OK so that --

MR. TAGGART: --would still restrict the hours that I can work --

COMMISSIONER APOSTOLAKIS: Yeah.

MR. TAGGART: -- but give me the flexibility to work those hours as I see fit, or the site sees fit to able to accommodate what we have for these type of meetings or scheduled activities coming up.

COMMISSIONER APOSTOLAKIS: My quick question for Dr. Dinges: The 47,731 subjects that you referred to in one of your slides. These were average people? I mean, they didn't include people like -- Commissioner Ostendorff mentioned submarine operators and so on --

DR. DINGES: They're a representative sample of the United States. The Bureau of Labor Statistics annually charges the Census Bureau to

do a call to twenty-some thousand people. Most industrialized countries use this, primarily for economic databases to understand what people are doing, what they're paying for. So they represent a cross-section of Americans who have telephones, which is just about everybody now, but not everybody.

COMMISSIONER APOSTOLAKIS: Are there any similar studies involving highly-trained people like airline pilots, submarine operators, or nuclear plant operators to see whether there's a difference?

DR. DINGES: So there are studies that have been done and are done; and they range from airline pilots, a fair amount of work in, particularly, long-haul aviation, but not exclusively, short-haul as well. And there's a fair amount of work in some other industries right in -- very recent studies in medical resident training duty hours of young doctors in training at hospitals and their error rates around the amount of sleep, et cetera.

So I can tell you that the biology works the same in the brains of generals, and popes, as it does in laborers. And -- on the other hand, and in fairness to Commissioner Ostendorff's point, there are individual differences. And some people are more resistant, or can tolerate it better than others and there is a hard target search in science for markers of that and trying to understand it. But again, I have to tell you we don't have that answer yet and don't understand what nature's trying to tell us.

COMMISSIONER APOSTOLAKIS: Thank you. Now, Mr. Taggart. Some of your arguments I don't find convincing. On slide four you say that the SRO was completely unaware of the violation prior to the meeting. Well, tough. He should have been. Why is that something that will make me vote one way or another?

MR. TAGGART: The point that I was making is if not having access to that computer program which is something you have to access from work that's not available at home.

COMMISSIONER APOSTOLAKIS: Why would I worry about that? If he should have access. And you also say on the next slide, if the computer program happen to fail. Well excuse me. I mean if it fails have a second one. I don't care.

MR TAGGART: Sir, we don't have that available to us. We have one computer program. If that system fails then I am stuck with trying to calculate on a --

COMMISSIONER APOSTOLAKIS: If I have another set of procedures, say on paper, you might say, "Well gee, we lost it." So --

MR. PIETRANGELO: Commissioner, I think the point is they don't know whether they're in compliance or not. When you come to work and don't know how many hours you're allotted to work.

COMMISSIONER APOSTOLAKIS: My problem is --

MR. PIETRANGELO: That's a problem.

COMMISSIONER APOSTOLAKIS: -- should they know. I mean --

MR. PIETRANGELO: Yeah. I believe they should know.

COMMISSIONER APOSTOLAKIS: OK. So whose fault is it? Is it the rule that makes them not know?

MR. PIETRANGELO: I think the complexity of the rule greatly complicates this.

COMMISSIONER APOSTOLAKIS: I am not sure I find that a very convincing argument. Then we have Mr. Erb telling us, you know, "If you guys

don't change the rule, we're going to get tired anyway because we'll get the second job." Now again, I don't know whether that's a way to regulate. I mean, are you threatening us? That you will get the second job and get tired anyway, so we better comply with what you say? Or am I exaggerating in the way I present your argument?

MR. ERB: Yeah, yes thank you Commissioner. No --

COMMISSIONER APOSTOLAKIS: I am not sure why your thanking me --

MR. ERB: Of course, there's no threat there whatsoever. Simply stated, you know we as security officers used to take a fair amount of overtime and that has been severely restricted, which has impacted us financially a great deal. A number of us are exploring, I myself, have, you know, looked for other jobs with the time off that we have. You know, we get our restorative rest to mitigate cumulative fatigue and then -- well, we still got to pay the bills.

To speak back to the question that you ask as far as the rigidity, if I work one unscheduled day being a nuclear security officer with a three MDO limit, I am allowed essentially two days of unscheduled overtime per 28 day cycle a month. If I work one 12 hour day, my next day is a day. If it's a four hour day, a six, a 12, a 14, it's a day. That's the rigidity of it; it's not an average of hours. So it's saying, you know, that a six hour day is going to be as fatiguing as a 14 hour day. That's the rigidity that I am speaking to. Does that answer your question?

COMMISSIONER APOSTOLAKIS: In some ways, yeah. Mr. Lochbaum. Your presentation was very interesting and informative until at the end you said that, or you asked yourself, "Why should safety always take a

backseat to business in this agency?" I don't know that your prior slide supported that but you must have some evidence to support your argument that we don't really care about safety.

MR. LOCHBAUM: Well there's going back -- there's the safety second book, that UCS published that was 100 pages of evidence showing why safety doesn't get the same treatment as business activities. If you look at a more recent example, if you look at the license renewal rule, with a couple of exceptions that Congressman Upton pointed to. You've never missed the schedule for approving a license renewal on any plant at any place. However, if you look at GSI-191 or all these generic safety issues that languish for years trying to get resolution, business -- the actions of NEI in the industry get approved on a fast track.

The report that you make to Congress every quarter on licensing of actions, you have like a 95 percent approval rate. You've hardly ever missed approving a licensing action. Yet your safety -- resolution of safety issues, allegations, generic safety issues and whatnot. You recently put out an Information Notice on an event that occurred in 2003. Seven years to put on an Information Notice? How does that show that you're putting safety first? What does that track record tell the public, except that you put the business interest of this industry ahead of safety?

COMMISSIONER APOSTOLAKIS: Now you mentioned a report. Can you send it to us please?

MR. LOCHBAUM: Yeah.

COMMISSIONER APOSTOLAKIS: I am sure I can find it from -- Yeah. Thank you very much.

MR. LOCHBAUM: It's old but I'll send you a copy.

COMMISSIONER APOSTOLAKIS: Thank you Mr. Chairman.

CHAIRMAN JACZKO: Commissioner Magwood?

COMMISSIONER MAGWOOD: Thank you Chairman. First let me thank all of you. I think today's discussions been quite interesting. This, like many issues we deal with, are very complex and sometimes controversial. While I am usually right, every now and then I am -- I do find myself a minority and recently, in a recent Commission meeting we did have a discussion about a point where three Commissioners took one side and I took the other and one abstention. And despite that the fact that the Packers did, indeed, win the Super Bowl. I still stand here today wearing my black and gold quite proudly. In the Pittsburgh tradition I congratulate the victors and simply say we will see you next year.

Now this is an issue -- Part 26 was one of the first things I really started to become engaged in when I first came into the Commission because it was one where, whether you met with executives from the industry here who made visits to the agency or you talked to plant staff as you made visits to nuclear power plants, this issue came up almost all the time. And I don't -- I think in some ways I do -- I often, you know, sort of joke with NEI staff that there seems that they're always coordinating these messages. You always get the same verbiage from the executives. But also from many people that were not really being coordinated to speak on this issue had very emotional responses to what they thought was going on. And in a recent plant I visited one person actually very upset about some aspects of this indicated that he felt that they were not able to do their job the way they thought they should do their job

because the way the rule was structured. And it called to me -- it sort of reminded me of some of the discussions we had in the previous Commission meeting about the Safety Culture Policy Statement.

And I mean think it was the EDO, Mr. Borchardt, who made the point that having a strong safety culture is, in part, having people do the right thing under all circumstances and that's part of the defense-in-depth of nuclear power plants. And I wonder, to some degree, is it possible that this rule is beginning to impact the safety culture in some fashion. That people don't feel they can do the things they think they should be doing. So with that, however, after Commissioner Svinicki mentioned the Commission's record on this. I've read the votes, and read a lot of the analysis. And I think the Commission did the right thing in taking this step to put this rule in place. I think the Commission was faced with a very, very complex situation. Even today, Dr. Dinges as indicated, there's a lot of unknowns here, a lot of things we don't understand about how fatigue works and how recovery works.

And I think with an uncertainty with a lot of anecdotal evidence that there were issues. To have taken no action was clearly not the right thing. But I also think that it's incumbent on us to look at the rule now that it's been in place for a reasonable period of time to see if adjustments can be made. I do think that discussions between the staff and the industry have been productive to try to find where we can make adjustments in implementation without impacting the purpose of the rule. To the degree that we can do that, you know, I am going to be very supportive of it.

There is, however, a point that Mr. Lochbaum brought up and I wanted to sort of talk to Tony about this a bit. And that is that if you look at -- and

I do think there's evidence to this because I gotten this from talking to people at various plants, that fatigue issues are not an across the industry problem. It was really more of a problem at a relatively confined number of plants that led to the need for a rule. And I wonder if first, I see you want to respond to that but please respond to that but we also do hear that there are plants that are having a lot less trouble implementing the rule than others. And I wonder if you can give us some insights as to why some plants will tell us that, "Well yes it's an administrative burden but we're dealing with it. It's not something that keeps us up at night." And others; it's a big problem. I'm wondering if you can give us some insight to that.

MR. PIETRANGELO: Yeah, first with David's presentation. My favorite slide in his presentation was the one showing the abuses because there was abuse of waivers from the generic letter that had the guidance in place for work hours. That's what kicked off the rulemaking process for this. The other thing I thought about, yesterday, was that we're a lot different industry than we were in the early and mid 90s than we are today too. When capacity factors were 70 percent, and when outages were 75 days long. You had to work a lot of overtime in those circumstances.

The other issue was security. After 9/11 we went to red alert and haven't come down yet. We went through a lot of overtime having to hire and train 3,000 new security officers across the industry. And we think because of the Fatigue Rule have gone out and hired more folks, so that's the place we're in now. On an average basis for our industry we don't have a lot of forced outages or significant events anymore so I think that's mitigated the problem somewhat from leading to work overtime when your capacity factors are averaging around

70. Now I think you don't see the widespread problem, people get it on this, they don't want fatigued workers at the plant.

The other thing people forget is that there is no -- the utility, the operating companies are also required to manage their costs effectively. If they can do it without having to pay overtime they prefer to do it that way. So, that's a natural -- that they're trying to manage their costs. They want their workers to be alert in the plant, to do their jobs effectively, to conduct their maintenance or security or operations, their surveillance tests effectively. So I think all those point to an industry that gets it on this. When this rule went into play I think we curtailed a lot of the practices that led to the good performance. We don't want to see it decline. Again, this does not relax any of the limits of the intended benefits of the rule. We don't get any more hours out of this interim approach. So that is where we stand.

COMMISSIONER MAGWOOD: Let me give Mr. Lochbaum a chance to react to that but let me ask you a specific question in that context. When you look at -- let's sort of isolate one piece of this, that is the proposal to go to the 50 hour per week average over the six week period. Do you find, in providing that as a mechanism for flexibility in of itself a problem or are there other aspects of the proposed changes that you find problematic.

MR. LOCHBAUM: Well first I need to preface that with the slides -- I wasn't able to attend those meetings and those slides only made their way in to public ADAMS last Thursday and Friday. I only saw them Monday, so I've had one day to look at them. I asked some of the staff some questions before the meeting about how they would be implemented. My concern would be not the 54 hours, you know, those limits seem pretty equivalent to what the current rule

states. My questions were -- concerns were what are the exceptions? Do the shift turn over hours count, not count? How does that mesh with the other parts of the rule --?

COMMISSIONER MAGWOOD: -- devil in the details is that?

MR. LOCHBAUM: Right. It sounds like it meshes pretty well so that it is simply a different -- six of one a half dozen of the other -- a different way of achieving the same objective. If that's the case, and I'd like a little more time to ensure myself that all those protocols provide that then I would agree it provides the same thing. I would still prefer to see it go out through rulemaking, rather than by edict or by enforcement discretion because it took a decade to reach that. You know, everybody's best intentions led to that. I want to make sure everybody's best intentions lead to whatever the alternative is as well.

COMMISSIONER MAGWOOD: Does the idea of having enforcement discretion on an interim basis make you feel any better or is that --?

MR. LOCHBAUM: It makes me feel better from the standpoint of fighting it. It's much easier for us to go out and point and say look, here is this agency just not enforcing rules again. That makes my job much easier, but I'd rather that you make my job as hard as possible and provide some other way of doing that. We'll still try to make fun of it and attack it but try to make that as hard as possible rather than give me those underhand passes to me. I'd much prefer that.

COMMISSIONER MAGWOOD: We won't let you get lazy. I appreciate that. Let me, in the last minute or so I have, Mr. Taggart and Mr. Erb -- I appreciate both of your statements. I wanted to just really point to Mr. Erb for just a moment. Your proposed rule change was -- had the benefit of being one

page long. It was actually shorter than the number of pages they attach for the people who supported what you were saying. So I wanted to just thank you for taking the effort and, you know, making the initiative to sort of step up and do this. I think it's been a real contribution to the process. One question I would have for you is, when you look at what's being proposed in the discussion between the staff and the industry, do you feel that that addresses the issues that you have raised?

MR. ERB: Yes, Commissioner. Yes I do. Basically it's taking MBO and just converting it into an average of hours, there very simple. It's just basically a conversion, and I feel that it would go miles to mitigate the unintended consequences I speak to.

COMMISSIONER MAGWOOD: Just to give you a chance Mr. Taggart.

MITCH TAGGART: I agree, Commissioner that would eliminate the concerns we have.

COMMISSIONER MAGWOOD: Dr. Dinges you had wanted to add something.

DR. DINGES: I just wanted to comment so because this is partly related to the question about what about going for a quarter versus six weeks et cetera. My concerns, purely just from understanding the dynamics of what produces fatigue, is that if any rule change resulted in a higher probability of cumulative fatigue developing without adequate recovery periods, that would not be a good thing. And so a part of this problem is figuring out do you inadvertently do that? It seems to me, one could make a case and I'm not suggesting that it's necessarily true that if you went to a quarter system that probability goes up. So

maybe keeping the averaging period shorter, but in the end this problem comes up over and over in many regulated industries and the only thing I guess I would urge and it may be unrealistic, is if you're going to make a change, measure objectively somehow what consequence the change had.

And with due respect to the desire for overtime and the inconvenience of adhering, measure alertness, fatigue, performance, measure the things you put the rules in place for to begin with which are not for overtime but for -- can we prevent a problem in an industry that is of national criticality and the one thing many industries fail to do is ask is what's the worst thing that could happen, and are we prepared to mitigate it?" And we see this over, and over again after the catastrophe occurs, and that's true for federal agencies. So I would just ask what is the consequence of a system that now is more flexible and works better, but does lead to erosion in certain workers' or something a fatigue. Or it's used in a way that it does that. I think part of it is how this stuff gets used, what actually happens. And I'm not suggesting that I know the answer to it, you almost need to sort of track it and understand it to know whether you did harm or not. But, again, with due respect to everything, the goal is to keep the workers at a high level of performance and vigilance to be able to do their job.

COMMISSIONER MAGWOOD: I appreciate that, and Mr. Chairman my time is up I wanted to give Dr. Dinges the chance to clarity one thing that he said. You mentioned that there is a whole study that indicates night shift work is a carcinogen. Could you --

DR. DINGES: The World Health Organization has made this claim.

COMMISSIONER MAGWOOD: Could you sort of clarify that just for the record?

DR. DINGES: So, it's just based on large scale population studies of night shift and day shift workers and the rates of both prostate and breast cancer. And they feel there is enough evidence, they is the World Health Organization, it's not an American body, that there's enough evidence to declare it as a carcinogen that the rates are high in association with the activity. I'm not -- realistically, and also night shift -- people have a severe reaction to night shift workers. There are now Food and Drug Administration approved medical interventions for them. It's called night shift disorder, night shift sleep disorder and we also have jet lag disorder now so we recognize that some people need to be treated for these things. I don't think anyone is proposing we can make night shift work go away; all industrialized economies depend upon it. But these are just realities of inherent risks certain jobs that one takes, and they're not the only jobs that have medical risks to them.

COMMISSIONER MAGWOOD: Thank you. Thank you Mr. Chairman.

CHAIRMAN JACZKO: Well I think it has been a very interesting discussion, I think as we've gone through this there's probably a variety of different issues in front of us. One, I think we have issues of the rule. Is the rule a good rule, a bad rule? We have a petition for rulemaking in process to do that and I think that should be addressed through the rulemaking process. My colleagues on this side of the table have not figured out yet that this is not an easy thing to do. No matter what. Scheduling workers, and shifts, and all these different things and it's a complicated business without a doubt. I mean, that's what I learned the last time around this process and it doesn't seem to be any different this time.

We then have an issue, which I think is the more immediate issue, which is the current rule may have some implementation challenges that are making it ultimately have a negative impact on safety. And that's what I'm hearing certainly I think those words have been used in a roundabout way. It's reducing beneficial safety practices but what I'm hearing is a negative impact on safety. I don't think that's what we want to do, but we want to ensure that we're keeping the same performance objectives to the rule. That's how I see what we have in front of us.

Now that's a significant issue for the Commission because we have a rule in front of us and to simply set aside a rule and not follow it is, you know, essentially through enforcement discretion is a very, very significant action for a regulatory body. I mean, all of these issues can easily be dealt with in the rulemaking process and I would note that a lot of the concerns that have been raised, were in fact raised by NEI. In fact, I think in their 2005 letter, under a section entitled unintended consequences.

So some of the unintended consequences were in fact foreseen and the Commission addressed many of them. The one that I think -- two in particular that I think that were not -- probably that is one is the particular issue I think Mr. Taggart that you talked about, which is this idea of a meeting among individuals who may all be on different shifts and therefore for them to get together they may come in for an hour or two simply to get together on that and with the MBO that clearly creates a challenge because that one or two hours might count on the day when they're intended to have their minimum day off. That was not one that I ever saw in the record, but many of these other issues, obviously the overtime issue all of these issues the management complexities

were raised as challenges, the distraction that shift supervisors would be spending more time on working through the implementation of the rule rather than other work. Those were all issues that were addressed so, again, it may be worth revisiting those but I don't' know that those warrant at this point revisiting in the context of simply setting aside the rule.

So, it gets as I think to the core, and I think Commissioner Magwood raised the issue and I think Mr. Lochbaum you hinted at it, is a 54 week rolling average the same thing as having a minimum -- 36 hour minimum days off every nine days? If it is, from a performance standpoint and a fatigue management standpoint then I have absolutely no problem figuring out a way to do that on a short and interim basis. And I don't know how to figure that out, to be quite honest with you and without going through everybody's shift schedules and working it out. I guess one metric I could use is 72-hour work weeks. And I don't know if any of you know the answer to this question but if you don't know it now, I'd certainly ask that you provide the information to us. But, under the current rule and normal plant operations, are workers able to work 72 hour consecutive work weeks? How many can they do?

MR. TAGGART: I'm not sure, Chairman. I'd have to actually calculate the numbers but Mike may have the answer to that.

MR. KUNZWILER: I do believe it's two weeks.

CHAIRMAN JACZKO: Could -- please, if you want to go.

MR. KUNZWILER: Four consecutive 72 hours.

CHAIRMAN JACZKO: Under the current approach with the current existing rule you are able to work four consecutive 72 hour --

MR. KUNZWILER: Well it depends which group you're in, each --

CHAIRMAN JACZKO: And, again --

[talking simultaneously]

But let's take the maximum -- there's a shift schedule that allows the maximum of four 72-hour consecutive under the current rule?

MR. KUNZWILER: I do believe.

CHAIRMAN JACZKO: OK.

MR. KUNZWILER: I'm not 100 percent but I do believe there are four. Scott might have --

CHAIRMAN JACZKO: So under -- and to me that, you know, is the best metric I can think of for looking at that cumulative fatigue. I mean 72 hours, that's essentially six 12 hour shifts. Under the 54 rolling average -- six-week rolling average is the number of consecutive 72-hour work weeks higher or lower? Or the same?

MR. BAUER: It's the same.

CHAIRMAN JACZKO: It's the same, OK.

MR. BAUER: There are 324 hours available to work under the 54 hour provision or the MDO provision. And those 324 hours can be front loaded in the schedule to the point where you could work four 72s in a row. Now, since we work rotating shifts we can't leave the control room unmanned the sixth week of the cycle so the most you can do is if you work 40 every week the most you could do is two 72s in a row.

CHAIRMAN JACZKO: OK, OK.

MR BAUER: That's one of the reasons that the rolling is kind of the preferred option because if you do fixed you could put those 72s back to back.

CHAIRMAN JACZKO: So the 54, then rolling average, gets you

essentially that same limitation on a 72 hour -- essentially the same number of consecutive 72-hour work weeks?

MR BAUER: Yes sir.

CHAIRMAN JACZKO: Now in terms then of the rest periods, under the existing rule how many guaranteed rest periods do you have?

MR BAUER: The rest periods are unchanged. You're still required a 10 hour break between each shift and you are required a 34-hour break every nine days.

CHAIRMAN JACZKO: So what do you accomplish with the minimum days off? What is the minimum days off accomplishing?

MR BAUER: Minimum days off are accomplishing forcing time off. The purpose of the minimum days off was to establish work weeks of 54 hours or less. So we're essentially just saying let's just take the MDO construct and just use 54 hours or less.

CHAIRMAN JACZKO: You know I have to tell you, Fred Brown is shaking his head behind you. So I'll probably ask him the same question. So what do we lose by getting rid of the minimum day off? I mean from the fatigue safety impact, what do we lose by getting rid of the minimum days off?

MR. BAUER: There's basically -- well I could let the staff stop and talk to their --

CHAIRMAN JACZKO: And I'll ask them the same questions today.

MR. BAUER: What we lose from the industry standpoint is we lose the rigidity that doesn't allow us to --

CHAIRMAN JACZKO: You've said that. What is your understanding of what I lose from a safety perspective with getting rid of the

minimum days off?

MR. BAUER: Without minimum days off one of the potentials is you could work people, in a six week period, there is 42 days you're required to have four 34 and nine breaks. So you could potentially work a person the other 38 days of that period. So you could potentially give a person some hours every day.

CHAIRMAN JACZKO: So they would essentially not have any guaranteed days off, basically. So you could be working them almost every single day.

MR. PIETRANGELO: In practice you cannot do that Chairman. That's the point. We have to staff 365 a year, you can't front load four 72s and have two weeks off for everybody and expect to be able to operate the plant. They don't do that.

CHAIRMAN JACZKO: And, again, I'm not -- and what I'm trying to get to is are these things identical? If they're identical then there's really not a problem that we have here in front of us and I think there should be a way to fix it. But I want to understand the difference. So that's essentially the difference, it's like you could have them coming in everyday for a management meeting or something where they're working a couple hours and then maybe they never get some effective rest. Something like that, that would effect and be the difference.

MR. BAUER: That could be a possibility but we believe it's a very small possibility.

CHAIRMAN JACZKO: OK.

MR. BAUER: I mean, we're not going to make major changes to our shift schedules. There's going to be minor tweaks here to allow people to

attend shift manager meetings and do just in time training, that type of thing.

CHAIRMAN JACZKO: Well I appreciate that and as I said I think you know there are broader issues here at play which gets to the issues of overtime. Those are known issues, those are not anything new. I think that our focus right now is on can we implement the same rule, the same kind of performance requirements, and objectives that we looked at in a better way? And it sounds like there is a possibility with this 54-week rolling average. We'll hear from the staff about where those areas are that we need to be sensitive to because, again, I think if we're going to look at this without changing the rule we want to achieve the same performance objective and if we can do it in a better way I think that's great. I'm all for that.

Which gets me to my last point, and I have to admit I'm somewhat sympathetic to Mr. Lochbaum, how do we do that if we're going to do it? Obviously rulemaking is the best way to do it. I had an argument with my staff last night about whether we could do a rulemaking in a couple of months. I'm sorry?

MR. LOCHBAUM: Are those months in a row?

[laughter]

CHAIRMAN JACZKO: Well maybe there is just a compression in the schedule we can accomplish it. I, personally, am uncomfortable with enforcement discretion. I don't think it's appropriate in this case because what we're talking about is a rule that we want to change the requirements for, I mean that's what we're talking about here. Issuing enforcement discretion in this case doesn't make sense to me because we don't know then what -- we're still requiring a certain provision. We would replace the provisions of the minimum

days off with a provision that's a 54 six-week rolling average. That is a new requirement that people can't exceed absent some kind of regulatory footprint I'm wondering how we ensure compliance with that provision then. So, it doesn't strike me that enforcement discretion is the right way to do this. Now, again -- as I said I was arguing with one of my staff last night who said we can do a rule I think in three months or four months, this is what the staff person said, I would love us to be able to do that so I'll probably ask the staff why it is we can't simply do that. And I think that's the right way to fix it.

Or, we take an approach of looking at orders and I know the General Counsel has not necessarily agreed with this, but again it gives us the advantage. If we're looking at the same technical underpinning, we put in place a new requirement, that requirement is in place until we complete rulemaking activity, much the same way that we've done in security cases. And if we're really dealing with here is a decrease in safety because of these practices like these shift manager meetings are not able to happen. Then we have a safety basis it seems, in my mind, for issuing orders. If there is no safety basis then I'm not sure exactly what the urgency is for us to make a change in this case. I don't know if anybody wants to comment on --

MR. LOCHBAUM: I just want to reiterate, the regulatory analysis that supported the original rules, said that there was some safety value that the rule would achieve -- say it's 100, a safety gain of 100. Unless the potential consequences of the lack of shift turnovers is greater than 100, why does it have to be on a faster or more urgent timeframe than the 10 years it took to achieve that safety value of 100. That's the way were looking at it , why is a potential safety consequence that nobody's argued is greater than the gain that the rule

produced, need to be handled more expeditiously, it doesn't seem to work in our -- the math doesn't add up in our case.

CHAIRMAN JACZKO: Thank you, any other comments?

MR. PIETRANGELO: We'll resend the testimony from the November 18 meeting, I think if you were there that day you would have saw 44 people who are actually currently impacted by the rule, as well as these two. It's a real safety issue today, it's not that we're not trying to operate the plants in an unsafe manner, that's not what were saying. But it has curtailed safety-beneficial practices that the industry has gotten through benchmarking, both here in our country and other countries to try to get the best performance we can. When you can't continue to do those practices, it's not in the interest of safety.

CHAIRMAN JACZKO: So if it is -- why wouldn't you support doing orders, I mean wouldn't that be the purpose of orders, we've got a safety --

MR. PIETRANGELO: No but you're not ordering us to do shift manager meetings, or just in time training, these are things we do to do our jobs better, that's not something you should order us to do.

CHAIRMAN JACZKO: Well, we wouldn't order that, we would order a new, a 54 hour six-week rolling average. And the basis would be that that would enhance safety because it would allow all of the safety benefit and practices which you're talking about, which currently I'm hearing are being prohibited by the rule

MR. PIETRANGELO: I'll just restate the reason we took enforcement discretion, it's the quickest, easiest way to restore those safety beneficial practices that has the least administrative burden on your staff, those were our reasons.

CHAIRMAN JACZKO: Well I appreciate you looking out for our administrative burdens [laughs]. But -- well and finally I think we'll go around if people want to have additional comments or questions, I know -- I think this is a very important topic, so I'll just have a few comments, but I thought at this point I'd stop. Commissioner Ostendorff did you have any additional --?

OK, well I'll just close, again I think this has been very helpful and I think as we go forward the important issue to keep in mind is, what is, in the scope of a rule change, which is in a petition for rulemaking, what are those immediate issues that we should look at? And Mr. Lochbaum to your point, I don't think the first rule should have taken 10 years, so if we can do a rule change faster I think all of our rule changes should get done faster, and I think in the end it -- you know, I get frustrated because we look at a process here where clearly there may be a better way to do this rule, and our own processes prevent us from doing that in the right way, which is clearly a rule change. That can't be right.

So there should be a way for us to get a simple rule change like this, which I may even have you, Dave, agreeing is comparable to the minimum days off provision. And if that's the case, there really doesn't seem to me a reason why we can't get that done in a quick rule change that could take three or four months. That is something that we should be looking at rather than going down the road of enforcement discretion, if it's a better way to do the same thing we should be able to do that. So I'm sure I'll hear from the staff on the next panel. And again I want to thank everyone on this panel for your presentations. Thanks, we'll take a quick five-minute break.

[break]

CHAIRMAN JACZKO: Well now we'll hear from the staff and you all have 45 minutes to enlighten us. I encourage you to get to the Commission questions as soon as possible and the discussion. Bill, I'll start with you.

MR. BORCHARDT: Well I think it's worth remembering that the issue of managing fatigue and work hours came out of the TMI lesson learned. It was in 1982, that the Commission issued a policy statement in a generic letter that addressed this and kind of transitioned into technical specifications, and administrative controls, and one I think the driving factors for why we're on the path that we are today, is that we saw a wide variation in how those administrative controls were actually implemented. There were some licensees that took very few waivers, others that had waivers in the thousands of waivers to those work hour rules, and that kind of gave us the impetus to go down the rulemaking process. So I think we've really benefitted throughout this entire process, through all the stakeholder involvement and participation into where we are today. So, Eric will begin the staff's briefing.

MR. LEEDS: Good morning Commissioners, Mr. Chairman. You heard from industry this morning about some of their concerns related to the unintended consequences --

[audio break]

MR. LEEDS: thank you -- and the impacts it's had on practices they consider beneficial. We agree -- the staff agrees that there has been some unexpected consequences that have impacted some plant practices. And we understand the industry's concerns, about the impact of these consequences. However, we believe that the basis of the rule, to manage fatigue, so that it does not adversely impact safety, is still valid, is still very important, and must be

maintained. Given our agreement with industry that unintended consequences exist, we've worked hard to develop a proposal that maintains the outcomes from fatigue management practices, while mitigating the unintended consequences that have resulted from implementation of the rule. Today you will hear from the staff about the science behind fatigue, our observations from our inspectors in the field. And also the staff's proposed alternative. And with that ill turn it over to Dave.

MR. DESAULNIERS: Thank you Eric. Of course I'd like to comply with the urging to move along rapidly, though given I have written speaker notes, I don't trust myself to stray too far from them and its difficult to compress 10 years of rulemaking into a short presentation, but I'll do my best. Now although I'm currently a senior technical advisor for the Office of New Reactors, I'm here as I alluded because of my former role as the technical lead throughout the development of Subpart I. In the next 15 minutes I will briefly discuss the rule in terms of the fatigue management science, and how that shaped many -- was shaped by many other relevant considerations. This will be followed by discussion of a few fatigue science concepts that are important to the understanding and management of fatigue. And I will conclude with a discussion of cumulative fatigue, which is the issue that is essential to the discussion of the alternative to the minimum day off requirements. Next slide please.

Development of the rule is based on a broad range of considerations, many coming from the numerous stakeholder meetings we held. Essential to the rule, and will be discussed later in the presentation is the science that supports our understanding of fatigue and human performance, of course you heard some of that already from Dr. Dinges. This understanding comes from

diverse methods and sources, including laboratory and field studies, studies of cognitive motor functioning, studies of accident and accident investigations, surveys of worker attitudes and behaviors, expert panels, and studies of human physiological and neurological responses to restricted sleep and extended wakefulness. Through these reviews the staff sought to identify areas of scientific consensus, and where data from diverse sources provided conversion validation of conditions and methods that the staff should target for fatigue management.

In addition to the science, the staff also considered many practical issues such as which job functions are most directly tied to the protection of public health and safety, which tasks are most susceptible to degradation from fatigue, what human performance tools are currently used in the nuclear industry to ensure reliable human performance, and what are the state of the art methods for effective fatigue management. To address all of these considerations, the staff sought to provide an integrated, comprehensive approach to fatigue management. Naturally part of this integration was with other NRC requirements, most notably other NRC fitness for duty requirements. And the results of these efforts are represented in the next slide.

Now this slide provides high level graphical summation of Subpart I. Fundamental to the fatigue management is worker understanding of the implications of fatigue for performance, and the methods that are effective for managing fatigue. Consequently at the base of the pyramid, you will see reference to Subpart I's training, self-declaration and work scheduling requirements.

The next level up on the graphic are the work hour and break requirements to address fatigue during periods of high intensity work. These

limits provide flexibility to meet short-term operational demands, but allow too many work hours to support fatigue management for extended periods. At the third level of the pyramid are the minimum day off requirements. The minimum day off requirements are intended to address the limitations of the work hour and break requirements by providing assurance that sufficient rest periods will be provided that will either prevent or mitigate fatigue that can result from extended work hours.

And finally, at the top of the pyramid is the requirement for licensees to annually assess implementation of the work hour controls. Collectively, these requirements provide the structure for a comprehensive fatigue management program. Next slide please.

For the purposes of Part 26, we define, as you can see here, fatigue with an emphasis on performance, and in relationship to inadequate rest. While the focus is on cognitive motor functioning, it's worthwhile noting that fatigue has subjective aspects including feelings of sleepiness, loss of motivation and irritability that can also affect worker performance. And finally, it's important to recognize that fatigue has biological underpinnings and consequences. Understanding the neurological and physiological basis for fatigue provides us the insight that motivation and the learning stimuli are not by themselves, sufficient methods for managing fatigue. Next slide please.

Fatigue as we've heard is a complex phenomenon, but there is broad agreement within the scientific community that it can be described and predicted reasonably well through the two-process model of sleep regulation. The two processes are the Circadian process and the sleep homeostatic process. And together they describe the oscillating, negatively sloped trend in

performance that is observed with increasing time awake or sleep restriction. Next slide.

As noted here, the Circadian process is reflected in a nearly 24-hour oscillatory variation in the propensity to sleep. In a survey of more than 100 shift supervisors at U.S. nuclear power plants, more than 90 percent reported times of day, or days in the schedule where operators are less alert. Circadian oscillations also occur in a wide range of physiological and cognitive measures. Oscillations in event frequency consistent with their Circadian rhythms have been reported in the analysis of human performance events at nuclear power plants in France, the Ukraine, and the U.S. The Circadian process reflects the influence of a biological clock that is essential to our -- excuse me, that is sensitive to our exposure to light and which naturally entrains our sleep-wake cycle to the day-night cycle. This entrainment is what allows us to eventually overcome jet lag. Although ultimately a benefit to travelers, this entrainment is a challenge as we've heard for workers on the night shift and why a change in shift can be more challenging than an equivalent change in time zones.

The Circadian process is relevant to the ongoing discussion concerning fatigue management because it has implications for both the quality and quantity of sleep that shift workers obtain. Quantity and quality of sleep is critically important to worker functioning, which leads us to discussing the other half of the two-process model, the sleep homeostatic process.

Extending the natural period of wakefulness or restricting natural sleep duration increases fatigue in associated impairments of cognitive and motor functioning. Multiple studies have shown performance measures for individuals who have been awake for 16 hours to be comparable to those

individuals who have blood alcohol concentrations on the order of 0.05, which happens to be in excess of NRC's Part 26 limits. I'm sorry I had to repeat that. Such indexing studies provide a useful comparative metric for the staff to understand how their positions relative to fatigue compare with positions relative to drug and alcohol.

Just as fatigue increases with time awake, fatigue increases with sleep reduction. Recent advances in science are giving us the ability to see the basis for this experience. Studies have shown substantial changes in metabolic and electrical activity of the prefrontal cortex of the brain following 24 hours of sustained wakefulness. Now this is important because the prefrontal cortex is an area of the brain that is associated with the fundamental functions of attention and working memory.

Consistent with these findings, sleep deprivation has been shown to result in involuntary micro-sleeps, cognitive slowing, declines in short term recall, perseveration on ineffective solutions, and loss of situational awareness. Total sleep deprivation would be highly unlikely under the Subpart I requirements; however, total sleep deprivation is not necessary to cause fatigue in associated degradations and performance. Sleep restriction, particularly when it occurs over successive sleep periods, can similarly degrade performance, and this is why Subpart I includes requirements to address cumulative fatigue. Next slide, please.

As defined in Part 26, cumulative fatigue is the increase in fatigue over consecutive sleep-wake periods. Dr. Dinges, distinguished expert on the external panel, and others have conducted compelling research, some of which you've seen here today, on the effects of extended sleep periods and sleep

restriction. Now, with significant sleep restriction, the effects of restricted sleep can compound rather rapidly over successive days. But even with limited sleep restriction, significant decrements can develop over time. For example, individuals restricted to six hours time in bed for 14 days demonstrated cognitive decrements equivalent to those which occur when individuals remain awake for 24 to 48 hours. Next slide, please.

Time in bed of not more than six hours can be a relatively common condition for shift workers. Sleep for shift workers is often truncated by the early start times required by round the clock operations and fragmented when they are trying to sleep during the day while their Circadian rhythms are exerting physiological pressures to remain awake. A 2008 National Sleep Foundation poll of U.S. workers found that 58 percent of shift workers compared to 13 percent of non-shift workers spent less than six hours time in bed. And those that spent less than six hours in bed were significantly more likely to report avoiding interactions with co-workers, becoming impatient with others, and finding it difficult to concentrate a few days a week. The average work week for these shift workers was reported to be 49.13 hours.

Recovery from cumulative fatigue occurs when individuals get sufficient time in bed to allow for natural wakening. Schedules that include extended periods of consecutive work days limit the opportunity for recovery while simultaneously allowing for progressive accumulation of fatigue. In addition, long work days and extended work weeks create the pressure for individuals to forego sleep in order to attend to daily living obligations that they either cannot or choose not to defer.

These findings and considerations suggest that shift workers, such

as those subject to the requirements of Subpart I, are at increased risk of experiencing cumulative fatigue and performance decrements. A detailed analysis of several years of human performance data from three nuclear power plants in France suggest that cumulative fatigue may in fact be effecting the performance of plant operations personnel. The data indicated that the incidence of human failure events increased at the end of the seven day sequences of successive shifts with the most pronounced effect for sequences of night shifts.

Similarly, a review of work hours for security personnel during the months following 9/11 indicated that despite a market increase in officers reporting concerns regarding excessive fatigue, they were generally not working in excess of 60 hours per week. They were just working these elevated hours day after day. Next slide.

Concerns associated with cumulative fatigue are currently addressed by Subpart I in part through the requirement for a minimum 34-hour break in any nine day period, and principally through the minimum day off requirements. A 34-hour break is effectively one day off; however, studies of recovery from sleep restriction have shown two to three consecutive days of unrestricted sleep are often required before performance returns to baseline levels. Therefore, the primary role of the requirement for a 34-hour break in any nine day period is not to ensure complete recovery from cumulative fatigue, but rather to ensure that cumulative fatigue is periodically attenuated.

Without this requirement, individuals on eight or 10-hour shifts could be allowed to work as many as four to five weeks without a day off. The minimum day off requirements are Subpart I's principle means to address cumulative fatigue. The required days off could be distributed across the

individual's shift cycle at the licensee's discretion as long as there are at least one day off in any nine day period and the work hours do not exceed the work hour limits, such as not more than 72 hours of work in a seven day period. Now, depending on how the days off are distributed, and consequently, how many consecutive days are worked, the days off act more in a preventative role or mitigation role relative to the management of cumulative fatigue.

Although they neither prevent nor mitigate cumulative fatigue, compensatory measures, such as behavioral observations, self-declaration, and frequent post rotations have a role in management of fatigue, though their limitations must be recognized. Regarding behavioral observations, fatigue typically does not have outward manifestations such as loss of facial tone until there are decrements in cognitive performance. Similarly, self-assessments and self-declaration of fatigue are important worker responsibilities, but many studies have shown a tendency for individuals to underestimate their level of impairment. Objective measures of impairment have been shown to increase more quickly than the subjective assessments of fatigue.

Finally, measures to promote alertness through activity and external stimuli can increase levels of alertness, but the benefits are typically temporary and alertness cannot be sustained for extended periods. In some, compensatory measures have a role in fatigue management, but they are not an effective substitute for adequate rest. That concludes my remarks.

MR. KENNEDY: Good morning, I'm Kriss Kennedy. I'm the director of Division Reactor Projects in the Region IV office. This morning, I'll provide the Commission with an overview of the current inspection program as it relates to 10 CFR Part 26, Subpart I and provide a summary of the results of

inspections conducted by resident and region-based inspectors from all four Regions. I'll also share with you observations made by inspectors during their daily inspection activities and interactions with plant personnel. Next slide, please.

There are three inspection procedures and one manual chapter that provide guidance to inspectors for the inspection of the fatigue management rule. The Plant Status manual chapter and the Outage Inspection Procedure are performed by resident inspectors; the Fitness for Duty Procedure is performed by region-based security inspectors; and the Managing Fatigue Procedure is performed on an as needed basis. Next slide, please.

The objectives of the inspection program are to maintain an awareness of situations at the plants that may result in increased fatigue; review a sample of waivers, self-declarations of fatigue assessments performed by the licensee; verify that outage work schedules developed by the licensee comply with Subpart I; verify licensee compliance with the rule for security force personnel; and finally, provide inspection guidance for the evaluation of issues related to Subpart I when it has been determined that fatigue was a root or contributing cause to an event or other operational issue at a plant. Next slide, please.

Our regulatory oversight in this area has verified that licensees are effectively implementing the rule. There have been no fatigue-related occurrences that have resulted in conditions adverse to safety and security. And there have been few NRC-identified violations since October 1, 2009, the date the rule went into effect. The violations were all determined to be non-cited violations of very low safety significance. Just a note, all fatigue-related

inspection findings are reviewed by a fatigue management board -- management oversight board prior to issuance to ensure consistency across the Regions.

I've also noted limited or no use of waivers by licensees at most sites. There are some exceptions, some examples of a large reliance on waivers primarily due to low staffing within a specific work group, appears to be independent of whether there is a plant as a part of a fleet or a single unit for a licensee appears to be more related to the staffing in a particular department. Next slide, please.

NRC inspectors have received both positive and negative feedback from plant personnel on the fatigue management rule. Some individuals believe the rule has had a positive impact on safety because they do not have to work as much overtime as they used to and are less fatigued during outages. Others indicated they do not like the changes implemented as a result of the rule because they cannot work as much overtime as they used to and therefore, they take home less pay. On the other hand, some plant personnel indicated that as a result of the rule, overtime has to be distributed more evenly, resulting in some individuals working more overtime than they had before and more than they would like.

One individual stated that he felt more fatigued during outages because of the way in which the licensee implemented the rule. The licensee changed from seven nine-hour day shifts to six 12-hour day shifts. The individual commented that with a one hour commute to and from work that he felt more fatigued than ever.

Inspectors have also received feedback that supervisors have experienced an increase in administrative work associated with managing their

staff's work hours to ensure compliance with the rule, reducing the amount of time they have to conduct more beneficial supervisory duties similar to what we heard this morning. Next slide, please.

Inspectors have not identified any examples in which licensee actions to comply with the rule had a direct negative impact on safety. We have observed some examples of work that has been delayed by licensees to ensure compliance with the rule; for example, there was -- a licensee was loading a spent-fuel storage canister and suspended work over the weekend after they experienced problems with a vacuum drying and helium back-fill at the cask. Because the licensee was not sure how much longer the evolution would take to complete, the canister was placed in a safe configuration and work was suspended to avoid exceeding Subpart I limits, resulting in a two day delay in moving the canister to the ISFSI. Another example, during an outage, a post-maintenance test on a transformer was delayed because only one person on-site was qualified to perform the test, and the individual was approaching a Subpart I limit.

Multiple reports by plant staff of an increase in burdens on supervisors were noted. And one example, feedback was received that ensuring compliance with the rule was cited as a distraction during an emergent security issue, which limited arrival and departure of plant personnel. And a second example, where feedback from security, where their attempts to schedule training modifications and self-assessments for a given year in order to ensure compliance with the rule are impacted by the notification of force-on-force exercises. So if a force-on-force exercise is scheduled, they have to make adjustments to the schedule and in some cases, defer or cancel activities that

they would otherwise have conducted.

In rescheduling these activities, supervisors must consider the activities already scheduled in order to ensure compliance with the rule. There have also been reports of reduction in beneficial practices at the sites, some of which you heard this morning; the limited duration of operation shift manager weekly phone calls to less than 30 minutes; limited operations personnel participation in benchmarking activities and plant improvement initiatives; and a negative impact on senior reactor operator mentoring programs.

In summary, based on what inspectors have seen and heard in the field, we have not seen degradation in plant safety as a result of the rule's implementation. We have observed some examples where licensees delayed work to ensure they remained in compliance with the rule and have received feedback from plant employees regarding increased burden on supervisors and a reduction in beneficial practices. That concludes my comments.

MR. BROWN: Thank you, Kriss. On slide 23, you'll see that I'm going to cover next steps in three parts. First, the staff recommendation to put in place a near term alternative to the minimum days off requirements; second, integrated rulemaking activities; and finally, effectiveness assessments. Next slide, please.

The industry's petition for rulemaking included a proposed alternative to the minimum day off requirements for non-outage periods. As you heard this morning, we've had a series of public meetings to better understand the industry's concerns and to determine whether the proposed alternative could be modified into an approach that is consistent with the technical basis of the new rule, Mr. Chairman, as I believe you asked. I personally thought that the

meetings were generally effective in allowing both the staff and industry to talk about what each was trying to accomplish and to explore a full range of ideas in an effort to find one that might be satisfactory to the majority of the key stakeholders.

In the end, we have settled on an idea that was presented by an industry participant at the January 6 public meeting; that is a 54-hour average per week calculated over a rolling period of up to six weeks as an acceptable alternative to the existing minimum day off requirements for normal operations. This single limit would apply to all covered activities. Overall, we expect that this approach will allow much greater flexibility in allowing beneficial practices; will be easier to implement; and will be simpler for plant staff to understand. The total number of hours that can be worked is generally consistent with the maximum number of hours that could be worked under the existing rule, although there were previously differences for different classes of covered activity.

While the rolling period does not provide direct assurance days off, it would limit the incidence of long work weeks and thereby limit the potential for cumulative fatigue. And I'd like to depart briefly from my prepared comments to address two of the Commissioner's questions from earlier today.

The six-week period in this proposal actually aligns with the shift cycles that staff, mainly in operations and security performing 24/7 coverage, are already on, and we've actually provided for less than six weeks because some plants use a five week rolling schedule. So the six-week proposal does align with a portion of current industry practice. The other piece, which is the quarterly review, which is more long-term maintenance planning, is, you know, is an overarching framework and it mainly is used for maintenance workers

scheduling, and you have multiple periods of six weeks within that, but literally, if you went to the 13 week period proposed by the industry, you'd still have a problem because five and six-week shift cycle schedules don't fit into that smoothly. So there are pluses and minuses for both approaches.

I think the thing that's critical, and the only reason I nodded my head in a negative way from the earlier discussion, is minimum days off doesn't just accomplish a 54-hour work week. Really, what the minimum day off provision does is looks at three factors. One is total hours that you can work in a period on an average basis. Two, how those hours are concentrated within the week and across weeks. And then three, as Dave said, the ability to have mitigative rest following concentrated work periods.

And the quarterly model actually changes those latter two properties considerably. You can have much greater concentrations with much less assurance of near term restorative rest. The importance, as the staff sees it, of the six week rolling average is we believe that quite literally this interim approach would be very comparable to the effects of the minimum day off as applied, in answer to your question Mr. Chairman. And I believe the question that was in many of the questions earlier, it's not a perfect solution. There are ways it could be abused, but as we met with the industry and talked about the realistic aspects of them maintaining 24/7 scheduling, most of those concerns are put to rest in our minds. In a practical sense we really believe that this is very consistent and in fact compliant with the existing technical basis and a reasonable alternative.

So then on slide 25, returning to my prepared comments. Should the Commission accept the proposed interim approach, the staff proposes

implementation as quickly as possible. The benefit in doing so is two-fold. First, it allows the industry to promptly re-implement the beneficial safety practices that have been curtailed under the existing regulation. Second, it will provide the industry and the staff an opportunity to assess the effectiveness of the interim approach while working on the revision to the current rule. We have explored five options for implementing the proposed alternative. The first was a direct final rulemaking. The advantage of this approach is it is a very open and transparent method for revising an existing regulation.

The disadvantage is that even a direct final rulemaking takes approximately six to 12 months and it takes only one significant adverse comment to require a notice in comment rulemaking which has a nominal two year time frame for non-controversial rules. We're concerned that this would defeat the purpose of having an interim approach. The second option would be to issue site specific exemptions. Again, this approach has a benefit of being open and transparent and is a normal method for meeting the intent of a rule through an alternative approach. The disadvantage is that it can be resource intensive for both licensees and staff. And while quicker than a rulemaking activity, it still takes about three to six months to process each exemption. The NRC resources alone would likely exceed two full time equivalents even without major complications in the exemption process.

The third and fourth options involved orders, however after careful review the staff is concerned that orders may not be a viable option. The fifth option would be to issue and interim enforcement policy that allows licensees to implement either the existing day off provision -- minimum day off provision -- or else the alternative interim approach. This approach has the advantage of being

relatively quick and involves low levels of resources.

The disadvantage is that it would be using enforcement discretion to cover a large number of licensees for the period of time that it takes to complete the revision of the rule. And I would note from an enforcement perspective, if a licensee was not following the alternative approach nor the minimum day off provision of the current rule, the staff would site that licensee against the minimum day off requirements. So there is an enforcement mechanism in the interim enforcement policy.

Turning to slide 26. As you are aware, the staff is currently performing rulemaking to apply fatigue management provisions to individuals who perform quality control and quality verification functions. As part of your direction to us on this rulemaking effort we were told to engage stakeholders and review the practical application of Part 26 Subpart I, including the event of any unintended consequences that might undermine the purpose of the rule.

As discussed in our January 4th Information Paper on the subject we have received three petitions for rulemaking that identify unintended consequences of the rule, mainly in the area of minimum day off provisions. Consistent with our understanding of your intent, we are consolidating these three petitions into the existing rulemaking so that we can address them in a fully integrated manner. The staff considers the technical basis for the quality control/quality verification proposed rule to be complete. This technical basis details the science behind the Commission's fatigue requirements, the foundation of which is unchanged by the public submittals or consideration of unintended consequences.

As such we believe that it is both appropriate and efficient to

leverage the existing technical basis and commence the expanded rulemaking in the proposed rule phase rather than starting the rulemaking activity over again. Next slide please.

Finally I want to leave you with you a strong assurance that the staff intends to continue forward in an open and inclusive manner. In addition to the input received at the public meetings we held this winter and the comments from the panel this morning, we have also issued the petitions in the Federal Register for public comment. And I understand that those comments have a wide range of views. And additional important source of information is our resident inspector staff. They and their managers are closest to the operational details of our licensee's facilities and we intend to include them in our information gathering efforts. We are committed to meeting on a quarterly basis with involved stake holders to obtain additional feedback on the fatigue management regulation, including the interim approach if it is approved by the Commission.

We intend to continue to monitor the most current developments in the science of fatigue management and are also interested in any additional information on actual nuclear power plant experience and performance. For a variety of reasons neither of these sources of information is a perfect indicator or source of regulatory language but both are important and need to be considered. When we return to the Commission with a proposed rule we want to be able to clearly articulate how we have blended these considerations into a product that is realistic, effective and to the maximum extent practical, minimizes any additional unintended consequences. That completes the staff's presentation.

CHAIRMAN JACZKO: We'll start with Commissioner Ostendorff.

COMMISSIONER OSTENDORFF: Thank you Mr. Chairman.

Thank you all for being here today and for your briefs, that's very helpful. I'm going to focus my first set of questions on Chris and Fred, certainly if anyone else wants to weigh in please feel free to supplement. I'm going to focus on just some operational, pragmatic kind of questions. When the original rule came out, was it envisioned that in order to comply with the rule people would need computer software? Whoever wants to take that.

MR. BROWN: David you've -- as the --

MR. DESAULNIERS: I believe the regulatory analysis took into consideration that there would be some need to change time accounting software in order to be able to comply, but I wouldn't say that the staff expected that this was necessary to understand compliance on a day-to-day basis. It was just a matter of recognizing it needed to be tracked on a longer term. When the minimum day off requirements went forward, from a simplistic perspective anyone within a particular type of work and shift duration was looking at -- they allowed this one extra day of work a week on -- typically beyond their normal schedule and so if you exceeded that, as a simple concept you know you were starting to exceed your minimum day off requirements. So from that perspective it seemed like a relatively straight forward concept. It was also --

COMMISSIONER OSTENDORFF: I think what we heard from the first panel was that this does require use of software and I'm just trying to figure out where the -- if there was a disconnect or if there were maybe not fulsome communications on the original development of the rule that we didn't understand how we got to that situation.

MR. DESAULNIERS: I would add that one of, I think, the areas where the software becomes necessary is that as you started to take a look at

shift schedules that were blended schedules of eight and 12 hour shifts, which occur in some cases. They're not one or the other. And then you had to say, "Well what is this -- what kind of shift is this?" And so we defined shift durations on average. And that led to, well if somebody's working routinely overtime on an eight hour shift they could effectively working a 12-hour shift or a 10-hour shift. And licensees, you know, quickly recognized, well we need to track average hours then to ensure that an individual on an eight hour shift remains on an eight hour shift and doesn't suddenly qualify for the 10 hour, 12-hour shift duration and then find themselves in non-compliance.

COMMISSIONER OSTENDORFF: Thank you.

MR. BORCHARDT: Yeah I don't think at the early stages of the rule development we really went to that level of detail. It was when the industry looked at how they were going to actually implement this that I know there were many conversations with NEI that were saying, "This is going to be very complicated." And as we got more into the details it got more complicated and we recognized that this was going to be quite a challenge. But at the early stages the answer is no.

COMMISSIONER OSTENDORFF: On that -- not here to Monday morning quarterback any rulemaking but I assume, Bill, there's been some lessons learned as to how to engage with residents, with operators, et cetera on a complex rulemaking to make sure that the execution phase and how you do something out in the field is fully understood prior to the completion of the rulemaking, is that --?

MR. BORCHARDT: Well certainly there's a lot lessons learned on this rulemaking and on this issue, but it's not unusual for the NRC to start to

develop some regulatory requirement and then leave the burden to the industry about some of the mechanics. The requirement was clear. The mechanics of how any given licensee was going to gather the data and make sure that they complied could very easily vary from plant to plant. And so we don't do that -- we don't that infrastructure for the licensee, so that was left to them. I can't speak exactly for the industry but it was fairly late in the process, beyond the point of no return, really, on this rulemaking that the difficulties with the computer systems and the burden on the supervisors at the plants was really recognized.

COMMISSIONER OSTENDORFF: Kriss I'm going to go back to your slide 21 and I've got some operational kind of questions, maintenance questions that come from that slide. These are not in any particular order, but the previous panel asked a question of, our PROS representative, with respect to shift manager meetings, and that certainly operating a nuclear power plant, you don't know what's going to happen three hours from now. You may have a steam leak, you may have a voltage regulator fluctuation on the switch board, you may have any number of operational kinds of things that one can't predict. So this is my own personal experience, I'm a big believer in having the flexibility to ensure that everybody associated with the operation and maintenance of a plant understands and has full knowledge of what anomalies or abnormalities may be of -- may have been occurring over the last shift.

So shift manager meetings with the ability to deal with emerging issues in a real time fashion is really, I think, important to nuclear safety. Yet if it's a 54 hour -- no, so if we have a 54-hour per week and a rolling six week average recalculated basis, and I understand that, is there any flexibility either in the current rule or under discussions of an interim change that might allow some

flexibility as emerging things happen to ensure that there's this time for meeting even if it results in exceeding a 54 hour per week limit?

MR. KENNEDY: Let me try to address that and Dave can correct me if I stray too far off. But the meetings that are being discussed, these off shift meetings, they're not -- typically not for -- to discuss emergent issues or safety issues at the plant. They're recurring meetings for shift managers or security managers to get on the phone and just have a periodic management meeting to discuss items of interest so those are the types of meetings that we're talking about here where it impacts -- could impact an individual's minimum day off or their break time by participating in those calls from home. There are provisions in the rule for handling emergent issues through the waiver process and there's some criteria for -- defined in the rule for those waivers. And they are written to address emergent conditions that are essentially beyond the licensee's control, that are taken to prevent an adverse safety condition.

COMMISSIONER OSTENDORFF: One example that recent visits showed, Commissioner Magwood and myself., we went to visit a plant last month and the -- as we understood the story being presented as to work hours situation, their emergency diesel was out of commission, they had a repair team in there and they were close to finishing the job but couldn't complete the job within the time allotted per the work hour and made the decision to stop work right then and there and then wait another 24 hours to resume work. And I understand work hour-wise how that could happen, but it was not clear to me that there was flexibility under the waiver process to take into account these other considerations that deal with equipment reliability and equipment availability, to weigh that against the work hours. Can you comment on that kind of a scenario?

MR. KENNEDY: Well I think it is a decision that licensees face when they're in that situation and not knowing the particulars of that situation. Certainly if a licensee determined they met the criteria for waivers they could have exercised that option, but the examples -- some of the examples I gave were determined delays due to not knowing how long a particular activity would take and needing to make sure that the individuals involved got their minimum days off. But I think there are planning provisions and waiver options in those cases. The waiver option is a pretty high threshold. The licensee essentially has to be able to show that the reason they need that waiver was beyond their control and so when you get into maintenance activity, oftentimes they may look back and, say, make a determination that in fact maybe they could have done something to prevent where they were at that time.

MR. BROWN: I guess I would just add, one of the considerations in talking with the industry over the last couple months is they've looked at their ability to schedule an EDG 14 day outage under this proposal and they were confident that they'd have the flexibility to successfully schedule that kind of activity. The 16 hour in 24 limit is still in place so, you know, to work 24 hours straight to get a diesel back online would still be precluded. There's still a balancing, but we believe the industry has looked at the concerns.

COMMISSIONER OSTENDORFF: Okay, thank you. Thank you Mr. Chairman.

CHAIRMAN JACZKO: Commissioner Svinicki.

COMMISSIONER SVINICKI: I want to thank all of you for your presentations and as I said to the prior panel, I really compliment the staff that I observed at the public meetings on this topic. I thought it was -- I won't comment

about it as being at all unusual. It's the typical, I think, productive engagement that the NRC staff has, but this time I got to observe it firsthand so I want to compliment you on that.

And Fred, thank you for addressing in the course of your presentation my question about why six weeks and why would the staff have proposed that. I take from your answer that depending on the functional category of work at a licensee, it may be that some are more on a quarterly type look for longer term planning and some are on six week and some are on five week. I found that very helpful so thank you for that. I think I will just -- I don't really have that many questions. I think the staff has really, I think, been keeping us engaged along the way. I've been reading the meeting summaries and things like that for meetings that I couldn't go to. I think I will touch on the subject of the options that the staff presented.

The staff concludes, I think I'm going to paraphrase your presentation, that some sort of interim relief or interim solution while the PRMs are looked at is appropriate and the staff has presented a number of options that are available to the regulator to move forward with such relief if that's the decision that's made. I will say I agree with the Chairman's comments that enforcement discretion is something that needs to be looked at very thoughtfully, needs to have a strong foundation but in cases, I think, where that case can be made and it's an instance where there's a high level of potential equivalency, of the type of relief that you're providing against the mechanism that was prescribed in a very detailed fashion in the rule, and that rulemaking will take you two years or more my view on this, I guess, lays bare that there's some diversity of view on this side of the table, but my view would be that enforcement discretion can be

appropriate and is appropriate where the case is made. But what I also took from your presentation is that the staff does not elect to make any recommendation among the five options for proceeding, is that correct?

MR. BORCHARDT: Yeah, that's correct. I think any of those that get us to the right end point is OK. I mean whether we use interim enforcement policy or enforcement discretion or any of the other options, it ultimately gets us to the same point where we're going to be implementing a revised set of requirements.

COMMISSIONER SVINICKI: OK, well I thank you for that. And of course I agree that the very fulsome processes of the APA are always preferable. I guess my point is as a practical matter sometimes the time frames of the APA don't make them the best option in every case. So I think with that I don't really have any other questions. Thank you Mr. Chairman.

CHAIRMAN JACZKO: Commissioner Apostolakis.

COMMISSIONER APOSTOLAKIS**:** Thank you, Mr. Chairman. On this issue of how to approach this issue in the interim, do we have experience with other rule made in the past and how did we do it then?

MR. BORCHARDT: Like direct final rules?

COMMISSIONER APOSTOLAKIS**:** Well, yeah, I mean, I understand now we're going to go through rulemaking to change the rule, right?

MR. BROWN: Right.

COMMISSIONER APOSTOLAKIS**:** And that might take two years or whatever. So we know where we're going. Well, I'm saying that having in mind Mr. Lochbaum's comment of maybe the public will intervene during that the rulemaking with some other ideas. But, yeah, I mean, is there a similar situation

from the past where we know we have to revise a rule and maybe in between we did something to accommodate licensees?

MR. BROWN: I would offer, sir, on actually on Part 26, Subpart I, we currently have an enforcement discretion policy in place for plants that are subject to isolation due to severe weather. When the rule was put in place there was a specific provision for storms and weather conditions that result in a declared emergency at the site, and they're exempt from the work hour controls at that time. Early in engagement with the industry, after the rule was finalized, the issue of hurricanes and shifting trajectory of hurricanes, was brought to our attention, and we do have an NGM in place for plants that come in for a specific license, exemption, or amendment. To cover that we've allowed departures from some of the work hour controls. So it's a comparable example involving this rule. It was a much smaller number of plants, and so we didn't believe it was a policy issue. This will be a much larger number of plants, we believe.

COMMISSIONER APOSTOLAKIS**:** And, just curious, it seems to me this is a highly prescriptive rule. And I'm wondering, is there any way we can make it more performance-based? Or that's out of the question here? That would take care of Commissioner Ostendorff's concerns about some people not getting as tired and operating under different environment.

MR. BROWN: I think -- I guess I would answer and then others may have their views -- as we go into rulemaking, certainly the staff's not turning their back on any proposal to achieve the desired outcomes. The one caution I guess that would continue, it's been mentioned several times today, is that performance-based -- until we have a breathalyzer test, or a random way to identify fatigue -- the science doesn't seem to be able to support a purely

performance-based approach. I looked this morning at event notifications for fitness for duty, and for every three fitness for duty event notifications, one is for cause, two are random testing, which tells us that we have a very well-established program for behavioral observation, and yet two out of three found hits are not where they were identified either by the individual or by other people at the plant. And so I think, you know, we need to keep that in mind. It goes back to an earlier question this morning.

COMMISSIONER APOSTOLAKIS: David, you want to say anything? If you don't, that's fine.

MR. DESAULNIERS: I will agree with Fred, and simply add that alternatives are being investigated by other agencies to try to consider, you know, alternatives to prescriptive hours-of-service requirements, but those are not in place just yet, and looking at what other agencies have in their proposed rules, there are significant challenges that need to be faced there as well. In part, they are expecting that in the scheduling as an alternative to hours of service -- complying with hours of service -- it would be done in accordance with bio-mathematical models, which Dr. Dinges referred to earlier. Those are coming a long way, but they're probably a little ways down the road for us to be able to have confidence that we could support our regulatory posture on those. And as Fred Brown also indicated the challenge there as well is trying to identify: what are you going to measure? You need strong measures to identify what's associated with -- what events or performance is associated with fatigue, and it continues to be an ongoing challenge and difference of opinion at times.

COMMISSIONER APOSTOLAKIS: Well, I mean, it depends on what you call performance. And it seems to me that here we're dealing with

human performance, so what really matters at the end is making a mistake. So, what comes to mind is what we're doing with safety culture. I mean, we have identified all sorts of traits, but I don't think that anyone is really proposing that we regulate each one of them and say, "Gee, you know, you have to make you're your people are learning from experience and we give them a test every three weeks to make sure they do." We just say in the reactor oversight process, if the inspectors find something, so that's a performance, something that's wrong, and then they look deeper and identify, or maybe find, for example, similar things happened in the last three years and the organization doesn't seem to be learning from this, then there is a problem, we point it out, and the licensee presumably does something about it. So that -- what triggers the whole thing is performance, that we found something wrong.

And I'm wondering, I mean, you know, you're a human factors guy, if we find that they do something wrong, maybe we can dig deeper, dig deeper, and say, well you know, you overworked this guy, that's why he did that. Is that a completely crazy idea, or there is something that we can do there and avoid this highly-prescriptive nature of the rule that says, you know, so many hours, you know, if you reach 17 hours and you're haven't had any sleep then your performance is diminished. Yeah, but for some people maybe that's not true, and what really matters from the safety perspective is what they actually do.

MR. BROWN: Sir, if I could. Just on those lines, two quick points. One thing is I think as Dr. Dinges pointed out this morning, it's not just errors of commission, but it's an error of omission when an operator doesn't respond. And the way plants are run in this country today, 18 months break to breaker without a lot of equipment challenges, you don't get an opportunity to get operating

experience until it's an NLO alone in the plant, with a fire, that has rendered the control room inoperable, and that NLO, individually, is implementing procedures that he doesn't use very often to place the plant in a safe condition. And so, you know, that's a kind of consideration where there is latent defects --

COMMISSIONER APOSTOLAKIS: -- I understand that. I understand that. But again, if we want to push the argument, the same would apply to safety culture. I mean, if I have a fire -- make it worse, there's an earthquake and a fire and then I find out that, you know, whatever traits we have identified are very poor, then I'm in trouble, too. So, you know, it's the same kind of situation. I'm just wondering because this looks to me like a highly prescriptive rule, maybe it has to be at this point with the state of knowledge we have, but I'm wondering whether anybody really thought about injecting some performance-based elements to it, and I'm just bringing up safety culture while I think -- maybe it's easier here, that's why we'll make it prescriptive, I mean, "Don't work more than 54 hours", I mean it's easy to say that. So anyway, that's a thought. Thank you Mr. Chairman.

CHAIRMAN JACZKO: Sure. Commissioner Magwood.

COMMISSIONER MAGWOOD: Thank you, Chairman. It might be my own fatigue, but while I was listening to Commissioner Apostolakis trying to think of a performance-based way of doing this, I kept thinking that, maybe installing, you know, Pac-Man game machines at each plant, and if you can't get a certain score you have to go home and go to sleep. The more I thought about it the more sense it started to make.

[laughter]

COMMISSIONER MAGWOOD: Let me first, you know, thank the

staff. I think that, you know, engaging the stakeholders in the way you have has been very beneficial. And I think the fact that we're listening to the problems that people say exist and trying to respond to, I think it's been a very responsible approach. I echo Commissioner Svinicki's comments about the way you've handled this, so, first, thank you for that.

Dave, let me sort of give you an opportunity, I was listening carefully to the things you were saying. I wasn't sure I heard an explicit endorsement of the alternative, and I want to see if I can draw that from you. And if not, please explain. What are your thoughts on going to a 54-hour workweek proposal, and particularly in light of Dr. Dinges' final, sort of somewhat ominous warning at the end about keeping an eye on the cumulative effects of fatigue and not making changes that sort of shift us back to where we were as opposed to moving forward? Just want to give you a chance to, sort of, give us your thoughts on where we are and what this proposal might do.

MR. DESAULNIERS**:** Thank you. Well, to answer your first question, yes, I specifically endorse the approach that we're proposing in that we've, over the past several months -- what you're seeing is the end product of consideration of a lot of hard work on the part of the technical working group considering many options outside of the one you're hearing about today, to try to look at which approach is going to address the most concerns that we've heard as well as maintain true to the objective of ensuring that individuals remain fit for duty and not impaired from fatigue.

Looking at this option, I think you've heard -- Fred actually characterized it pretty well -- that there's, you know, we're accomplishing much of what we would have done under the minimum day off requirements. There is not

one area of concern, there's not an explicit result of insurance of days off just by the averaging itself. You have to assume regular, routine scheduling of individuals, and what practical considerations come into play, and say, as a result, it's more than likely individuals will be getting days off. I believe it's a strong feature of this approach to have a rolling six-week cycle, because that is admittedly one of the weaknesses under the current requirements for minimum days off that was based on fixed shift-cycles, so they were back -- you know, someone could backload one shift and frontload the following shift, and this would reduce that. So there's a tradeoff there.

There's also a difference in terms of we're taking one approach to address multiple work groups. And there's a simplicity I think that we gain there. We also recognize that, under the original construct where we had different days off for different work groups, we were recognizing -- and I think Commissioner Ostendorff's comments went to, you know -- do we give any credit for the fact that people are working in teams, and so forth. And I think that was built into the original minimum day off requirements because we provided more restrictive requirements for security personnel who may be working in isolation. We provided less restrictive requirements for control room operators that had the benefit of automatic safety functions, as well as teamwork. So we're simplifying here, but in the end you're getting to, you know, what was the nominal work hours that'll fit most of the group, so it's going to be about 54 hours.

COMMISSIONER MAGWOOD: Appreciate that. Appreciate giving explicit endorsements. Always look for these things learned around here. Let me follow up and then ask you also to comment on this Fred. I appreciate the simplicity of having, you know, sort of the one criterion for all workers, but I found

the dialogue between Fred and Commissioner Svinicki kind of interesting that, while yes, there are some people where six weeks makes perfect sense, but there's other people, maintenance workers for example, where quarterly makes, perhaps, a little bit more sense. Is there a particular reason not to look at different work -- you know, have one or two or three different approaches for tracking the hours of workers? Why not have quarterly for the maintenance workers?

MR. DESAULNIERS**:** I may have interpreted Fred's comments a little bit differently than the Commissioners with respect to the quarterly, in that, yes, we acknowledged that there might be longer shift scheduling periods for other groups of workers, in particular maintenance, but to me the bottom line concern is that the quarterly period would allow longer string of very long workweeks, up to 72 hours, and you know, the maintenance personnel and the operations personnel are not physiologically different in terms of their response to fatigue. There are some considerations in terms of the nature of the work that's being performed. But again, you could be potentially looking at some substantial strings of long work hours as the cumulative fatigue -- absent, you know, a quarterly average absent some other significant controls to ensure periodic days off, would probably increase the potential for cumulative fatigue.

COMMISSIONER MAGWOOD: Fred.

MR. BROWN: Yes sir. I would just say, actually I don't think we're opposed to, in any case, looking at any proposed alternative. Part of what we've tried to do over the last few months is in an effort to avoid unintended consequences, but the industry tells us what would work for them while achieving the fatigue management outcomes. And the consistent approach was an

industry proposal. I think it's critically important that we continue to meet and continue to assess the effectiveness of the interim approach if you approve it through the rulemaking period. And if we get information that we can substantiate, and it's important, then we'll reflect that in what we give back to you in a proposed rulemaking. So, I don't think this is an "it's got to be this way" approach as much as it's "this is what was suggested to us, and we can make it make sense within the technical basis and compare it to the existing controls."

COMMISSIONER MAGWOOD: Thank you. Kriss, let me ask you a question. I want to follow up on what Commissioner Ostendorff mentioned about our joint visit to a plant where we heard the story about the emergency diesel generators. And, you know, I was watching, I was listening carefully as you were discussing the other instances of suspension of work on the loading the spent fuel canister, delaying post-maintenance tests on a transformer, but also, and something we heard quite frequently in talking to licensee staff, is the amount of administrative time required by supervisors to track hours. In fact, the phrase that sort of stuck with me from one of the visits I've had, I think was the same one Commissioner Ostendorff mentioned, is that they spend hours chasing after minutes. And I'm sure -- you look like you've heard that phrase.

And clearly, you know, one result of that is, if you have supervisors who are chasing minutes, they're not, you know, out in the plant, watching what's happening, and perhaps not performing the kind of role that they're used to performing to ensure that, you know, work is being done correctly. And I ask that in the context of something you sort of started off with on one of your slides by saying that there is no indirect impact on safety. And I wonder if you are sort of implicitly acknowledging, or perhaps suggesting, that there is perhaps an indirect

impact on plant safety through these other effects that we've observed.

MR. KENNEDY: That was my intent, actually. I mean I think, you know, there's no direct impact on safety, meaning we've seen, given that we haven't identified any events that have occurred, or any as a result of fatigue, or any adverse impact of implementing the rule that we can lay our hands on and say, you know, because of the rule, or because of the way the licensee implemented the rule, this happened directly for a safety related component, or operating the plant. But I think indirectly, I mean if you buy into the feedback that we're getting and the arguments that we're getting, I think the beneficial practices that have been discussed today do in fact enhance safety at the plant in an indirect way.

COMMISSIONER MAGWOOD: OK, excellent. Appreciate that. Just one last thing, my time is basically up. Fred, can you -- one aspect of using enforcement discretion to deal with this that does concern me, is something that Dave Lochbaum mentioned, which is it doesn't provide an opportunity for outside stakeholders to really give us their thoughts, give us their objections, give us their alternate views about this. If we go down that path, is there a way to listening to those sorts of views and making sure the Commission has a chance to reflect on them?

MR. BROWN: Yes, thank you, sir. And actually, I said we started this winter meeting with the public. Actually at the RIC a year ago we had a session specifically on Subpart I and fatigue management and got public input into the effectiveness of the rule on potential alternative proposals and we've received petitions for rulemaking from not just Nuclear Energy Institute, but from affected members of the public that are plant employees. Our meetings this

winter were all public meetings, they weren't closed meetings, they weren't -- we actually -- the last couple were Category 3 meetings to get as much input as we could.

This hasn't been done in a vacuum and we don't have stakeholder concerns out of those meetings. Having said that I do recognize David Lochbaum's comment this morning that this is the first opportunity for him to see the interim approach that we're proposing and I think that that's a critical point of the going forward process of regular public meetings, looking at implementation and getting feedback while we're in the rulemaking process as well as all the public comments on the rulemaking process if the Commission decides to direct us on an interim approach. We will gather that information and give it back to you. And aside from Dave's comment, we don't have any over the last year from our many publicly open comments that would be a concern with this proposal.

COMMISSIONER MAGWOOD: Appreciate that. Thank you, Chairman.

CHAIRMAN JACZKO: I -- again, I just wanted to say I think there's a couple issues that we have in front of us, one is that -- immediate issues with a part of the rule that may be an implementation challenge. There are other things which are longstanding. I would note to my colleagues Commissioner Ostendorff and Magwood that the unintended consequence of the diesel generator is a pre-unintended consequence.

We'd go back to NEI's letter from December of 2005 in which they said, "Another example of the unintended safety consequences of the Subpart I is in the conduct of plant maintenance on diesel generators. This nominal 10-day job will be extended to 11 or 12 days so the maintenance teams can take one or

two days off. Assigning additional less qualified individuals to the job in an effort to get the job completed in 10 days will increase in potential for errors." So in five years we've had an issue that was projected to be an issue that the industry has not yet fixed. That no longer, I think, falls in the category of unintended consequences, that's just something that they haven't gotten around to fixing. So, you know, many of these stories that are told that are rehashed are kind of -- they've almost become apocryphal in a way that they are the things that were thrown up as to why the rule wasn't going to work.

We debated those, we discussed those at length with the industry and in the end, the rule was largely a product of extensive discussions with the industry. The industry in the end, to some extent, supported. So all of these issues were raised, were talked about, were discussed, and there was a lot of back and forth to put in place a plan that would work. So to this day that we still haven't figured out the diesel generators, I don't know is a problem with the rule but may be a problem with licensees not actually implementing the rule or going about making the improvements that they need to make to change because the rule does change practice.

It did require a practice for hour and fatigue management that didn't previously exist, which is why we put in place the rule. So, of course, there is going to be an increased burden on supervisors. There's going to be more work because there was no such system before. So a lot of -- and again, and I could go through these same issues that they talked about operational distraction. Trying to manage the nuclear plant workforce with all of the proposed restrictions in Subpart I will require significant management attention. Now, again, we can have the argument whether the rule was the right thing or not, but that's an

argument for the rulemaking, not for the discussion I think that we're having immediately in front of us which is a specific implementation question that we're trying to deal with.

So, you know, as I said, I think these are fair discussions and good things. But I just don't want people to leave with the impression that none of these issues were talked about or thought about. They were extensively in extensive detail and repeated efforts to come up with a workable solution were developed. The group work hours was the first provision. That was determined to be unworkable by the industry and so the staff moved away to the individual work hours, which is largely where we find ourselves today. So, it has a long history and, you know, again it's a challenging subject without a doubt and not one that's easy.

But I want to try to bring us back then to what the basic point is is that we have this one provision, which is minimum days off, which appears to be having an unintended consequence of perhaps reducing safety beneficial practices in the facilities. And what we seem to have in front of us is a provision that would allow an alternative way to implement that rule, that would accomplish the same goals with the exception of a few areas of possible concerns. And I want to just get exactly from the staff a couple of questions. One, Fred, I think you made the comment that said the six-week rolling average, it could be -- there are ways in which it could be abused. I mean, what in your mind are the ways in which it could be abused?

MR. BROWN: Probably the one that's most specific that we've talked about is for a senior employee like a shift manager who has a lot of self-initiated potential for work activity to come in and check on something on his time

that he would normally have his days off based on his normal work hours. To have him come in and work a lot of days is a possibility. In fact, in terms of interfering with restorative rest, that really only happens if he sets an alarm and comes in at 2 a.m. or 4 a.m. or wakes up early at 6 a.m. to do it. If he comes in at 1 p.m. for an hour to check something, it's probably not that big a fatigue issue. And so in discussing that issue with the industry and looking at the existing regulations on training requirements and procedures, I think we've come to the conclusion that it ought to be in the training that someone doesn't interrupt their own Circadian process and force themselves into a sleep deprivation, fatigue-induced mode voluntarily.

CHAIRMAN JACZKO: That currently in the training -- I mean, is there guidance on the training program? Does that specify that kind of level of detail or that's largely up to the licensee?

MR. BROWN: We haven't -- we have -- there is an implementation guide for the rule NEI-0611 that we have a Reg Guide that endorses -- Dave can correct me -- I don't believe it goes into that level of detail for specific requirements, but that is something that the industry has indicated some interest in as they revise in 0611 to address that sort of thing and capture it. And since we believe, you know, Commissioner Apostolakis' point is in a performance-based perspective, if we find shift managers that are doing this in an abusive way, I believe that we have an enforcement avenue to get to that today and updating the guidance is really a preventive measure that makes sense for the industry and their staffs to address. I believe that's the biggest single issue.

We are interested, as we've said repeatedly, I think, the industry offered this morning to meet with us and share operational data and it will allow

us to see whether the need to staff 24/7 really means that the industry implements the kind of profile of hours used that we expect. We had talked about having that information more readily available but the rule already requires retention of records and the industry's expressed an interest to share them with us. So I think, we believe, that that will be addressed. So, although those concerns are there, we have spent a lot of time talking and looking at the existing rule and interacting with the licensees about the other provisions in the rule and I believe we're confident in making this recommendation that it is equivalent to the -- in most ways, to the current rule.

CHAIRMAN JACZKO: Well, I appreciate that and I think, as others have said, this has been a good process up until now. And I think this is where -- and perhaps I'm not in alignment with my colleagues here, and I think if that's the case, I would say it's like as Commissioner Magwood said earlier, I think that perhaps it's unfortunate, but I won't necessarily give up on my team. We find ourselves with a bit of a problem. We wrote a rule, it was an incredibly complicated rule, but it was a rule that went through a lot of discussion, a lot of input, and despite, you know, our desire sometimes not to have to do the rulemaking process, that's what by law what we have to do. So now we find ourselves in a situation where we want to change it. And the problem isn't that we can't change it, the problem is is that we think changing it under the process we're supposed to use is going to take too much time. So our preferred solution appears to be enforcement discretion because enforcement discretion is faster.

Well, the only reason it's faster is because we cut out the public involvement. I'm simply not comfortable with that as an approach. I don't think that's the purpose for enforcement discretion is to simply rewrite our rules without

any public comment and that's effectively what we're doing here. We are replacing the minimum days off requirement with a new requirement through enforcement discretion. And I think that's an abuse of that process, it's a general approach, it's not being done on an individual basis. So, I would encourage us as a body to look at a way to fix the underlying problem here, which is that we can't get what everyone is basically telling me is an equivalent provision in our rules. Why we can't get that rule change made in a few months, I do not understand.

There is no technical basis development that is required because I've been told by Fred that it is the identical technical basis for the rule that we have in front of us. We're simply making a change to the provision. It's got -- goes out for a 30-day public comment, gives an opportunity for public comment. That rule should be able to come back in and be completed in a few months. I really don't see why that should take us two years to do. And if it does, enforcement discretion isn't the solution to that problem. I mean, it just isn't. Yes, it gets it done faster and it gets it done easier, but it does because it cuts out the public.

So, as I said, I'm not comfortable with that, I can read tea leaves and am probably not going to be successful with that, but I think it would be an unfortunate way for us to go forward in something that has been very involved and a very significant rulemaking for the agency. So with that, I know Dr. Dinges wanted to make a quick comment. I'd be happy to give you the opportunity to say a few words.

DR. DINGES: It will be very quick. I want to commend the staff who I have not been interacting with until just very recently just to understand

what the issues were to appear here. But I think their understanding of the science in this area is extremely high and that they -- I would have every trust in them knowing what they are doing relative to the industry. I want to elaborate on this, why I'm concerned about that, be careful if you go here. You still allow enough recovery time and it's really as much directed at the industry as the Commissioners. If my slide number four could come back up, I just want to show you how I look at this rule change. Just quickly.

And while they are getting it up, let me just say, Commissioner, that there are measures, objective performance measures being studied now. And again, we have some on the -- one on the space station in particular, it's very short it will tell you the stability of someone's nervous system relative to fatigue, like how much sleep they've had, how stable are they. They are not ready for primetime, but this is something NRC can surveil over the years. And when it looks like there's something that might be useful in this industry you could look at to see -- have your staff look at it and look at it to see if the evidence is there. But that is coming.

This graph, the top graph is what I want you to look at. And there's a curve for six hours' sleep a night. If you work a 12-hour shift, what we find over and over again is people will sleep half the time off duty you give them. If you give them 16 hours off, they'll sleep eight. If you give them 12 hours off, they'll sleep six. On average it's consistent over and over. That's what the time use studies show as well. Nearly every industry shows it. You give them five hours off; they'll sleep two or three. What are they doing? They are driving, making love, eating, everything that humans do. OK, now the rule, as you have it, at nine days, you've got to have a period off every nine days.

If you went eight days at six hours, you are still below our deficit curve. But if you went 14 straight days working 12-hour shifts -- let's say you have a rule of only one day off a week if you're working the 12-hour shifts, you are still only getting four hours' additional sleep out of 14 days. You are somewhere on that curve, only now out at day 14. That's what I was referring to.

OK. If you really packed it down -- and I know the industry actually has to do it. I'm not arguing against it as an operational need. But what it means is your fatigue mitigation strategies have to be elevated. You've got to be on alert now and I'm sure they know this, right? You are a safety sensitive industry, you know when you are pushing people hard you have to be sensitive. But that's where everybody's got a role to play. If you give them the flexibility, make sure that they understand that they'll push people hard and there has to be fatigue mitigation. They've got to be watching for errors, they've got to be watching for the kinds of things that could lead to something that nobody wants. So that was really my point. But I want to commend the staff for a good job from a science standpoint. Thank you.

CHAIRMAN JACZKO: Thank you. Well, with that I will also thank everyone. I don't know if anyone has any closing comments or remarks they'd like to make. Well, again, I want to thank everybody for a very interesting meeting and appreciate all the work so far the staff has done working with our stakeholders to try and work what is a difficult issue but seems to be making good progress. Thank you. We're adjourned.

[Whereupon, the proceedings were concluded]