

OFFICE OF THE SECRETARY  
CORRESPONDENCE CONTROL TICKET

Date Printed: Jan 26, 2007 15:37

PAPER NUMBER: LTR-07-0058

LOGGING DATE: 01/26/2007

ACTION OFFICE: EDO

To: Dyer, NRR

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cys: EDO  
DEDMRS  
DEDR  
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ADM

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ADDRESSEE: Dale Klein

SUBJECT: 10 CFR Part 26 Fitness for Duty

ACTION: Appropriate

DISTRIBUTION: RF, SECY/RAS

LETTER DATE: 01/25/2007

ACKNOWLEDGED No

SPECIAL HANDLING:

NOTES:

FILE LOCATION: ADAMS

DATE DUE:

DATE SIGNED:

January 25, 2007

The Honorable Dale E. Klein  
Chairman  
U.S. Nuclear Regulatory Commission  
Mail Stop O-16 C1  
Washington, DC 20555-0001

Dear Chairman Klein:

The National Sleep Foundation (NSF) is aware that the Commission is currently considering the Nuclear Regulatory Commission's 10 CRF Part 26 Fitness-for-Duty Draft Final Rule. We appreciate the leadership the Commission has shown in addressing the very important issues surrounding sleep and alertness for nuclear plant operators and other employees.

Established in 1990, National Sleep Foundation (NSF) is an independent nonprofit organization dedicated to improving public health and safety by achieving understanding of sleep and sleep disorders, and by supporting sleep-related education, research and advocacy. NSF is comprised of many of the nation's foremost sleep, circadian, medical and transportation safety experts with a keen interest in protecting the public's health, safety and well-being.

NSF has been very involved over the past several years in the discussion and development of this proposed rule and is pleased that a final rule is now under consideration. At this time, NSF would like to emphasize a few concerns regarding the current minimum day off requirements for normal operations and outages, as previously addressed in its original comments on January 10, 2006, which are enclosed for your convenience.

The NRC staff has proposed a 34-hour break in any 9-day period. NSF believes that this is inadequate to provide for full recovery, particularly when it follows 6 consecutive 12-hour shifts. In practicality, this provision would only allow for one day off and only one night of extended sleep. NSF believes that the issue of off-duty time is one of the most important currently being considered by NRC. As stated in our formal submission, numerous studies have confirmed that the average person needs 7-9 hours of sleep to sustain alertness. Nationally-representative polls conducted by the National Sleep Foundation show that most adults sleep less than 7 hours on average. This evidence supports the belief that most Americans are chronically sleep-deprived and functioning below the level of optimum alertness. Therefore, it is likely that most workers will already be starting with a cumulative sleep debt and that these work hour controls, as currently drafted, will lead to additional cumulative sleep debt.

As the NRC notes in the proposed rule, one night of extended sleep cannot overcome the compounded effects of sleep loss, extended work hours and sleep debt. Recovery time periods must take into consideration the necessity for overcoming cumulative fatigue resulting from such schedules and must include sufficient nighttime sleep. It is important to note that nighttime sleep has been found to be more efficient than sleep acquired during the daytime and that hours of sleep acquired during daylight hours are typically fewer than during similar sleep opportunities at night. Therefore, NSF reiterates that recovery time should allow for at least 2 consecutive nights of sleep (including the hours between midnight and 6:00 a.m.) and be available every 7 days at a minimum prior to going back on duty. The 34-hour break, as proposed by NRC, does not allow for this, especially for night shift workers and workers with early start times.

Additionally, NSF continues to be concerned that the NRC would allow 16 hours of work in any 24-hour period. Because market pressures often cause regulatory limits to be pushed in all industries, the total number of work hours should be lower. NSF is aware that 12 hours has become increasingly common at U.S. nuclear power plants and that NRC has proposed provisions that would restrict or dissuade the use of

16-hour days. However, NSF believes that allowing the possibility of 16-hour days for personnel in safety-sensitive positions is counterproductive and potentially hazardous. NSF believes that the proposed 16-hour value appears to imply that (1) fewer than 8 hours of sleep will be acquired between work shifts, which is insufficient as the NRC itself has noted, or (2) the report time will slip from day to day causing circadian instability, which should not be acceptable. NSF suggests that the maximum number of work hours should be 10 hours per 24 hours for people on 8-hour shifts and 14 hours per 24 hours for people on 12-hour shifts.

The NRC staff also proposes that, "During the first 60 days of a unit outage, licensees need not meet the requirements of paragraph (d) (3)."

NSF continues to not understand the safety-related rationale for waiving any work hour controls during outages for whatever reason. NSF does not concur that employees should be encouraged to work more hours during times when significant maintenance and operational functions such as refueling, testing of systems, repair of failed components and structures, plant modifications and regulatory inspections are undertaken. NSF requests that NRC reconsider all provisions that allow relaxed controls, especially those involved in planned outages.

Furthermore, for the reasons stated by the NRC in its first proposed rule, NSF continues to believe that security personnel must be under more stringent work hour controls and should not be included in any provisions that allow waivers during outages or other circumstances other than, possibly, during attack or emergency situations. And under these rare circumstances, the licensee should be required to have emergency plans that implement fatigue countermeasures for security personnel working long hours.

Thank you for your consideration of our concerns. Should you have any questions or need additional information, please contact me at (202) 347-3471, ext. 202 or [ddrobnich@sleepfoundation.org](mailto:ddrobnich@sleepfoundation.org).

Sincerely,  
Darrel Drobnich  
Chief Program Officer for  
Policy, Education & Research

Enclosure

cc:

The Honorable Edward McGaffigan, Jr.  
The Honorable Jeffrey S. Merrifield  
The Honorable Gregory B. Jaczko  
The Honorable Peter B. Lyons

**Nuclear Regulatory Commission**

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**10 CFR Part 26**

**RIN 3150—AF12**

**Fitness for Duty Programs**

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**Comments**

**of The**

**National Sleep Foundation**

**January 10, 2006**

**Transmitted to**

**Secretary Annette Vietti-Cook  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001  
Attention: Rulemakings and Adjudications Staff**

**Submitted by**

**Darrel Droblich  
Senior Director, Government Affairs and Programs  
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1522 K Street, NW, Suite 500  
Washington, DC 20005**

## **INTRODUCTION**

The National Sleep Foundation (NSF) is an independent nonprofit organization dedicated to improving public health and safety by achieving understanding of sleep and sleep disorders, and by supporting sleep-related education, research and advocacy.

Established in 1990, NSF is comprised of many of the nation's foremost sleep, circadian, medical and transportation safety experts with a keen interest in protecting the public's health, safety and well-being. These experts volunteer their services to ensure the quality and accuracy of NSF's publications and programs.

Sleep represents one third of every individual's life and is perhaps the single most important factor in determining how humans live, perform, think, and function during the waking state or other two-thirds of the day. It is indeed equal to food, water, and air in sustaining life. Sleepiness affects vigilance, reaction times, learning abilities, alertness, mood, hand-eye coordination, and the accuracy of short-term memory.

For these reasons, NSF is pleased to comment on the important subject of the Nuclear Regulatory Commission's Proposed Rule regarding Fitness for Duty Programs (10 CFR Part 26).

In order to respond to the NRC's proposed rule, NSF formed a task force consisting of some of the nation's top experts in the area of sleep and human performance, who have many years of experience in laboratory and operational settings at the U.S. Coast Guard, branches of the Department of Defense, academia, and law enforcement. This task force was charged with thoroughly reviewing the NRC proposal, supporting documents, and a limited set of comments already existing in the docket related to the rulemaking. The task force's comments were then shared with NSF's Executive Committee for further review and comment.

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## **COMMENTS ON THE PROPOSED RULE**

NSF would like to commend the Nuclear Regulatory Commission and its staff in conducting a thorough review of the literature regarding sleep and human factors and for showing due diligence in collecting public input throughout the rulemaking process by holding numerous stakeholder meetings and public listening sessions. NSF would especially like to commend NRC staff members, Dr. David Desaulniers, David Trimble Jr., Jay Persensky, Clare Goodman, Rebecca Karas and others for their dedication to conducting fair and balanced discussions during the rulemaking process. We have found their professionalism and tenacity to "getting it right" to be very admirable and beyond reproach.

NSF realizes that it is impossible to develop a flawless set of regulations acceptable to all parties; however, we believe that the proposal put forth by the NRC, will significantly improve safety and the quality of life of plant operators, security personnel and others covered by its provisions if implemented. While there can be honest debates about certain provisions within the proposal, NSF believes that the recommendations, on the whole, represent a reasonable balance of the various considerations, with particular regard to sleep science. In this document, NSF offers suggestions for improvements to the NRC proposal and efforts to combat sleep deprivation and attendant performance decrements in the nuclear power industry.

NSF believes that the proposed regulations are long overdue for such safety-sensitive operations as the nuclear industry. This proposal is especially important in the wake of the events of September 11, 2001 and the continuing threats of terrorism that face the nation. Also, as oil prices continue to rise and existing oil supplies become depleted, a new discussion of building additional nuclear plants to provide energy to the nation is underway.

According to the U.S. Department of Energy, by the year 2020, there will be a need for 50 percent more electricity in the United States. In order to meet this demand, the Nuclear Energy Institute predicts in their document *Vision 2020* that the nuclear industry will have to re-license existing plants and build new ones to add a minimum of 50,000 megawatts to the U.S. electricity grid.

Should this take place, safety will be a major topic in the public discourse. If the industry can show that it has embraced the notion that employee alertness is something that is non-negotiable and actually essential to the bottom line as well as public safety, the public may be more receptive to the building of new nuclear facilities. A safe nuclear industry can only be achieved by incorporating sound sleep science into fatigue management plans that consist of work schedules that adhere to the circadian clock, comprehensive education and training, the addition of sleep disorder screening and treatment to health plans and wellness initiatives, and flexibility as new research and technologies come available.

To promote the highest level of safety in the nation's nuclear plants, new regulations must be based on current scientific research and understanding regarding fatigue and performance. NSF recommends a system to manage fatigue that includes prescriptive regulations that can be monitored and enforced by NRC inspection personnel and, above all, provide adequate rest periods with reasonable, responsible limits on work. While science is essential to the process of establishing general principles regarding sleep and alertness, it is more difficult to extend current scientific findings to develop specific recommendations that quantify such issues as hours of duty, which involve individual physiological differences and other complexities. NSF agrees with the NRC's following statement:

“Work hour controls are necessary, but not sufficient, to effectively manage worker fatigue. Worker fatigue, and its effects on worker alertness and performance, can result from many causes in addition to work hours (e.g., stress, sleep disorders, daily living obligations) (Rosa, 1995; Presser, 2000). Further, there are substantial individual differences in the ability to work for extended periods without performance degradation from fatigue (Gander, 1998; Jansen, et al., 2003; Van Dongen, et al., 2004a; Van Dongen, et al., 2004b). The work hours controls of proposed § 26.199 would provide only partial assurance that individuals are not fatigued.” (Federal Register, pg. 50505).

Ultimately, it is the shared responsibility of licensees, medical review officers, unions, industry associations, employees, and the government to develop a system that promotes proper fatigue management through comprehensive education and training that helps create a culture that prioritizes sleep and alertness as the underpinnings of any safe, productive and profitable 24-hour operation.

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## **THE IMPORTANCE OF RECOGNIZING THE FUNCTION OF THE CIRCADIAN CLOCK IN HUMAN PERFORMANCE**

Sleep is needed by all animals. The human body naturally follows a 24-hour period of wakefulness and sleepiness that is regulated by an internal circadian clock that is linked to nature's cycle of light and darkness. The clock regulates cycles in body temperature, hormones, heart rate, and other body functions.

Most people are alert in the morning, and except for a small dip in alertness in the mid-afternoon, remain alert until the evening hours. The strongest tendency to sleep occurs between midnight and six a.m. The internal circadian clock that determines this pattern of alertness/sleepiness is resistant to re-setting. It is therefore not surprising that 10-20% of night shift workers report falling asleep on the job (usually during the second half of the shift when the circadian rhythm of alertness approaches its nadir). Similarly, tired shift workers who have worked all night often find it difficult to sleep during the day, because they are trying to sleep during the ascending phase of the circadian rhythm of alertness. This circadian rhythm of

alertness cannot be changed to accommodate federal regulations or economic needs (Mitler et al., 1998; Wylie et al., 1996; Folkard, 1997).

The NRC recognizes and acknowledges this fundamental element of human physiology and its effects on human performance. The NRC proposal states:

“Studies of the nuclear power industry indicate that normal daily variations in alertness associated with human circadian rhythms (i.e., physiological processes that vary on an approximate 24-hour cycle) may be responsible for daily variations in the incidence of personnel errors at nuclear power plants (Bobko, et al., 1998; Dorel, 1996; Maloney, 1992). The findings of these studies are consistent with the results of a survey of more than 100 nuclear power plant shift supervisors—over 90 percent stated that they notice times of day, and days in the schedule, during which control room operators are less alert, less vigilant, or make more mistakes (Baker, et al., 1990 [EPRI NP- 6748]). These studies suggest that, despite safeguards to ensure correct and reliable human performance, factors that influence alertness may increase the incidence of human errors in nuclear power plants.” (Federal Register, pg. 50455)

However, NSF believes that the proposed rest break provisions and individual work hour controls, if implemented at the upper limits of what would be allowed, could result in work schedules that are not based on the 24-hour biological clock. NSF understands that market and industry forces add natural checks and balances that would keep most facilities from scheduling employees on 16-hour shifts. However, if these upper limits of scheduling were allowed in the final rules, there could be facilities that misinterpret these limits as being the established upper boundaries for safe operational performance, and as a result, impose work schedules on employees that actually produce unsafe levels of fatigue – at the plant or when the employee drives home. NSF and its task force suggest that NRC make an additional effort to provide clear guidance regarding the systematic scheduling of 24/7 operations that are consistent with a 24-hour day. Additionally, NSF suggests that NRC take steps to add provisions that would encourage licensees to make shift rotations that are not only in keeping with the basics of sleep and human performance research, but are predictable and stable.

NSF believes that predictability of shift schedules is also important to allow employees’ family members to adjust their own schedules and activities in a manner that accommodates the workers’ need to sleep during the daytime or early evening hours. Likewise, there should be limits on scheduling employees to rotating shifts without prior notice. It is likely that if new regulations are based on a 24-hour clock the rules would be easier to implement.

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**REST BREAK PROVISIONS** – “Proposed §26.1999 (d)(2)(ii) and (d)(2)(iii) would require licensees to provide individuals who are subject to the proposed work hours limits with at least one 24-hour rest break in any 7-day period and at least one 48-hour rest break in any 14-day period, except during the first 14 days of any outage, as well as certain other circumstances for security force personnel.”

**COMMENT:** 10 hours off between shifts is the very minimum that should be allowed to provide employees the opportunity to get adequate sleep. NSF encourages NRC to consider raising this provision to at least 12 hours off between shifts.

As the NRC points out on page 50591 of the rulemaking:

“Belenky, *et al.* (2003) found that the performance of subjects whose sleep periods were restricted to 7 hours per night over 7 consecutive days increasingly degraded as the number of sleep-restricted days increased. Van Dongen, *et al.* (2003) similarly found that the performance of subjects whose sleep was limited to 8-hours per night also declined over a two-week period. The

only subjects in these studies who did not show any performance decrements were those who were permitted 9-hour sleep periods in the Van Dongen study. These results clearly demonstrate that individuals require more rest than a 10-hour break provides over time to prevent performance degradation from cumulative fatigue, including that which accrues from a series of days of mild sleep restriction (e.g., 7 hours per night).

Further, a 10-hour break provides an opportunity for 7 hours of sleep only if one assumes the minimal times for meals, hygiene, and commuting described with respect to proposed § 26.199(d)(i), with no other daily living obligations. These assumptions are realistic only for unusual circumstances and limited periods of time during which individuals may be able to temporarily defer their other obligations. As the number of consecutive days increases on which individuals have only a 10-hour break available to meet these other obligations, the pressure on individuals to restrict sleep time in order to meet these other obligations increases.”

NSF believes that the issue of off-duty time is one of the most important currently being considered by NRC. Numerous studies have confirmed that the average person needs 7-9 hours of sleep to sustain alertness (Roehrs et al., 1989, 1996; Wehr et al., 1993). Nationally-representative polls conducted by the National Sleep Foundation show that most adults sleep less than 7 hours on average (NSF, 1999, 2000, 2001, 2002, 2003, 2004, 2005). This evidence supports the belief that most Americans are chronically sleep-deprived and functioning below the level of optimum alertness.

As the NRC notes in the proposed rule, one night of extended sleep cannot overcome the compounded effects of sleep loss, extended work hours and sleep debt. Recovery time periods must take into consideration the necessity for overcoming cumulative fatigue resulting from such schedules and must include sufficient nighttime sleep.

It is important to note that nighttime sleep has been found to be more efficient than sleep acquired during the daytime (Lavie, 1989) and that hours of sleep acquired during daylight hours are typically fewer than during similar sleep opportunities at night (Akerstedt, 1997). Recovery time should allow for at least 2 consecutive nights of sleep (including the hours between midnight and 6:00 a.m.) and be available every 7 days at a minimum prior to going back on duty (Rosekind et al., 1997; Caldwell et al., 1998; Johnson et al., 1998).

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**WORK HOUR CONTROLS FOR INDIVIDUALS** – “Proposed § 26.199(d) would be added to specify that licensees must establish work hour controls for each individual who performs the duties listed in proposed § 26.199(a). Licensees shall control the work hours of individuals, as follows: (1) Except as permitted under paragraph (d)(3) of this section, licensees shall ensure that any individual’s work hours do not exceed the following limits: (i) 16 work hours in any 24-hour period; (ii) 26 work hours in any 48-hour period; and (iii) 72 work hours in any 7-day period.”

**COMMENT:** NSF is concerned about the individual work hour control that would allow 16 hours of work in any 24-hour period. Because market pressures often cause regulatory limits to be pushed in all industries, the total number of work hours should be lower. NSF is aware that 12 hours has become increasingly common at U.S. nuclear power plants and that NRC has proposed provisions (§ 26.199(d)(1)(ii), § 26.199(d)(2)(I)) that would restrict or dissuade the use of 16-hour days. However, NSF believes that allowing the possibility of 16-hour days for personnel in safety-sensitive positions is counterproductive and potentially hazardous. NSF believes that the proposed 16-hour value appears to imply that (1) fewer than 8 hours of sleep will be acquired between work shifts, which is insufficient as the NRC itself has noted, or (2) the report time will slip from day to day causing circadian instability, which should not be acceptable. NSF suggests that the maximum number of work hours should be 10 hours per 24 hours for people on 8-hour shifts and 14 hours per 24 hours for people on 12-hour shifts.

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**WAIVERS FOR PLANNED SECURITY SYSTEM OUTAGES** – “Proposed § 26.199(f)(2)(i) also would permit licensees to exclude security personnel from the 48-hour per person per week collective work hour limit during the first 8 weeks of a planned security system outage, during which time they would be subject to a 60-hour per person per week collective work hour limit.”

**COMMENT:** NSF is concerned that security personnel would be allowed to work more hours during planned security system outages. For the reasons stated by NRC in its reasoning in relation to Proposed § 26.199(a)(5), NSF believes that work controls should be in place for security personnel, especially during times of increased activity such as planned security system outages or under threat conditions. The NRC said the following regarding Proposed § 26.199(a)(5):

“Proposed § 26.199(a)(5) would be added to require work hour controls for individuals who are performing the duties of an armed security force officer, alarm station operator, response team leader, or watchperson at a nuclear power plant... In order to ensure that these individuals are able to meet their responsibilities for maintaining the common defense and security, it is necessary to ensure that they are not subject to fatigue, which could reduce their alertness and ability to perform the critical job duties of identifying and promptly responding to plant security threats. Security personnel are the only individuals at nuclear power plants who are entrusted with the authority to apply deadly force. Decisions regarding the use of deadly force are not amenable to many of the work controls (e.g., peer checks, independent verification, post-maintenance testing) that are implemented for other personnel actions at a nuclear plant to ensure correct and reliable performance. By contrast to most other nuclear power plant job duty groups, security personnel are typically deployed in a configuration such that some have very infrequent contact with other members of the security force, or other plant personnel... Many security duties are largely dependent on maintaining vigilance, whereas vigilance tasks are among the most susceptible to degradation from fatigue (Rosekind, 1997; Monk and Carrier, 2003). Finally, unlike operators, security forces lack automated backup systems that can prevent or mitigate the consequences of an error caused by fatigue.” (Federal Register, pg. 50584).

For these reasons, NSF believes that security personnel must be under more stringent work hour controls and should not be included in any provisions that allow waivers during outages or other circumstances other than, possibly, during attack or emergency situations. And under these rare circumstances, the licensee should be required to have emergency plans that implement fatigue countermeasures for security personnel working long hours. For instance, critical and support personnel should be able to sleep near the command center and their operational stations. They should trade off with each other, taking naps during lulls in activity and responding quickly when needed. Thus, the NRC should require that licensees create in-house rest facilities and rest plans for security personnel as part of their overall fatigue management plans.

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**WAIVERS OF WORK HOUR CONTROLS** – “Proposed §26.199(d)(3) would permit licensees to waive individual work hour limits and rest break requirements only in circumstances in which it is necessary to mitigate or prevent a condition adverse to safety, or to maintain the security of the facility. Proposed §26.197(e)(1) would require licensees to report the number of waivers granted in a year.”

**COMMENT:** NSF agrees with the NRC’s expectations that waivers would only be granted “to address circumstances that the licensee could not have reasonably controlled.” The two circumstances where a waiver can be sought as proposed in §26.199(d)(3)(i)(A) – to mitigate or prevent a condition adverse to safety or to maintain the security of the facility – appear to be reasonable and appropriate. All use of waivers should be reported to and tracked by NRC to analyze for unsafe or inappropriate patterns. This information should be made available to the public where deemed appropriate.

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**OUTAGE WORK SCHEDULING** – “The NRC is seeking comment on the exclusions from certain work hour controls that would be allowed by proposed §26.199(d)(2)(iii), (f)(1) and (f)(2) during maintenance and refueling outages, and how these exclusions could affect human error. The NRC is specifically interested in whether a more precisely defined rule scope with more limited outage exclusions would better meet the stated objectives of the rule.”

**COMMENT:** The National Sleep Foundation does not understand the rationale for waiving individual and group work controls for the first 8 weeks of outages. NSF does not concur that employees should be encouraged to work more hours during times when significant maintenance and operational functions such as refueling, testing of systems, repair of failed components and structures, plant modifications and regulatory inspections are undertaken. NSF requests that NRC reconsider all provisions that allow relaxed controls, especially those involved in planned outages.

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**DEFINING JOB DUTY GROUPS** – “Proposed §26.199(a) would require any individual who performs duties within specified job duty groups to be subject to the work hour control provisions in §26.199. Other individuals, beyond those specified within the scope of §26.199(a), might substantially impact the outcome of risk-significant work, such as certain engineers (e.g., Shift Technical Advisors).”

**COMMENT:** NSF and its task force agree with NRC that transient workers should be included under individual work controls, but that it would not be practical to include such workers in collective work hour controls.

Furthermore, NSF agrees with NRC’s proposal as outlined in Subpart C to require licensees and other entities to collect and share greater amounts of information than under the current rule, subject to the protections of individuals’ privacy that would be specified in proposed § 26.37. This requirement is needed due to the increasing use of transient workers that travel from site to site to provide services. Facilities should be required to share information on a transient workers work hours at any particular facility to ensure they that do not exceed the individual work hour control limits.

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**PROVISIONS REGARDING SELF DECLARATION** – “Proposed § 26.199(e) [Self declarations during extended work hours] would be added to require licensees to take immediate action in response to a self-declaration [as discussed with respect to proposed § 26.197(b)(1)] by an individual who is working under, or being considered for, a waiver from the work hour controls in proposed § 26.199(d)(1) and (d)(2). Licensees would be required to immediately stop the individual from performing any duties listed in proposed § 26.199(a) unless the individual is required to continue performing those duties under other requirements of 10 CFR Chapter I, such as the minimum control room staffing requirements in 10 CFR 50.54(m).”

**COMMENT:** NSF and its task force commend the NRC for proposing this self declaration provision. We applaud the NRC’s intentions to provide employees with a process to declare when they might be too fatigued, for whatever reason, to conduct certain tasks.

NSF believes that is the responsibility of the licensee to develop work schedules and work environments that promote alertness and performance. In turn, it is the responsibility of the employee to make sleep a priority by getting as much as possible while off duty, taking maintenance naps during scheduled breaks if necessary, and seeking medical treatment for any sleep complaints or suspected sleep disorders.

Performing face-to-face fatigue assessments as proposed in the rule will be very difficult, no matter how well trained supervisors may become. The NSF task force commented that even sleep professionals would not rely on observation to determine how fatigued a person may be. The NRC will have to work very hard to develop appropriate guidance for the implementation of training programs in relation to performing fatigue assessments.

It must be noted that research demonstrates that most people experience cognitive decrements long before they start to exhibit physical manifestations of fatigue that may be observed by a supervisor or co-workers. Without some objective instrument or measure of fatigue, the system as currently proposed would be vulnerable to error and/or abuse.

NSF and its task force would like to reiterate that it should be the responsibility of the licensee to develop work schedules and a working environment that encourages and facilitates alertness and that helps identify individuals within the workforce who may require special consideration and/or treatment of chronic sleep problems or disorders. While the concept of self declaration is a worthy one in theory, its use may be impractical since (a) employee's may fear reprisal, directly or indirectly; and (b) chronically sleep deprived individuals and individuals with certain sleep disorders are not capable of accurately self-assessing their level of alertness and capacity to perform. We encourage NRC to put forward very clear guidance regarding the implementation of this rule to make sure that the potential for abuse for both self declaration and face-to face assessments are minimized. NSF also encourages the NRC and the nuclear industry to support the development and utilization of objective assessment tools and predictive software models currently being tested.

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#### **NAPPING AS A COUNTERMEASURE**

**COMMENT:** Studies show that napping at the workplace is especially effective for workers who need to maintain a high degree of alertness, attention to detail, or make quick decisions. (Bonnet, 1990; 1991; Rosekind et al, 1993; Dinges et al, 1988; Lorizio et al, 1990; Matsumoto and Harada, 1994; Rogers et al, 1989; Rosa, 1993; Webb, 1987). In situations where the worker is working double shifts or longer, naps at the workplace are even more important. Educational components should include information on the benefits of naps prior to a shift as well as during scheduled breaks and lunch periods. These educational materials should also include information on sleep inertia.

NSF encourages the NRC to include a provision regarding the inclusion of sound napping policies in the fatigue management plans developed by licensees. These napping policies should include the designation of quiet, dark and accessible areas (e.g., rooms in EAP or wellness units) to be used as napping facilities. The use of these facilities should be encouraged especially during outages, the use of heavy overtime, and when waivers are granted.

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#### **GENERAL COMMENTS ON EDUCATION AND TRAINING PROGRAMS REQUIRED UNDER THE PROPOSED RULE**

**TRAINING AND EXAMINATIONS** – Proposed § 26.197(c) would establish additional fatigue-related training and examination requirements, in addition to those required under proposed § 26.29(a) and (b). (Fed. Reg., page 50578).

**COMMENT:** NSF fully endorses this provision. Comprehensive education and training on the promotion of good quality sleep and the mitigation of fatigue is essential to the promotion of safety in the nuclear industry.

Furthermore, some education and training on sleep, sleep disorders and the consequences of sleep deprivation, although not necessarily examinations, should be required for all personnel whether or not they are in safety sensitive positions or covered under work hour controls §26.199(a). NSF firmly believes that education of all personnel, including (and perhaps especially) upper management, is key to fostering a culture that embraces alertness and effective fatigue management.

**Proposed § 26.197(c)(1)** – “Examples of topics that licensee training and examinations would address that are related to this KA would include, but are not limited to: (1) The principal factors that influence worker fatigue; (2) knowledge that a worker’s ability to perform and remain alert is influenced by physiological changes that follow a daily pattern; (3) the time periods during which workers are most likely to exhibit degraded alertness and performance; (4) the principal symptoms of common sleep disorders (*e.g.*, sleep apnea and insomnia) and the conditions that can contribute to their onset; (5) the methods for optimizing sleep periods on a shift work schedule; and (6) how to safely and effectively counteract fatigue with measures such as caffeine and strategic napping.”

**COMMENT:** NSF believes that as the NRC finalizes its rule, it should provide specific guidance regarding topics that should be covered in fatigue training and education modules and examinations. NSF suggests that the NRC take the lead in developing uniform curriculum and examination materials in order to ensure the accuracy and uniformity of information provided. Similarly, all medical review officers should receive education and training regarding the signs and symptoms of sleep disorders as well as effective treatment options.

Additionally, NSF strongly believes that information on the prevention of drowsy driving should be included in any materials that are developed. The National Highway Traffic Safety Administration conservatively estimates that 100,000 police-reported crashes are the direct result of driver fatigue each year. These crashes cause over 1,550 deaths and 71,000 injuries as well as \$12.5 billion in diminished productivity and property loss. According to annual nationally-representative surveys conducted by NSF over the last eight years, more than 50 percent of adults reported that they had driven drowsy and approximately 20 percent admitted to dozing off at the wheel at least once in the prior year. Moreover, 80 percent of shift workers say that they have driven while drowsy in the previous year, indicating the existence of a major public health problem.

According to a study conducted for the AAA Foundation for Traffic Safety (Stutts et al., 1999), 14 percent of employed drivers in sleep crashes and 24 percent of employed drivers in fatigue crashes worked the night shift. Working the night shift increased the odds of a sleep-related (versus non-sleep-related) crash by nearly six times. Furthermore, drivers who worked more than 60 hours a week increased their risk of being involved in a drowsy driving crash by 40 percent. The study also found that the strongest risk factor was the total number of hours slept the night before – the fewer the hours slept, the greater the odds for involvement in a sleep-related crash.

Given the number of hours that employees will be allowed to work under this proposal, the dangers of drowsy driving and appropriate countermeasures should be included in all educational materials. Given the rise in criminal and civil penalties NSF has witnessed over the years, it should be made explicitly clear to licensees that their liability for the actions (and work hours) of their employees does not end at the property gate – it may extend onto the highway as well.

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#### **GENERAL COMMENTS ON PROVISIONS REGARDING SLEEP DISORDERS**

“NRC plans to similarly revise the same documents during preparation of the final Part 26 rule. The self-disclosure of sleeping disorders by licensed operators (item 4) is being addressed by the NRC as a separate effort from this proposed rule through changes to Regulatory Guide 1.134, (Medical Evaluation of Licensed Personnel at Nuclear Power Plants).” (Federal Register, pg. 50445).

**COMMENT:** NSF fully supports NRC's efforts to address the self-disclosure of sleep disorders by operators through other regulatory documents such as the Regulatory Guide 1.134, (Medical Evaluation of Licensed Personnel at Nuclear Power Plants). No employee should be afraid to seek treatment for a sleep disorder that can be effectively diagnosed and treated. Furthermore, NRC should take appropriate steps to ensure that all medical review officers (MRO) receive proper training regarding the signs and symptoms of sleep disorders as well as effective treatments. NRC should take appropriate steps to see that uniform education and training materials for MROs are developed to ensure that appropriate topics are covered accurately.

“Proposed § 26.27(b)(7) would amend current § 26.20(b), which requires the FFD policy to describe programs that are available to individuals desiring assistance in dealing with drug, alcohol, or other problems that may adversely affect their performance of their job duties. Proposed § 26.27(b)(7) would add fatigue as one of the problems for which individuals may be seeking assistance because of sleep disorders.”

**COMMENT:** NSF commends the NRC for considering the impact that untreated sleep disorders have on the health and safety of the workforce at nuclear plants under proposed § 26.27(b)(7). NSF believes that NRC has clearly and accurately cited existing information regarding the prevalence of sleep disorders in the United States. NSF also agrees with NRC that given the demographics of workers in the nuclear industry, sleep disorders (e.g., sleep apnea) are likely to be prevalent in the workforce and should be diagnosed and treated. No matter how much time for sleep they are afforded, individuals who suffer from sleep disorders such as sleep apnea do not accrue the full recuperative benefits from sleep, resulting in an inability to sustain normal levels of alertness and performance throughout the subsequent hours of wakefulness.

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**ALTERNATE WORK-SCHEDULING EXAMPLES** – “As a means of determining the flexibility of the proposed rule work hour controls in §26.199, the NRC is seeking public comment on work-scheduling examples that meet the requirements of the proposed rule and whether such schedules afford a reasonable degree of flexibility to licensee management.”

**COMMENT:** NSF and its task force believe that all schedules and shift lengths need to be based firmly on a 24-hour basis. To serve as the basis for further analysis and discussion by the NRC and affected parties, NSF would like to offer the alternative work-scheduling **example** below. The task force believes the implementation of the following suggestion would force the adoption of shift work plans (*rotas*) that are equitable and predictable.

- Limit the industry to a basic, maximum **8-hour shift length**.
  - Allow the **12-hour shift length**, but require that a company justify any increase to the 12-hour shift length, in writing, with respect to a document such as *Biological Rhythms: Implications for the Worker* (Office of Technology Assessment, U.S. Congress, Committee Report OTA-BA-463, Washington DC: U.S. Government Printing Office, 1991).
- Specify that staffing levels shall allow at least **four crews** for each in-house 24/7 operation (or at least four people for each in-house 24/7 position), plus enough staff **coverage** for that operation (or that position) to deal with pre-calculated amounts of sick time, vacation, holidays, and training.

- Also, make provisions for **5-crew** operations, which are just 4-crew operations plus carefully integrated weeks of 9-to-5 days.
- Specify the nominal total hours to be scheduled for shift work per calendar period for 8-, 12- and 24-hour shift lengths. This provides a basis for overlap and overtime calculations, and allows direct comparisons across nominal shift work systems and comparisons of shift work systems to the 9-to-5 week. In accord with the fundamental arithmetic of the clock and calendar, specify that for...
  - **8-hour shifts and 4 crews**, each employee shall be scheduled at a ratio of three work days to one free day, for no more than six sequential work days before one free day of at least 24 hours, for no more than 84 hours of work in 14 days, and for no more than 168 hours of work in 28 days.
  - **12-hour shifts and 4 crews**, each employee shall be scheduled at a ratio of one work day to one free day, for no more than four sequential work days before one free day of at least 24 hours, for no more than 84 hours of work in 14 days, and for no more than 168 hours of work in 28 days.
- **THEN**, specify additional limits for shift **overlap** (or turn-over), for currency **training** and **administration**, and for **overtime**, beyond the nominal systems, above.
- Finally, it would be good to define and then require companies use **fixed** (non-rotating) shifts, **rapid** rotation (no more than 3 contiguous work days on the same shift) or **slow** rotation (no fewer than 28 contiguous work and free days on the same shift) for 8- and 12-hour shifts.]

This concludes the extent of the National Sleep Foundation's comments on the Nuclear Regulatory Commission's proposed rule for 10 CFR Part 26 – Fitness for Duty Programs. Please let us know if NSF can be of further assistance with the finalization of this rulemaking.

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