

NEI 06-11 [Draft Revision 2(C)]

Managing Personnel Fatigue at Nuclear Power Reactor Sites

February 2013

ACKNOWLEDGEMENTS

This document, *Managing Personnel Fatigue at Power Reactor Sites*, NEI 06-11, was developed by members of the NEI Fatigue Management Task Force. These industry professionals, experts on access authorization programs, drawing upon practical lessons learned during the application of the previous requirements, provided valuable insights to update the program. The changes provide a more efficient and effective program. NEI also wishes to acknowledge the extensive review and comment by those industry representatives who shaped the final form of this document and comprise the experts in Fatigue Management for the nuclear energy industry. As the historical revisions progressed, there are too many to mention but comprise the experts in the field of fatigue management processes and procedures.

NOTICE

Neither NEI, nor any of its employees, members, supporting organizations, contractors, or consultants make any warranty, expressed or implied, or assume any legal responsibility for the accuracy or completeness of, or assume any liability for damages resulting from any use of, any information apparatus, methods, or process disclosed in this report or that such may not infringe privately owned rights.

EXECUTIVE SUMMARY

This document provides guidance for managing fatigue in accordance with 10 CFR 26, Subpart I, *Managing Personnel Fatigue*. The goals of this guide are to provide the tools needed to meet regulatory requirements while:

- Maintaining reasonable assurance of industrial and nuclear safety.
- Recognizing that a wide variety of work situations exist across the industry.
- Supporting management flexibility and decision making when unplanned work is required.
- Providing the records needed to allow the required performance evaluations to be performed efficiently.
- Clarifying the rights and responsibilities of licensees and workers.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	ii
EXECUTIVE SUMMARY	iii
1 INTRODUCTION	1
2 SCOPE	2
2.1 General Application	2
2.2 Fatigue Management	2
2.3 Work Hour Controls	2
3 DEFINITIONS	4
4 FATIGUE MANAGEMENT OVERVIEW	9
5 POLICY and PROCEDURES	10
5.1 POLICY	10
5.2 PROCEDURES	10
6 MANAGING FATIGUE – GENERAL POPULATION	14
6.1 INDIVIDUALS SUBJECT TO FATIGUE MANAGEMENT	14
6.2 REQUIREMENTS	14
7 WORK HOUR CONTROLS	15
7.1 INDIVIDUALS SUBJECT TO WORK HOUR CONTROLS	15
7.2 GENERAL WORK HOUR REQUIREMENTS	17
7.3 DEVIATIONS	17
7.4 APPLICATION OF CEILING AND BREAK LIMITS	17
7.4.1 Applying Break Limits	18
7.4.2 Applying Ceiling Limits	18
7.5 UNIT ON-LINE WORK HOUR CONTROLS	18
7.5.1 Minimum Day Off Method	19
7.5.2 Maximum Average Work Hours (On-line Averaging) Method	21
7.6 UNIT OUTAGE, SECURITY SYSTEM OUTAGE OR INCREASED THREAT CONDITION WORK HOUR CONTROLS	23
7.6.1 Minimum Day Off Method	23
7.6.2 Calculating Work Hours During Unit Outages	24
7.6.3 Unexpected Outages	27
8 SPECIAL CIRCUMSTANCES AND INTERPRETATIONS	28
8.1 IMPACTING CALCULATIONS	28
8.2 MISCELLANEOUS INTERPRETATIONS	31
9 WAIVERS	32
9.1 APPLICABILITY	32
9.2 WAIVER PROCESS	32
10 FATIGUE ASSESSMENTS	35
10.1 FATIGUE ASSESSMENT ATTRIBUTES	35
10.2 CIRCUMSTANCES REQUIRING FATIGUE ASSESSMENT	36
10.3 CONDITIONS FOR CONDUCTING FATIGUE ASSESSMENTS	36
10.4 REQUIRED INFORMATION	39
10.5 DOCUMENTATION	40
10.6 PROCESS FOR CONDUCTING FATIGUE ASSESSMENT	40

11	SELF-DECLARATIONS	42
11.1	APPLICABILITY AND GENERAL PROVISIONS.....	42
11.2	SELF-DECLARATIONS DURING EXTENDED WORK HOURS UNDER WAIVER.....	42
12	TRAINING AND EXAMINATIONS	43
13	REVIEWS.....	44
13.1	ANNUAL REVIEW.....	44
13.1.1	Content of Annual Review.....	44
13.2	DOCUMENTATION AND FOLLOW-UP	45
14	RECORDS	46
15	REPORTING	46
15.1	ANNUAL REPORTING REQUIREMENTS	46
15.2	INCIDENT REPORTING REQUIREMENTS	47
16	AUDITS.....	48
16.1	CONDUCT OF AUDITS	48
16.2	AUDIT RESULTS	48
16.3	TIMING OF AUDITS	48
17	PERSONNEL ACTIONS	49
18	REFERENCES and RESOURCES	50
19	EXAMPLES	51
20	CONSIDERATIONS FOR FATIGUE MANAGEMENT	60

1 INTRODUCTION

This guide provides an approach to meeting 10 CFR 26, Subpart I requirements related to managing personnel fatigue at power reactor sites. The management of fatigue is integrated into the industry's fitness-for-duty program and is addressed in NEI 06-11, Managing Personnel Fatigue at Nuclear Power Reactor Sites, NEI 03-01, Nuclear Power Plant Access Authorization Program, and NEI 03-04, Guideline for Plant Access Training

These documents should be used by the licensee to develop policies, procedures and programs specific to their utility. Training, security and human resource policies as well as labor management and relations practices need to be considered as well in the development of the policies, procedures and programs.

This guide also addresses the training and the comprehensive examination that is required by Part 26 for the following new knowledge and abilities (KAs):

- Knowledge of the contributors to worker fatigue, circadian variations in alertness and performance, indications and risk factors for common sleep disorders, shift work strategies for obtaining adequate rest, and the effective use of fatigue countermeasures
- Ability to identify symptoms of worker fatigue and contributors to decreased alertness in the workplace.

The training for other KAs associated with FFD is addressed in NEI 03-01 and NEI 03-04.

2 SCOPE

2.1 GENERAL APPLICATION

This guide applies to licensees who are authorized to operate a nuclear power reactor under Sec. 50.57 and holders of a combined license under 10 CFR 52 after the Commission has made the finding under 10 CFR 52.103(g). This guide also applies to new plant construction no later than upon receipt of special nuclear material in the form of fuel assemblies. This guide does not apply to decommissioned plants, not authorized to operate.

2.2 FATIGUE MANAGEMENT

In accordance with 10 CFR 26.4, fatigue management requirements, with exception of work hour controls, apply to:

- All persons who are granted unescorted access to nuclear power reactor protected areas, and
- All persons who are required to physically report to the Technical Support Center or Emergency Operations Facility, in accordance with the site Emergency Plan and procedures (whether they have unescorted access or not).

2.3 WORK HOUR CONTROLS

10 CFR 26.205, “Work Hours” apply to covered individuals (a subset of the individuals to which the Fatigue Management Program applies) who are granted unescorted access to nuclear power reactor protected areas. Any individual who performs duties within any of the following job categories is a covered individual subject to work hour controls:

- Operating or on-site directing of the operation of systems and components that a risk-informed evaluation process has shown to be significant to public health and safety.
- Performing maintenance, on-site directing of the maintenance, or quality inspections during and following maintenance on systems, structures, and components (SSCs) that a risk-informed evaluation process has shown to be significant to public health and safety;
- Performing Health Physics or Chemistry duties required as a member of the on-site emergency response organization minimum shift complement.
- Performing the duties of a Fire Brigade member who is responsible for understanding the effects of fire and fire suppressants on safe shutdown capability. The person specifically designated for understanding the effects of fire and fire suppressants on safe shutdown capability is considered the person responsible for understanding the effects of fire and fire suppressants on safe shutdown capability. The remaining Fire Brigade members are not considered as

the person(s) responsible for understanding the effects of fire and fire suppressants on safe shutdown capability.

- Performing security duties as an armed security force officer, alarm station operator, response team leader, or watchman, hereinafter referred to as security personnel.

3 DEFINITIONS

The following definitions are used in this guide.

Acute fatigue - means fatigue from causes (e.g., restricted sleep, sustained wakefulness, task demands) occurring within the past 24 hours.

Alertness - means the ability to remain awake and sustain attention.

Averaging Period - the duration consisting of rolling weeks over which the 54-hour average is calculated and may or may not be consistent with standard shift schedules, but never exceeds 6 weeks.

Break - the interval of time that falls between successive work periods, during which the individual does not perform any duties for the licensee other than one period of shift turnover at either the beginning or end of a shift, but not both. This means that one period of shift turnover can be considered as part of the break.

Break Limits - are defined as the following:

- Minimum Work Period Break : A 10-hour break between the previous work period, or an 8-hour break between the previous work period when a break of less than 10 hours was necessary to accommodate a crew's scheduled transition between work schedules or shifts.
- Minimum 9-Day Break: A 34-hour break in the preceding 216-hour (9-day) period.

Call-in – being required to return to the site when not normally scheduled for work.

Ceiling Limits - are defined as the following:

- 16 hours in a 24-hour period
- 26 hours in a 48-hour period
- 72 hours in a 7-day period or 168 hours

NOTE: The periods of “24-hours,” “48-hours,” and “7-days” are considered rolling time periods. Rolling means the period is not re-zeroed, or the “clock reset” following a day off or after obtaining authorization to exceed the limits. The “24-hours,” “48-hours,” and “7-days” periods do not restart after a day off, the periods continue to roll.

Circadian variation in alertness and performance - means the increases and decreases in alertness and cognitive/motor functioning caused by human physiological processes (e.g., body temperature, release of hormones) that vary on an approximately 24-hour cycle.

Contractor/vendor (C/V) - any company, or any individual not employed by a licensee who is providing work or services to a licensee, either by contract, purchase order, oral agreement, or other arrangement.

Corrective maintenance - includes actions that restore by repair, overhaul, or replacement, the capability of a failed SSC to function within acceptance criteria.

Covered individual - an individual subject to work hour controls. Any individual granted unescorted access to a nuclear power plant's protected area that performs covered work. (see Example 1)

Covered SSC – systems, structures, and components (SSCs) that a Risk-Informed Evaluation Process has shown to be significant to public health and safety. The operational condition of the SSC is not relevant to the SSC covered status. See Examples 2 & 3

Covered work - means the following:

- Operating or on-site directing of the operation of systems and components that a risk-informed evaluation process has shown to be significant to public health and safety;
- Performing maintenance, on-site directing of the maintenance, or quality inspections during and following maintenance on systems, structures, and components (SSCs) that a risk-informed evaluation process has shown to be significant to public health and safety;
- Performing Health Physics or Chemistry duties required as a member of the on-site emergency response organization minimum shift complement;
- Performing the duties of a Fire Brigade member who is responsible for understanding the effects of fire and fire suppressants on safe shutdown capability; and
- Performing security duties as an armed security force officer, alarm station operator, response team leader, or watchperson, hereinafter referred to as security personnel.

See Example 4

Cumulative fatigue - the increase in fatigue over consecutive sleep-wake periods resulting from inadequate rest.

Day-off - a calendar day in which an individual does not start a work shift.

Deviation - a departure from the requirements included in 10 CFR 26 Subpart I.

Directing - the exercise of control over a maintenance or operations covered work activity by an individual who is directly involved in the execution of the work activity, and either makes technical decisions for that activity without subsequent technical review, or is ultimately responsible for the correct performance of that work activity. (See Example 4 and 16)

Fatigue - the degradation in an individual's cognitive and motor functioning resulting from inadequate rest.

Fatigue Assessment - an evaluation of an individual's ability to perform any assigned duties within the scope of the fitness-for-duty rule. It is not limited to covered individuals.

Incidental duties - those work activities, required by the licensee, performed off-site.

Increased threat condition - an increase in protective measure level, relative to the lowest protective measure level applicable to the site during the previous 60 days, as promulgated by an NRC advisory.

Maintenance - the following onsite activities: modification, surveillance tests, post-maintenance testing, and corrective and preventive maintenance of covered SSCs. Only maintenance activities that change the operational condition of the SSCs are included.

Maximum Average Work Hours Alternative (On-line Averaging) –the alternative approach to on-line minimum days off (MDO); a weekly maximum average of 54 hours worked, calculated based on a rolling averaging period of up to 6 weeks. This alternative is applicable to all Covered Worker classifications.

Minimum Day Off (MDO) - a “day off” that must be taken in order to comply with the appropriate on-line or outage work hour control rules that requires days off.

Nap or Restorative Sleep - a brief opportunity and accommodations for restorative, uninterrupted sleep of at least one half hour in a designated area.

Nominal - limited flexibility is permitted in meeting a scheduled due date for completing a recurrent activity that is required under 10 CFR 26, such as the nominal 12-month frequency required for FFD refresher training. Completing a recurrent activity at a nominal frequency means that the activity may be completed within a period that is 25 percent longer or shorter than the period required in 10 CFR 26. The next scheduled due date would be no later than the current scheduled due date plus the required frequency for completing the activity.

On-site - within the owner controlled area of the nuclear power plant.

Off-site - any area not considered on-site.

On-Line Day – a day when the unit is not in an outage when the shift starts.

Outage Day – a day when the unit is in an outage when the shift starts

Outage Worker - a worker supporting outage activities that are not part of a multi-unit minimum control room compliment required by the operating unit on the same site.

Predictive Maintenance – to monitor, diagnose, or trend SSC functional or condition indicators by observation, driven by the condition of the SSC or at specified intervals. Results indicate current and future functional ability or the nature of and schedule for planned maintenance not real-time operations. Examples of activities that may be excluded if they do not change the state or condition of these Covered SSCs include, but are not limited to, nondestructive examination (NDE), thermography, vibration analysis, and data collection and analysis.

Preventive maintenance - includes actions that detect, preclude, or mitigate degradation of functional structures, systems, and components (SSC) to sustain or extend its useful life by controlling degradation and failures to an acceptable level.

Quality Inspections –for the purpose of determining covered individuals; those inspection/verification activities performed during and following maintenance on covered SSCs. Excluded are material and fuel receipt inspections and the directing of quality inspections.

Risk Informed Evaluation Process - an evaluation based on a probabilistic risk analyses approach such as the Maintenance Rule (50.65(a)(4)) or other similar process.

Security personnel - armed security force officer, alarm station operator, response team leader, or watchman.

Shift cycle - a series of consecutive work shifts and days off that is planned by the licensee to repeat regularly, thereby constituting a continuous shift schedule. A shift cycle cannot exceed 6 weeks for the purposes of calculating days off. The shift cycle can be a “fixed” period recurring after a fixed number of weeks not to exceed 6 weeks, or a “rolling” week method where each new week is the last week of the shift cycle period.

Shift Schedule - a schedule that for a averages the hours described below over a shift cycle:

- **Eight (8)-hour shift schedule** – a schedule that averages not more than 9 hours per workday
- **Ten (10)-hour shift schedule** - a schedule that averages more than 9 hours, but not more than 11 hours, per workday.
- **Twelve (12)-hour shift schedule**- a schedule that averages more than 11 hours, but not more than 12 hours, per workday.

Shift turnover - those activities that are necessary to safely transfer information and responsibilities between two or more individuals between shifts. Shift turnover activities may include, but are not limited to, discussions of the status of plant equipment, arming and disarming of armed security officers, transit to and from turnover stations including compliance with radiological and personal safety requirements, and the status of ongoing activities such as extended tests of safety systems and components.

Tactical exercise - a force-on-force simulation used to evaluate and demonstrate the capability to defend target sets against selected attributes and characteristics of an adversary. A force-on-force tactical exercise includes all key program elements of a station's protective strategy.

Unit outage - the reactor unit is disconnected from the electrical grid.

Work hours - the amount of time an individual performs duties for the licensee. This calculation of work hours is subject to rules and exceptions described in this guidance document.

Work hour controls - the regulatory requirements in 10 CFR 26.205. This includes two on-line methodologies (MDO and Averaging) and outage requirements.

4 FATIGUE MANAGEMENT OVERVIEW

An individual's ability to safely and competently perform his or her duties is not solely based on the individual's hours worked or that the individual has had adequate rest. Fatigue can be caused by numerous factors including long hours of work, inadequate rest between work periods, sleep disorders, sedentary lifestyles, work problems or dissatisfaction, home finances and relationships, inadequate nutrition, emotional stress, physical stress, prescription drugs, and mental or physical illness. Fatigue may lead to decreased alertness. When an individual is alert, he or she may be more focused and better able to pay attention. Fatigue and decreased alertness can substantively degrade an individual's ability to safely and competently perform his or her duties.

Fatigue management is part of the licensee's overall fitness-for-duty (FFD) program. In 1982 the Nuclear Regulatory Commission issued Generic Letter 82-12, *Nuclear Power Plant Staff Working Hours*, providing guidelines for managing the hours worked for individuals performing safety related work. The current rule was driven, in part, by the variation in approaches used across the industry to meet these guidelines. To meet the requirements in Subpart I, a detailed process, as described in this guide, is needed for consistent application of fatigue management principles across the industry. As an integral part of the fitness for duty program, sound fatigue management for individuals should be viewed as a way of doing business as opposed to requirements imposed by the NRC.

5 POLICY AND PROCEDURES

5.1 POLICY

- a) The licensee shall establish a policy for the management of fatigue for all individuals who are subject to the licensee's Fitness-For-Duty (FFD) program and incorporate the guidance into the site or corporate written FFD policy as required in 10 CFR 26.27(b). As related to fatigue management, the FFD policy should:
- Address the effect of fatigue on FFD;
 - Provide a description of any program that is available to individuals who are seeking assistance in dealing with fatigue or other problems that could adversely affect an individual's ability to safely and competently perform the duties that require an individual to be subject to this subpart;
 - State which method of on-line work hour controls is being used, on-line MDO or On-line Averaging.
 - When complying with the on-line averaging method, state which work-hour counting system is being used relative to the start and end of the work day. See 10 CFR26.205(d)(7)(ii);
 - Describe the consequences of violating the policy;
 - Describe the responsibilities of managers, supervisors, and escorts to report FFD concerns; and
 - Describe the individual's responsibility to report FFD concerns.
 - Describes the individual's responsibility to maintain their FFD and make self-declaration if they are not fit for duty.

5.2 PROCEDURES

- a) The licensee shall develop, implement, and maintain procedures that describe the:
- Process to be followed when any individual covered by the FFD program makes a self-declaration that he or she is not fit to safely and competently perform his or her duties for any part of a working tour as a result of fatigue.
 - State which method of on-line work hour controls is being used, MDO or on-line averaging.
 - When complying with maximum alternative work hours, state which work hour counting system is being used relative to the start and end of the work day. See 10 CFR26.205(d)(7)(ii);
 - Individuals and licensee's rights and responsibilities related to self-declaration.

- Requirements for establishing controls and conditions under which an individual may be permitted or required to perform work after that individual declares that he or she is not fit due to fatigue.
 - Process to be followed if the individual disagrees with the results of a fatigue assessment that is required.
 - Process for implementing the work hour controls required for covered individuals.
 - Process to be followed in conducting fatigue assessments.
 - Disciplinary actions that the licensee may impose on an individual following a fatigue assessment, and the conditions and considerations for taking those disciplinary actions.
- a) The procedures, at a minimum, delineate the following responsibilities:
- **Operations Shift Manager** or a site senior level manager with requisite signature authority:
 - Determining the necessity of a waiver of work hour controls for an individual
 - Staffing levels are adequate ensure work hours are managed with the objective of preventing impairment from fatigue.
 - **Security Shift Manager or a site senior manager with requisite signature authority:**
 - Determining the necessity of a waiver of work hour controls to maintain site security
 - Security staffing levels are adequate ensure work hours are managed with the objective of preventing impairment from fatigue.
 - **Plant Manager (generic title for top senior level site manger responsible for plant operations)**
 - Responsible for ensuring a review is performed at least once per year to evaluate a full year of data evaluating the effectiveness of work hour controls. This review includes evaluation and review of:
 - Staffing levels to ensure individual work hours are managed with the objective of preventing impairment from fatigue due to the duration, frequency, or sequencing of successive shifts.
 - The performance of individuals to ensure individual work schedules prevents impairment from fatigue. This includes evaluating the duration, frequency and sequencing of the hours that are worked by each individual relative to worker performance.
 - The performance of the station in adhering to work schedules for covered work groups: evaluate the number of schedule changes and reasons for the changes and assess whether or not the schedule is effectively being implemented.

NOTE: Issues identified in the annual review are addressed in the corrective action program

- **Supervisor [or Manager] of the individual who will be issued a waiver:**
 - Evaluating the employee's fitness by performing a face-to-face fatigue assessment.
 - Evaluating the employee's performance and continued fitness-for-duty while working under a waiver.
 - Ensuring the waiver is authorized prior to allowing an individual to exceed work hour limit(s) being waived.

NOTE: If evaluating for the issuance of a waiver and the individual's Supervisor or Manager is not on-site, this responsibility may be performed by any manager or supervisor who is qualified to oversee the work to be performed by the individual.

- **Department Head for departments with Covered Workers:**
 - Providing guidelines for overtime selection process, including those required by the union contract, and the fitness-for-duty requirements outlined in this guide and in the licensee's FFD Program.
 - Communicating the requirements to appropriate personnel within his/her department.
 - Maintaining a record of the shift schedules and shift cycles used for at least the past 3 years for those individuals who are subject to work hour controls. Records may be required longer than 3 years, if legal proceedings are ongoing.
 - Evaluating staffing levels are adequate to ensure individual work hours are managed with the objective of preventing impairment from fatigue due to the duration, frequency, or sequencing of successive shifts.
- **Employee (licensee or contractor):**
 - Evaluating his/her personal fitness to work based on impairment from fatigue.
 - Managing his/her work hours consistent with the objective of preventing impairment from fatigue.
 - Making a self-declaration of fatigue and discussing his/her concerns with supervision or management in cases when he/she feels his/her performance may be impaired.
 - Verifying his/her working hours are correctly documented regardless of whether he/she is paid for the hours worked.
 - Monitoring and reporting concerns related to individuals' fitness to work based on impairment from fatigue (i.e., behavioral observation program).

- Being aware of the total hours worked in the previous 14 days and notifying management if work hour limits will be exceeded if asked to work additional hours.

6 MANAGING FATIGUE – GENERAL POPULATION

6.1 INDIVIDUALS SUBJECT TO FATIGUE MANAGEMENT

- a) Fatigue management requirements, with exception of work hour controls, apply to the following individuals:
 - All persons who are granted unescorted access to nuclear power reactor protected areas, and
 - All persons who are required to physically report to the Technical Support Center or Emergency Operations Facility, in accordance with the site Emergency Plan and procedures.

6.2 REQUIREMENTS

- a) Personnel subject to fatigue management will be trained and examined as part of the fitness for duty training requirements for the following KAs:
 - Knowledge of the contributors to worker fatigue, circadian variations in alertness and performance, indications and risk factors for common sleep disorders, shift work strategies for obtaining adequate rest, and the effective use of fatigue counter measures; and
 - Ability to identify symptoms of worker fatigue and contributors to decreased alertness in the workplace.

7 WORK HOUR CONTROLS

7.1 INDIVIDUALS SUBJECT TO WORK HOUR CONTROLS

- a) Personnel subject to work hour controls are those workers designated as Covered Individuals. This excludes those workers who do not have unescorted access and are escorted during the process of doing Covered Work. However, this does not relieve the licensee of ensuring fitness for duty and a quality work by the escorted worker.
- b) In addition to either the MDO or on-line averaging methods of work hour limits, work hours must comply with Ceiling Limits and Break Limits at all times unless specifically exempted.
- c) If a Covered Individual begins or resumes performing Covered Work during the calculation period, the licensee shall include in the calculation of the individual's work hours all work hours worked for the licensee, including hours worked performing duties that are not considered Covered Work. These work hours apply to Break Limits, Ceiling Limits, as well as total hours worked for either the MDO or on-line averaging Methods below.
- d) At a multi-unit site when one or more units is in an outage, only those licensed operators composing the minimum shift complement of operators required in the table below derived from 10 CFR 50.54(m) are required to work under the on-line hours rules:

Minimum Number of Individuals Per Shift Working Nonoutage Schedules for Onsite Staffing of Operating Nuclear Power Units during Outages								
Number of operating nuclear power units ¹	Position	Two-unit Site		Three-unit Site				
		One Control Room	Two Control Room	Two control rooms			Three Control Rooms	
				Single Control Room Unit In Outage	Single Control Room Unit and One Unit Served by Dual Control Room In Outage	One of the Units Served by Dual Control Room in Outage		Two Units Served by Dual Control Room in Outage
One	Senior Operator	2	2		2		2	2
	Operator	2	2		2		2	2
Two	Senior Operator			2		3		3
	Operator			2		4		4

¹ For the purpose of this table, a nuclear power unit is considered to be operating when it is connected to the grid.

- o If a worker (any classification) is dedicated to and solely working the operating unit, that worker is not eligible for outage work hour rules. See Example 17 for further clarification.
- e) In Fuel Handling operations, the operators making and approving reactivity changes are required to be on Operations rule if using the MDO method.
- o At a minimum, this includes the operator on the manipulating bridge over the Reactor Vessel the Fuel Handling SRO in Containment, and the Control Room Reactor Operator on the Tag Board (or equivalent).
 - o All others involved with FH operations may be considered under the Maintenance rules.
- f) Predictive Maintenance on a covered system is not a covered activity. If a change in operational state of the equipment is necessary, the actual operation or maintenance activity to prepare for the predictive maintenance activity may be covered.
- g) Emergency Response Personnel who do not perform health physics or chemistry duties required as a member of the onsite emergency response organization minimum shift complement are not covered workers.

7.2 GENERAL WORK HOUR REQUIREMENTS

NOTE: See Examples 5-7 for clarifications.

- a) If a work hour limit will be exceeded, it shall be identified before the hours are worked. To determine if the minimum days off requirements will be met (before working the additional hours) a licensee may use one of the following methods: Calculate the minimum days off based on a backwards look of the previous five weeks and determine if the extra hours worked in the sixth week would still meet the requirement (rolling 6-week cycle method); or ensure that sufficient days off still exist (within the shift cycle) to meet the minimum days off requirements (fixed shift cycle method).
- b) Hours worked should be evaluated to determine if any limit will be exceeded based on the work schedule by picking a future time (T) on the work schedule and asking, “how many hours will have been worked during the T-24 hours, T-48 hours, or T-168 hours (T-7 days)”
- c) The limit for 72 hours in a 7-day period may be calculated using a rolling 168-hour window or based on 7 calendar days. (i.e., a backwards look at the number of hours which have or will have been worked based on a time in the future.)
- d) The period is not re-zeroed, or the “clock reset” following a day off or after obtaining authorization to exceed the limits.

7.3 DEVIATIONS

NOTE: A Covered Worker must be in compliance with all the specific work hour rules or be under an approved waiver prior to performing covered work.

- a) Whenever a Covered Worker finds that a violation of limits exists, then in order to reset from that deviation to permit further Covered Work, the worker must come into compliance with all:
 - Break Limits
 - Ceiling Limits
 - The specific rules for the method of work hour calculation below prior to performing any further Covered
- b) Each deviation must be documented in the licensee corrective action program.

7.4 APPLICATION OF CEILING AND BREAK LIMITS

- a) Ceiling and Break Limits always apply when a worker is a Covered Individual except when specifically exempted in Section 8.

- b) Break times may require to be extended based on the travel time provisions in Section 8.

7.4.1 Applying Break Limits

- a) When calculating the duration of a break between work periods, either the off-going turnover duration or the subsequent on-coming duration of turnover may be included as part of the break duration, but not both.
- b) When rotating shift periods are transitioning to a new time of day (e.g. day shift to night shift) or work schedules (e.g. 10-hour shifts to 12-hour shifts) then a break period of 8 hours is acceptable for the transition.
- c) When determining the 34-hour break in 9 days, a rolling 216-hour period should be used.
 - o The licensee should continuously look forward from the start of the first period of work, immediately following a 34-hour break, to ensure there is a 34-hour break in the subsequent 9 days or 216-hour period.
 - o Conversely, to ensure that the actual hours worked by the individual are in compliance, the licensee must verify that the individual has had a 34-hour break in the previous 9 days or 216-hour period at the end of the work period.

7.4.2 Applying Ceiling Limits

- The periods of “24-hours,” “48-hours,” and “7-days” are considered rolling time periods. Rolling means the period is not re-zeroed, or the “clock reset” following a day off or after obtaining authorization to exceed the limits.
- The “24-hours,” “48-hours,” and “7-days” periods do not restart after a day off, the periods continue to roll.

See Example 7

7.5 UNIT ON-LINE WORK HOUR CONTROLS

NOTE: Ceiling Limits and Break Limits apply under all circumstances when determining work hours to be worked unless waived or specifically exempted in Section 8.

7.5.1 Minimum Day Off Method

- a) The MDO method requires that in a Shift Cycle, the worker will receive an average number of Days Off equal to or greater than the MDO requirement for the shift duration that applies.

Covered Individual	8- hour shift	10- hour shift	12- hour shift
Actual Average Shift Hours	8 to less than or equal to 9 hours	Greater than 9 to less than or equal to 11 hours	Greater than 11 and less than or equal to 13 hours
Maintenance	1 day off per week	2 days off per week	2 days off per week
Operations, HP, Chemistry, Fire Brigade	1 day off per week	2 days off per week	2.5 days off per week
Security	1 day off per week	2 days off per week	3 days off per week

- b) The planned shift schedule is used to establish the beginning minimum day off (MDO) requirement. If the actual hours worked do not deviate from the planned shift schedule then the required MDO will not change.
 - o Periodically, workers and supervisors may need to work unscheduled hours to meet station needs. An accumulation of unscheduled work hours over a shift cycle may affect the MDO requirement that applies to individuals or crews.
 - o The above table is shift schedule is averaged over a shift cycle of 42 days or less as applicable. If the worker averages more hours than previously scheduled the licensee must recalculate the average hours worked per shift to ensure the proper MDO (8, 10 or 12) is met prior to the end of the shift cycle. For actual shift rotation cycles greater than 42 days, the averages must be calculated over a period of 42 days or less.
- c) If the individual works for a licensee for a period less than one week, the MDO requirement is not applicable.

7.5.1.1 Calculating Work Hours using the MDO Method

- a) Licensees shall ensure that individuals have, at a minimum, the number of days off specified for their shift duration.
 - o The duration of the shift cycle may not exceed 6 weeks for the purposes of calculating the average.
 - o If individuals work for a licensee for a period of less than one week, the minimum day off requirements are not applicable.

- b) Work hours are calculated as the amount of time an individual performs any duties for the licensee including but not limited to the following:
 - All within-shift break times and rest periods during which there is no reasonable opportunity or accommodations appropriate for restorative sleep (e.g., a nap);
 - Shift holdovers to cover for late arrivals of incoming shift members;
 - Early arrivals of individuals for licensee required meetings, training, or pre-shift briefings for special evolutions (these activities are not considered shift turnover activities); and
 - Holdovers for interviews needed for event investigations.
- c) Within-Shift Breaks and Rest Periods
 - Time spent at lunch, although non-productive work may not be excluded from the work hour calculations.
 - Break time allowed during the scheduled work day is included in the work hour calculation.
 - That portion of a break or rest period during which there is a reasonable opportunity and accommodation for restorative sleep on site (e.g., a nap of at least 30 minutes) may be excluded.
- d) Shift Turnover - Licensees may exclude Shift Turnover from the calculation of an individual's work hours.
- e) Resets from Deviations must additionally ensure that actions are in place to comply with MDO requirements by the end of the Shift Cycle if using the fixed-cycle method in work hour calculations.
- f) Transitions between on-line schedules

Licensees may transition individuals or crews between shift schedules by ending a shift cycle and starting a new shift cycle with a different shift schedule. The following guidance applies:

- Terminating the shift cycles: Ensure that the individuals meet the MDO requirement applicable to the shift schedule that the individuals were working before it was terminated.
 - In these instances, for the purpose of determining compliance with the MDO requirements, the licensee may average the individuals' work hours over a period immediately preceding the transition that is equal in length to the shift cycle the individuals were working before the transition (e.g., 6 weeks, if the shift cycle was 6 weeks in length). The licensee should then ensure that the individual meets the applicable MDO requirement for the new shift schedule going forward from the beginning of the new shift cycle. A shift cycle may be as short as 1 week. There are no MDO requirements for shift cycles less than 7 days.

g) Transitions between on-line and outage schedules:

The Ceiling and Break Limits apply during the transitions. The outage MDO's only apply while in an unit outage.. The first shift after the breaker closes starts the online MDO rules. For the first 42 days after an outage, (for 6 week cycles) the employee must be evaluated using the fixed shift cycle method.

h) Transitions between covered groups or onto a covered shift:

If an individual begins or resumes performing for the licensee any covered work during the calculation period, the licensee shall include in the calculation of the individual's work hours all work hours worked for the licensee, including hours worked performing duties that are not covered work and control the individual's work hours.

- Ceiling and Break Limits always apply.
- A minimum of 1 day off in the preceding 7-day period is acceptable for individuals to begin or resume covered duties and for individuals who have been working an 8-hour shift schedule, as either day or shift workers, and are transitioning (1) from a non-covered group to a covered group or (2) from a covered group to another covered group that has more stringent MDO requirements.
- A minimum of 2 days off in the preceding 7-day period is acceptable for individuals who have been working a 10- or 12-hour shift schedule, as either day or shift workers, and transition (1) from a non-covered group to a covered group or (2) from a covered group to another covered group with more stringent MDO requirements.
- A minimum of 2 days off in the preceding 7-day period is acceptable for operators at a multiunit site with one or more units in an outage, if the operators have been working outage hours on 10- or 12-hour shifts before they transition to an operating unit as members of the minimum shift complement described in Section 7.1.1 (c).
- There is no minimum day off requirement for transitioning from a non-covered to covered work if the previous schedule was less than 7 days in length

See Example 7.

7.5.2 Maximum Average Work Hours (On-line Averaging) Method

- a) The alternative approach to on-line MDO is a weekly maximum average of 54 hours worked, based on a rolling averaging period of up to 6 weeks. This alternative is applicable to all covered workers, regardless of classification.

7.5.2.1 Calculating Work Hours Using the On-line Averaging Method

a) Rolling Period

- The averaging period starts “rolling” after a work history for a covered worker has been established equal to the length of the averaging period.
- The averaging period rolls by one full week at a time. The week does not have to start on any specific day but must be consistent through the calculation period and documented in the controlling procedure.
- Shifts that bridge the point in time during the week when the averaging period rolls forward one week may be counted in one of two ways and must be documented in the controlling procedure:
 - The hours for that shift may be included in the week the shift starts or,
 - The hours may be included in the weeks the hours are worked.

b) Calculating the Average

- While the calculation of the average work hours worked occurs at the end of the averaging period, there is a need to be continually calculating the average looking forward to identify potential exceedances of the limit so that work hours can be adjusted or, as appropriate, waivers can be prepared in advance of exceeding the limit.
- One simple method is to add up the work hours from the previous five weeks and subtract from 324 giving the worker the maximum amount of hours that can be worked the upcoming week.

c) Beginning a Rolling Averaging Period

- In the case of a worker who has not been performing on-line covered work and will be transitioning to on-line covered work, there are two options for setting up the schedule to start the averaging period:
 - The schedule established for the worker for the initial averaging period (e.g. initial 6 weeks) can be set up as a fixed period which averages 54 hours or less. The first week after this (e.g. 7th week worked) is the start of the rolling schedule.
 - The number of weeks in the averaging period for the worker is determined and the hours for the past number of work weeks that is equal to the averaging period are calculated to establish the history needed to begin rolling.

d) Partial Averaging Periods

- Partial averaging periods occur when a worker will not be working a full averaging period.
- If less than a full week, then only Ceiling Limits and Break Limits apply.

- If greater than one full week but less than a full averaging period, then the worker must limit the average work hours to 54-hour per week or less averaged over the partial averaging period.

- e) If the fixed schedule is truncated due to unforeseeable events outside the control of the licensee, the worker will be considered to be in compliance with the rule if the schedule for the averaging period would have met the on-line averaging limit should the truncation not have occurred.
 - Examples of unforeseeable events:
 - Unexpected unit outage
 - A declared emergency as defined by the licensee's emergency plan
 - Duties of the worker are terminated
 - An unplanned security system outage (security only)
 - An increased threat condition (security only)
 - Following such an event, the Covered Worker may start a new averaging period or choose not to truncate the averaging period.

- f) Extended Absences
 - An extended absence is not considered an interruption or truncation of an averaging period but is considered part of the averaging period.

- g) Resets from Deviations must additionally ensure that actions are in place to comply with the 54-hour averaging limit by the end of the averaging period.

7.6 UNIT OUTAGE, SECURITY SYSTEM OUTAGE OR INCREASED THREAT CONDITION WORK HOUR CONTROLS

NOTE: Ceiling Limits and Break Limits apply under all circumstances when determining work hours to be worked unless waived or specifically exempted in Section 8.

7.6.1 Minimum Day Off Method

NOTE: If an individual is performing work under multiple categories, the most restrictive work hour controls apply.

NOTE: During a unit outage, the options for control of work hours for covered workers are outage MDOs or staying with on-line work hour controls.

- a) During the first 60-day period of a unit outage, the Covered Worker under outage rules will receive an average number of Days Off equal to or greater than the MDO requirement for the shift duration that applies.

Covered Individual**	8- hour shift Days off	10- hour shift Days off	12- hour shift Days off
Maintenance	1 day off per week	1 day off per week	1 day off per week
Operations, HP, Chemistry, Fire Brigade	3 days off in each successive (i.e., non-rolling) 15-day period	3 days off in each successive (i.e., non-rolling) 15-day period	3 days off in each successive (i.e., non-rolling) 15-day period
Security	4 days off in each successive (i.e., non-rolling) 15-day period	4 days off in each successive (i.e., non-rolling) 15-day period	4 days off in each successive (i.e., non-rolling) 15-day period

**If the worker averages more hours than previously scheduled the licensee must recalculate the average hours worked per shift to ensure the proper MDO (8, 10 or 12) is met prior to the end of the listed period.

- b) During the first 60-day period of an unplanned security system outage or increased threat condition, the requirements for MDOs for Security personnel do not apply.
- c) Extensions of 60-day period may be provided to individuals in 7-day increments for each non-overlapping 7-day period in which the individual has worked not more than 48 hours during the unit or security system outage or increased threat condition.
- This extension can be made anytime in the outage period after the less than 48-hour work week.
 - Since this extension is calculated by a week defined as 7 days
 - If every week of the initial 60 days is used for the extension only 56 days (8 weeks) are available for the extension.
 - The 48-hour allowance can only be banked during the first 60 days of the outage and used no later than day 116 of the outage.
 - See Examples 13 & 14.

7.6.2 Calculating Work Hours During Unit Outages

- a) Licensees shall ensure that individuals have, at a minimum, the number of days off specified for their shift duration.
- b) Transitioning to a planned outage using the MDO method:

- Rolling shift cycles - Since the rolling evaluation method is a backwards look at days worked, online MDO's are in compliance when entering a planned outage.
 - Fixed shift cycles – The working hours must be carefully managed working towards the beginning of an outage. In the last week prior to the outage, the number of days off must meet the averaged shift length on-line MDO requirement. These individual may either need additional days off or have their working hours adjusted to meet the required MDO's for a fixed evaluation period prior to entering the planned outage.
 - Schedules can also be abbreviated to cause a fraction number of weeks in the online schedule. In these cases the required number of MDO's is prorated over the abbreviated schedule. For example 30 days is 4.3 weeks. A 12-hour shift operator shift would require 4.3×2.5 MDO/week or 11 days off to be in compliance with the rule.
- c) Transitioning to a planned outage using the on-line averaging method:
- See section 7.5.2 (d)
- d) Transitioning from a Planned Outage to On-Line using the MDO method:
- Return to on-line work hour limitations starts a new shift cycle. As long as the worker has not exceeded the maximum number of allowed work days for the period (7-day rolling or 15 day fixed), the licensee shall be considered to be in compliance with the rule.
- e) Transitioning from a Planned Outage to On-Line using the on-line averaging method:
- See section 7.5.2
- f) Work hours are calculated as the amount of time an individual performs any duties for the licensee including but not limited to the following:
- All within-shift break times and rest periods during which there is no reasonable opportunity or accommodations appropriate for restorative sleep (e.g., a nap);
 - Shift holdovers to cover for late arrivals of incoming shift members;
 - Early arrivals of individuals for licensee required meetings, training, or pre-shift briefings for special evolutions (these activities are not considered shift turnover activities); and
 - Holdovers for interviews needed for event investigations.
- g) Within-Shift Breaks and Rest Periods
- Time spent at lunch, although non-productive work may not be excluded from the work hour calculations.
 - Break time allowed during the scheduled work day is included in the work hour calculation.

- That portion of a break or rest period during which there is a reasonable opportunity and accommodation for restorative sleep on site (e.g., a nap of at least 30 minutes) may be excluded.
- h) Shift Turnover
- Licensees may exclude Shift Turnover from the calculation of an individual's total work hours.
 - Licensees may exclude one shift turnover, either on-coming or off-going, from the calculation of the minimum work period break.
 - The level of precision in determining the time duration for turnover should be not greater than 15 minutes.
- i) Resets from Deviations must additionally ensure that actions are in place to comply with MDO requirements by the end of the specified period.
- j) Contract Outage Workers
- Licensee employees and contractor/vendor personnel may go from an outage at one site to an outage at another site.
 - When a licensee employee or contractor/vendor performs covered work for a licensee during two or more unit outages or security system outages (or a combination thereof), and the interval(s) between successive outages is less than 9 days, the receiving licensee should make a reasonable judgment as to the individual's fitness for duty relative to fatigue.
 - Licensees are not responsible for tracking individual's hours between outages for different licensees.
 - If the Contractor does not have unescorted access, then the work performed is not covered. (See Example 1)
- k) Operator Relief at Multi-Unit Sites
- An operator who has been working outage work hours and has had 2 days off in the previous 7-day period may provide relief to the operator at the controls or the senior operator in the control room, if an appropriately qualified operator who has been working non-outage work hours is not immediately available to provide relief.
 - If an operator who has been working outage work hours and has had 2 days off in the previous 7-day period is not immediately available, an operator who has been working outage hours may provide:
 - short-term relief (up to 2 hours) for the operator at the controls or the senior operator in the control room without a waiver or,
 - longer term relief (more than 2 hours) under a waiver of the MDO requirement that is applicable to the shift schedule (i.e., 8-, 10-, or 12-hour shifts) for personnel assigned to the operating unit.

7.6.3 Unexpected Outages

- a) Unexpected outages can impact the licensee's ability to demonstrate compliance with the normal operations day off requirements. During an outage, days off are required on a day basis every non-rolling 15-day period for the duration of the outage and not on an average basis as when on-line.
- b) When entering an unexpected outage, the licensee shall be considered to be in compliance with the rule if the schedule for the shift cycle would have provided for the required minimum days off.
 - o See Example 15

8 SPECIAL CIRCUMSTANCES AND INTERPRETATIONS

8.1 IMPACTING CALCULATIONS

- a) Paid Time Not Included in the Work Hour Calculations
 - Only the actual hours worked are included in the work hour calculations. Examples of paid hours not worked follow:
 - Vacation time – this is time away from work and is not included in the work hour calculation.
 - Sick leave – this is time away from work and is not included in the work hour calculation.
 - Personal leave – this is time away from work and is not included in the work hour calculation.
 - Holiday pay – this may be either time away from work or at work. If the time is at work, then only the actual hours worked are included in the work hour calculation.
- b) Declared Plant Emergencies as defined in the licensee’s emergency plan.
 - The hours worked during a declared plant emergency may be excluded from the total number of hours worked. This includes the period of time the plant is in the declared emergency and any recovery time necessary to deactivate the emergency facilities.
 - When the plant exits the emergency classification to a non-emergency state, this exclusion becomes not applicable. This exclusion applies for ceiling limits, break limits, MDOs and on-line averaging limits.
- c) Unannounced emergency preparedness exercises and drills.
 - Licensees may exclude the time an individual works unscheduled work hours for the purpose of participating in the actual conduct of an unannounced emergency preparedness exercise or drill. If an individual is on a day off, it is still considered a day off.
- d) Force-on-force tactical exercises
 - Licensees may exclude shifts worked by security personnel during the actual conduct of force-on-force tactical exercises evaluated by the NRC when calculating the individual’s number of days off.
- e) Common defense and security
 - Licensees need not meet the work hour requirements when informed in writing by the NRC that these requirements, or any subset thereof, are waived for security personnel in order to assure the common defense and security, for the duration of the period defined by the NRC.
- f) Daylight Saving Time

- When working during the change from standard time to daylight savings time, the shift being worked during the time change may be counted as a 7-hour, 9-hour, or 11-hour shift.
 - When working during the change from daylight savings time back to standard time, the shift being worked during the time change may be counted as an 8-hour, 10-hour, or 12-hour shift (i.e., the additional hour does not have to be included in the work hour calculations).
 - In addition to not counting the extra hour, the evaluation period (i.e. 24 hours, 48 hours, 168 hours or 7 calendar days should not be impacted by the decrease or increase in actual time versus apparent time.
- g) Call-in work period
- A call-in is considered an addition to the normal work schedule. The work hours can be accounted for using three different methods depending on timing and circumstances of the call-in work period.
 - The call-in hours can be considered a separate work period. Using this method, only the hours worked for the licensee will be counted. The method requires a 10-hour break before the call in period and after the call-in period.
 - The call-in hours can be considered an extension to the preceding or succeeding work period. Using this method, the intervening hours of the extended work period must be counted.
 - A waiver can be processed for the required 10-hour break between successive work periods. The requirements of Section 9, Waivers, apply to this method.
 - See Examples 8 & 9.
- h) Incidental duties performed off-site
- Licensees may exclude from the calculation of an individual's work hours unscheduled work performed off-site (e.g., technical assistance provided by telephone from an individual's home or an unscheduled teleconference, calls between the licensee and a vendor or between parties on behalf of the licensee) provided the total cumulative duration of the work, which is required by the licensee, does not exceed a nominal 30 minutes during any single break period.
 - For the purposes of compliance with the minimum break requirements and the minimum day off requirements, such duties, (work periods less than 30 minutes), do not constitute work periods or work shifts..
 - Professional time is not discouraged, for example after-hours study time that is not required by the licensee may be excluded from work-hour calculations. As with any academic setting and curriculum, after hours study time varies from individual to individual. Appropriate after hours study time complements the utility provided training to ensure the learning process occurs and optimal information retention is achieved.

- This does not include short duration, infrequent, or irregular telephone calls that do not interrupt a sleep period to verify or discuss plant and equipment status.
 - See Examples 10, 11, 12, and 18
- i) Shift Duration Extensions (holdovers)
- When considering shift extensions for individuals performing covered work, all hours worked by the individual shall be included. For example, if an individual has performed 15 hours of non-covered work, and the individual is needed to perform additional covered work that extends beyond 16 hours in a 24-hour period, then a waiver to exceed the work hour limits shall be approved prior to the individual exceeding the 16-hour limit.
 - On the other hand, if the individual has performed 14 hours of covered work, and is needed to perform additional non-covered work, then the programmatic approvals of this document do not apply. However, the additional work hours are included in consideration of any other limits if the individual subsequently performs covered work.
- j) Official Union Time
- Unpaid Union business is considered personal time and not counted in work hour calculations (including no impact to breaks and ceiling limits).
 - Grievance meetings held pursuant to a contract between the Union and the licensee where personnel are required to be in attendance are considered time that must be considered in work hour calculations.
- k) Travel Time
- Should the worker be required to travel to another work location within the same licensee organization, the licensee has the option to either count the travel time in the work hour calculation or apply the following:
 - If the worker is required to extend his/her shift duration by traveling (either at the end or beginning), then extend the shift hours by the nominal travel time and apply the minimum break and ceiling rules accordingly.
 - If the worker is required to travel on their own time, then increase the minimum break time (either the minimum work period break or minimum 9-Day period break as appropriate) by the nominal travel time to ensure adequate opportunity for a full rest period. There is no impact on the ceiling limits since no additional work hours have been incurred.
 - Nominal travel time is determined using an established web-based mapping application.

See Examples 5 & 6.

8.2 MISCELLANEOUS INTERPRETATIONS

- Scaffolding – erecting scaffolding is not considered a covered activity.
- Crane operations are often covered activities if part of covered work or operations dealing with safe load lifts as defined by NUREG 0612.
- Insulation – removal of insulation is not a covered activity. However, restoration of insulation material that brings a covered SSC back into compliance with its design is covered work.

9 WAIVERS

NOTE: Waivers” are only applicable to covered workers.

9.1 APPLICABILITY

NOTE: The issuance of a Waiver is expected to meet a high threshold and be infrequent. The annual assessment evaluates the use of waivers and requires a determination of adequate staffing if multiple waivers are issued through the year

- a) A waiver is only permitted when necessary to mitigate or prevent a condition adverse to safety, or to maintain site security.
- b) Waivers can be issued for the work hour rules of Break Limits, Ceiling Limits, Minimum Days Off, and the on-line averaging limit as applicable.
- c) Each rule requires a distinct and separate Waiver although they can be processed together on one form at the discretion of the licensee’s program.
- d) To the extent practicable, licensees shall rely upon the granting of waivers only to address circumstances that could not have been reasonably controlled
- e) If the covered work authorized under a waiver is completed prior to the expected time, the specific worker under the waiver should be sent home.

9.2 WAIVER PROCESS

- a) The process for granting waivers includes the following distinct steps:
 1. Identification by the job supervisor that a waiver is needed:
 - Name of the individual for which a waiver is to be requested.
 - Date and time the request is initiated.
 - Limits for which a waiver is required.
 - Date and time waiver would start.
 - Duration of the waiver requested. For example, how many hours beyond 16?
 - Description of the work to be performed. This should be in adequate detail to support the supervisory (operations or security shift manager) fatigue assessment.
 - Circumstances that caused the job extension.
 - Identify that the waiver is required to address conditions that are adverse to security or safety

NOTE: A senior site manager with requisite signature authority may substitute for the shift manager or security shift manager as applicable to the need for a waiver.

2. Review and approval by the operations shift manager or security shift manager.
 - Basis for approval
 - Name, signature, date, and time
3. Supervisory Fatigue Assessment

NOTE: The Fatigue Assessment shall be completed before start of waiver period and no more than 4 hours prior to the beginning of work under a waiver.

- Work history for the past 14 days as reported by the individual for whom the waiver is requested and, if the individual has worked for a licensee who is subject to Subpart I of Part 26 over the past 14 days, as documented by that licensee.
 - A statement of how the following were considered:
 - Potential for acute fatigue—time since last 10 hour break.
 - Potential for cumulative fatigue—review work history above.
 - Circadian factors-time of day and recent work cycle.
 - Observation and statements of the individual.
 - How fatigue could affect the work quality, if at all.
 - Nature of work to be performed.
 - Are controls and conditions on work required? If yes describe.
 - Name, signature, date, and time review completed.
4. Closeout. In many cases waivers are generated as a contingency for a job and not used. The information in this section is to support the periodic reviews that are required.
 - Hours actually worked, beyond limits, under this waiver.
 - Did the individual perform satisfactorily?
 - Name, signature and date of job supervisor or individual for whom waiver was granted.

b) Granting Waivers

- In order to grant a waiver, the licensee shall meet the following requirements:
 - Shift Manager or Security Shift Manager Approval:
 - An operations shift manager determines that the waiver is necessary to mitigate or prevent a condition adverse to safety, or a security shift manager determines that the

waiver is necessary to maintain site security, or a site senior-level manager with requisite signature authority makes either determination.

- Fatigue Assessment for Waivers:
 - A supervisor assesses the individual face to face and determines that there is reasonable assurance that the individual will be able to safely and competently perform his or her duties during the additional work period for which the waiver will be granted.
 - The supervisor performing the assessment shall be trained in accordance with the requirements of §§ 26.29 and 26.203(c) and shall be qualified to direct the work to be performed by the individual.
 - If there is no supervisor on site who is qualified to direct the work, the assessment may be performed by a supervisor who is qualified to provide oversight of the work to be performed by the individual. The supervisor, if knowledgeable of the work activity, can be a second level supervisor or a manager in the chain of command.
 - See FATIGUE ASSESSEMENTS for the process to perform an assessment required for waivers.

10 FATIGUE ASSESSMENTS

10.1 FATIGUE ASSESSMENT ATTRIBUTES

- a) A Fatigue Assessment is an evaluation of an individual by an authorized Fatigue Assessor to make a determination regarding that individual's ability to perform any assigned duties within the scope of the fitness for duty program with respect to fatigue. The evaluation consists of two components:
1. A review of data pertaining to fatigue contributors, and
 2. A face-to-face interview
- Employer policies typically describe the obligation on the part of the employee to be fit for duty. In the same way that drug and alcohol testing protocols provide a mechanism for measuring fitness for duty with respect to substance abuse, the fatigue assessment protocol provides a mechanism for measuring fitness for duty with respect to fatigue.
 - The fatigue assessment may, in some circumstances, provide the basis for subsequent actions or sanctions under the licensee's Fatigue Management or Disciplinary policies.
 - The fatigue assessment may also be a factor in determining whether or not time off for fatigue recovery is paid by the employer.
 - The fatigue assessment is often used to determine whether the individual is capable of safely and competently performing their assigned duties without degraded alertness due to fatigue.
 - There are certain restrictions on who may perform fatigue assessments.
 - The fatigue assessments must be performed by a staff member of the FFD organization or by a supervisor.
 - If the individual being assessed is a contractor/vendor, the Fatigue Assessor may be a supervisor in the affected contractor/vendor organization.
- b) Fatigue Assessors
- The minimum training and examination requirements for a Fatigue Assessor are the same requirements as those described in Section 14 for all individuals who are in the FFD population. Among other FFD program topics this training addresses:
 - Contributors to worker fatigue and decreased alertness in the workplace
 - Symptoms of worker fatigue
 - Indications and risk factors for common sleep disorders
 - Effective use of fatigue countermeasures
 - Licensees and contractor/vendors may require additional optional training for their Fatigue Assessors, such as that available through the National Academy for Nuclear Training electronic learning portal (NANTeL).

- See Post-Event conditions below for further restrictions on Fatigue Assessors.
- c) The licensee may not conclude that fatigue has not or will not degrade the individual's ability to safely and competently perform his or her duties solely on the basis that the individual's work hours have not exceeded any of the work hour limits or that the individual has had the minimum breaks or minimum days off, as applicable.
- d) Following a fatigue assessment, the licensee shall determine and implement the controls and conditions, if any, which are necessary to permit the individual to resume performing duties for the licensee, including the need for a break.

10.2 CIRCUMSTANCES REQUIRING FATIGUE ASSESSMENT

- a) There are four circumstances or conditions under which a Fatigue Assessment is required for all personnel under general requirements of the Fitness for Duty Program:
 - For-cause
 - Self-declaration
 - Post-event
 - Follow-up
- b) There is one condition that only applies only for individuals who are being evaluated to perform covered work under a waiver (See Section 9 Waivers).
 - Waiver of regulatory work hour limits

10.3 CONDITIONS FOR CONDUCTING FATIGUE ASSESSMENTS

- a) For-Cause
 - A For-Cause fatigue assessment is initiated by a supervisor based on direct behavioral observation or based on credible information provided by others.
 - Observation for fatigue should not be applicable during an individual's break period
 - The Fatigue Assessor may not be the individual who observed the condition of impaired alertness.
 - The drug and alcohol testing requirements of the FFD Program may also apply in a For-Cause situation.
 - If the observed condition is impaired alertness with no other behaviors or physical conditions creating a reasonable suspicion of possible substance abuse, then the drug / alcohol testing is not required.

- In this case, a fatigue assessment only may be performed or other fatigue counter measures may be taken. For example, the individual may be provided with a ten-hour break period in lieu of a fatigue assessment.
- If the affected individual is performing covered work and a break period is not provided, then a fatigue assessment is required to evaluate the individual's ability to safely and competently continue with covered work duties.
- If a break period is provided, but is for a duration of less than ten hours, then a Follow-up fatigue assessment is required before the individual can resume covered work duties.

b) Self-Declaration

- Self-Declaration of fatigue is a provision of the Fatigue Management Program which allows individuals to formally notify supervision that they are not or may not be able to safely and competently perform their duties due to fatigue.
- This provision is not unlike similar notifications that an individual may make regarding the need to use medication and the possible resultant impact on fitness for duty.
- Licensee procedures must make a clear distinction between formal declarations of fatigue under the Fatigue Management Program and casual comments such as being up late, being tired, etc.
- A fatigue assessment must be conducted in response to an individual's self-declaration to his or her supervisor that he or she is not fit to safely and competently perform his or her duties for any part of a working tour because of fatigue, except if, following the self-declaration, the licensee permits or requires the individual to take a break of at least 10 hours before the individual returns to duty.

Additional information regarding Self-Declaration is provided in Chapter 11.

c) Post-Event

- A Post-Event fatigue assessment is required in conjunction with drug / alcohol testing which is invoked in response to events or circumstances as described in the licensees Fitness for Duty Program (refer also to 10 CFR 26.31(c)(3)(i) through (iii)).
- The primary purpose of the fatigue assessment is to determine if worker fatigue contributed to the event.
- If the event entails an injury to the affected individual then necessary medical treatment must not be delayed in order to perform the fatigue assessment.

- In cases where the fatigue assessment is delayed by 10 or more hours, a fatigue assessment may not be useful in determining if worker fatigue contributed to the event.
- If medical treatment is not an issue and the affected individual is to remain in a work capacity without a ten-hour break period, then the fatigue assessment is needed to determine if that individual can safely and competently perform the assigned work duties without impairment due to fatigue.
- The Fatigue Assessor for a Post-Event fatigue assessment may not have:
 - (i) Performed or directed (on-site) the work activities during which the event occurred;
 - (ii) Performed, within 24 hours before the event occurred, a fatigue assessment of the individuals who were performing or directing (on-site) the work activities during which the event occurred; and
 - (iii) Evaluated or approved a waiver of the limits for any of the individuals who were performing or directing (on-site) the work activities during which the event occurred, if the event occurred while such individuals were performing work under that waiver.

d) Follow-Up

- The purpose of the Follow-Up Fatigue Assessment is to determine if the individual is capable of safely and competently performing the assigned work duties without impairment due to fatigue.
- A Follow-up fatigue assessment is required in circumstances where a break period of less than ten hours is provided to an individual following a For-Cause or Self-Declaration situation.
- A Follow-up fatigue assessment is also required if a break period of less than ten hours is provided to an individual involved in an event, as described in item c, in which fatigue was confirmed or was reasonably believed to be a contributor.

e) Waiver (of regulatory work hour limits)

- A Waiver fatigue assessment is required to evaluate the capability of an individual to safely and competently perform covered work during any work period or shift when a waiver is being used to allow the work hour limits (10 CFR 26.205) to be exceeded.
- Although a waiver applies to a plant condition (operational or security) and may involve multiple individuals over a duration multiple shifts, the fatigue assessment applies to an individual and is valid for one work period or shift for that individual.
- A separate fatigue assessment must be conducted for each individual working under the waiver.

- The face-to-face portion of the fatigue assessment must be performed within a four-hour window prior to commencing work under the waiver and must support a reasonable conclusion regarding the potential for worker fatigue during the work period or shift covered by the fatigue assessment.
 - At a minimum, the assessment must address the potential for acute and cumulative fatigue considering the individual's work history for at least the past 14 days, the potential for circadian degradations in alertness and performance considering the time of day for which the waiver will be granted, the potential for fatigue-related degradations in alertness and performance to affect risk-significant functions, and whether any controls and conditions must be established under which the individual will be permitted to perform work. This is both a real time assessment and predictive assessment of fatigue.
 - The licensee should consider and establish additional fatigue counter-measures to further mitigate the potential for fatigue during the work period or shift.
 - A new fatigue assessment is required for each subsequent work period or shift that the affected individual performs covered work in excess of the work hour limits as allowed by an approved waiver.
 - The individual's obligation and rights to self-declare fatigue remain in effect while working under a waiver fatigue assessment.
 - The Fatigue Assessor for a waiver fatigue assessment for must be a supervisor who is qualified to direct the work being performed under the waiver.
 - If that supervisor is not on site, the Fatigue Assessor must be a supervisor who is at least qualified to perform oversight of the work being performed.

10.4 REQUIRED INFORMATION

- a) At a minimum, the fatigue assessment must address the following factors:
 - Acute fatigue
 - Cumulative fatigue
 - Circadian variations in alertness and performance
- b) Individuals shall provide complete and accurate information that may be required by the licensee to address the required factors.
- c) Licensees shall limit any inquiries to only the personal information from the subject individual that may be necessary to assess the required factors
- d) Review of individual performance as applicable.

10.5 DOCUMENTATION

- a) Licensees shall document the results of any fatigue assessments conducted, the circumstances that necessitated the fatigue assessment, and any controls and conditions that were implemented.
- b) The licensee shall maintain on-site a summary for each nuclear power plant site of instances of fatigue assessments that were conducted during the previous calendar year for any individual identified in § 26.4(a) through (c). The summary shall include:
 - The fatigue assessment type (i.e., For-cause, Self-declaration, Post-event, Follow-up, or Waiver).
 - A statement of whether or not the individual was working on outage activities at the time of the self-declaration or condition resulting in the fatigue assessment.
 - The category of duties the individual was performing, if the individual was performing the duties described in § 26.4(a)(1) through (a)(5) at the time of the self-declaration or condition resulting in the fatigue assessment.
 - The management actions, if any, resulting from each fatigue assessment.
- c) Fatigue Assessments must be documented and an annual summary of fatigue assessments must be prepared by January 30 for all fatigue assessments performed in the prior calendar year.
- d) The Fatigue Assessment documentation and the Annual Summaries must be retained for a minimum of three years.

10.6 PROCESS FOR CONDUCTING FATIGUE ASSESSMENT

NOTE: See specific requirements in the applicable sections of this guidance to ensure all attributes of the assessment are met for the circumstance.

- a) The process for conducting a fatigue assessment includes the following steps:
 1. Identification of condition requiring a fatigue assessment:
 - Name of the individual.
 - Date and time.
 - Type of fatigue assessment
 - Narrative supporting the type of evaluation:
 - For Cause—description of observed behavior
 - Self-declaration—description of current job duties, time in a duty status, and scheduled end of tour.
 - Post-event—description of the event and the individuals involvement.
 - Follow-up—length of rest period, reason for early return, and expected duties
 - Waiver – description of covered work to be performed by the individual

- Name, date, time, signature of individual completing this section.
2. Assessment
- Work history for past 14 days as reported by the individual.
 - Work history for the past 14 days as documented by the licensee.
 - Statement that the following were considered.
 - Potential for acute fatigue—time since last 10 hour break.
 - Potential for cumulative fatigue—review work history above.
 - Determine if the individual has had the opportunity for two restorative rest periods, 34 hours off in the last 7 days.
 - Circadian factors-time of day and recent work cycle.
 - Observation and statements of the individual.
 - Nature of work to be performed.
 - Results of evaluation
 - Individual is fit for duty—return to full work status.
 - Individual is not fit for duty due to fatigue—provide a 10 hour break.
 - Individual is returned to duties with the following restrictions (Describe the restrictions. Restrictions can include assignment to non-covered work, a nap before continuing covered work, etc.)
 - Name, date, signature of supervisor.

11 SELF-DECLARATIONS

11.1 APPLICABILITY AND GENERAL PROVISIONS

- a) It is the individual's responsibility to make a clear self-declaration of fatigue.
- b) Site procedures should clearly identify how a self-declaration is to be made and leave no room for confusion.
 - A casual statement to a supervisor or fellow employee that an individual is tired is not a self-declaration.
 - The process shall leave no confusion that a declaration was made and when it was made.
 - It should also be clear that an assessment is not needed if the supervisor agrees with the individual and provides a rest break of at least 10 hours.
- c) Any on-site individual covered by the FFD program can self declare whether or not they are performing covered work.
- d) See Section 10.3 (b) for Self-Declaration follow-up requirements.

11.2 SELF-DECLARATIONS DURING EXTENDED WORK HOURS UNDER WAIVER

- a) If an individual is performing, or being assessed for, work under a waiver of the requirements and declares that, due to fatigue, he or she is unable to safely and competently perform his or her duties, the licensee shall immediately stop the individual from performing any covered work.
 - The exception to this is if the individual is required to continue performing those duties under other requirements of the regulations, e.g., meet minimum licensed operator staffing.
 - If the subject individual must continue performing the covered work until relieved, the licensee shall immediately take action to relieve the individual.
- b) Following the self-declaration or relief from performing covered work, as applicable, the licensee:
 - May reassign the individual to duties other than covered work, but only if the results of a fatigue assessment indicate that the individual is fit to safely and competently perform those other duties;
 - Shall permit or require the individual to take a break of at least 10 hours before the individual returns to performing any covered work.

12 TRAINING AND EXAMINATIONS

- a) Licensees shall add the following KAs to the content of the training that is required in § 26.29(a) and the comprehensive examination required in § 26.29(b):
 - Knowledge of the contributors to worker fatigue, circadian variations in alertness and performance, indications and risk factors for common sleep disorders, shift work strategies for obtaining adequate rest, and the effective use of fatigue countermeasures.
 - Ability to identify symptoms of worker fatigue and contributors to decreased alertness in the workplace.
- b) Employees and contractors of the licensee should be aware of the trustworthiness and reliability requirements for unescorted access to the protected area, the importance of being fit for duty, understand the potential consequences of working while fatigued, and work in compliance with the station FFD policy.
- c) Workers should be able to:
 - Demonstrate knowledge of the basic fatigue management requirements for workers.
 - Recognize the personal, public health, and safety hazards associated with fatigue.
 - Discuss the company fatigue management policy.
 - Discuss individual roles and responsibilities under the company fatigue management policy.
 - Demonstrate knowledge of the contributors to worker fatigue, circadian variations in alertness and performance, indications and risk factors for common sleep disorders, shift work strategies for obtaining adequate rest, and the effective use of fatigue countermeasures.
 - Demonstrate understanding of identifying symptoms of worker fatigue and contributors to decreased alertness in the workplace.
 - Demonstrate understanding of fatigue management techniques.
 - Discuss the methods used to implement the company fatigue management policy.
 - Discuss the consequences of not following the company fatigue management policy.
 - Discuss individual and company rights regarding the company fatigue management policy.
- d) Each test is to include at least one question from each KA. The rest of the test should be a random sample of questions from all the remaining KAs.

13 REVIEWS

Licenseses shall evaluate the effectiveness of their control of work hours of individuals who are subject to this section.

13.1 ANNUAL REVIEW

- Licenseses shall conduct the reviews once per calendar year.
- If any plant or security system outages or increased threat conditions occurred since the licensee completed the most recent review, the licensee shall include in the subsequent review an evaluation of the control of work hours during the outages or increased threat conditions.
- Licenseses shall complete the review within 30 days of the end of the review period. The review period should be defined by the licensee.

13.1.1 Content of Annual Review

- a) Review the actual work hours and performance of covered individuals during the entire review period, including any plant or security system outages or increased threat conditions, for consistency with the work hours scheduling requirement objective of preventing impairment from fatigue due to the duration, frequency, and sequencing of hours worked.
 - The review should be based on information in, but not limited to, the corrective action program.
 - At a minimum, this review should address the following:
 - When using the on-line MDO method, individuals whose actual hours worked during the review period exceeded an average of 54 hours per week in any shift cycle
 - When using the on-line averaging method, individuals who actual hours worked exceeded an average of 54 hours per week in any averaging period of up to 6 weeks.
 - Individuals whose actual hours worked during the review period exceeded an average of 54 hours per week in any shift cycle while the individuals' work hours were subject to the non-outage day-off requirements.
 - Individuals who were granted more than one waiver during the review period.
 - Individuals who were assessed for fatigue during the review period.
- b) If work under a waiver occurred, review the individuals' hours worked and the waivers under which work was performed to evaluate staffing adequacy for all jobs subject to the work hour controls.
- c) Review performance of the station in adhering to work schedules for covered work groups: evaluate whether or not the schedule is effectively being implemented.

- Is the schedule being adhered to?
- Are the changes understood and reasonably consistent with a properly managed schedule?
- Does the overtime utilized support efficient utilization of resources?
- Are the available resources properly aligned with the scheduled work load?
- Is unplanned work or outages indicative that other corrective actions are necessary?
- Does the level and pattern of overtime support a determination that staff size is appropriate for the schedule and work

13.2 DOCUMENTATION AND FOLLOW-UP

- a) Document the methods used to conduct these reviews and the results of the reviews.
- b) Record, trend, and correct, under the licensee's corrective action program, any problems identified in maintaining control of work hours consistent with the specific requirements and performance objectives of the rule.

14 RECORDS

- a) Licensees shall retain the following records for at least three years or until the completion of all related legal proceedings, whichever is later:
 - Records of work hours for individuals who are subject to the work hour controls
 - Records of shift schedules and shift cycles of individuals who are subject to the work hour controls
 - The documentation of waivers including the bases for granting the waivers
 - The documentation of work hour reviews
 - The documentation of fatigue assessments

15 REPORTING

15.1 ANNUAL REPORTING REQUIREMENTS

- a) Licensees shall report Fatigue Rule information in a standard format in the annual FFD program performance report required under § 26.717.
 - Reports related to fatigue management can be integrated into the overall FFD report and can be submitted electronically.
- b) A summary for each nuclear power plant site of all instances during the previous calendar year in which the licensee waived the work hour controls for individuals described in section 6, Managing Fatigue- General Population and Section 7, Work Hour Controls.
 - If a waiver(s) was involved, include only those waivers under which work was performed.
 - If it was necessary to waive more than one work hour control during any single extended work period, the summary of instances shall include each of the work hour controls that were waived during the period.
 - For each category of individuals specified in § 26.4(a), the licensee shall report:
 - The number of instances in which each work hour control was waived for individuals not working on outage activities.
 - The number of instances in which each work hour control was waived for individuals working on outage activities.
 - A summary that shows the distribution of waiver use among the individuals within each category (e.g., a table that shows the number of individuals that received only one waiver during the reporting period, the number of individuals that received a total of two waivers during the reporting period, etc.).
- c) A summary of corrective actions, if any, resulting from the analyses of these data, including fatigue assessments.

15.2 INCIDENT REPORTING REQUIREMENTS

- a) Within a 24-hour limit, licensees are required to report significant FFD policy violations or programmatic failures under § 26.719(b).

NOTE: The requirements in § 26.719(b)(1) and (b)(2) originated in the previous FFD rule and refer to drug and alcohol issues.

The requirement at § 26.719(b)(3) addresses any intentional act that casts doubt on the integrity of the FFD program.

- b) Since no reporting requirements were specifically identified for Fatigue Management incidents, an equivalency judgment will need to be made when an incident occurs. A few examples are as follows:
- A conflict of interest when performing a fatigue assessment may reach the threshold of significant.
 - Events or a series of events which, in the judgment of management, indicate a significant systemic failure of the Fatigue Management Program, Procedures, or Policies or failure to meet key objectives related to safety.
 - A significant attempt by a supervisor to subversively violate the Fatigue Management Program

16 AUDITS

Licenses shall audit the management of worker fatigue as required by § 26.41.

16.1 CONDUCT OF AUDITS

- a) Audits shall focus on the effectiveness of the FFD program element, Fatigue Management, and shall be conducted by individuals who are qualified in the subject(s) being audited.
- b) The individuals performing the audit of the program shall be independent from both the subject FFD program's management and from personnel who are directly responsible for implementing the FFD program.

16.2 AUDIT RESULTS

- a) The result of the audits, along with any recommendations, shall be documented and reported to senior corporate and site management.
- b) Each audit report shall identify conditions that are adverse to the proper performance of the FFD program, the cause of the condition(s), and, when appropriate, recommended corrective actions.
- c) The licensee or other entity shall review the audit findings and take corrective actions, including re-auditing of the deficient areas where indicated, to preclude, within reason, repetition of the condition.
- d) The resolution of the audit findings and corrective actions shall be documented.

16.3 TIMING OF AUDITS

- a) Audits shall be conducted each twenty four months in accordance with the license's audit program.

17 PERSONNEL ACTIONS

- a) Individuals that exhibit chronic self-declaration that they are not fit for duty as a result of fatigue should be considered for referral to the employee assistance program.
- b) Individuals that exhibit chronic self-declaration that they are not fit for duty as a result of fatigue, absent a sound medical reason, may be subject to disciplinary action.
 - Personnel are required to be fit for duty and getting sufficient rest is required to ensure a person is not subject to fatigue.
 - Persons who make choices that result in less than the sleep necessary for that person to remain alert and avoid fatigue are not meeting their obligation per this rule.
- c) The refusal on the part of an individual to submit to a fatigue assessment shall subject the individual to disciplinary action and possible removal from unescorted access.
- d) Facts to be considered in assessing disciplinary action shall include the employee's job assignment, past work record, and work schedule.
- e) Personnel subject to the fatigue assessments who refuse to be assessed will be considered fatigued and unable to perform their duties. Time away from work for fatigue management recovery shall be classified as vacation, personal time (if available), or non-paid time.

18 REFERENCES AND RESOURCES

- 10 CFR 26
- Regulatory Guide 5.73
- 73 FR 16966 dated March 31, 2008
- SECY 06-0244
- SECY 09-0183
- SECY 11-0028
- NUREG CR-4248
- NUREG-1912
- ML11189A177
- ML12320A581
- RIS 2102-09
- EGM-09-008

19 EXAMPLES

Example 1: Unescorted Access

If an unbadged contractor is brought on-site to do emergent critical specialty work on a risk-significant component, (such as a contractor who is sealing a risk-significant valve), is that contractor subject to the work hour limitations? Note that the contractor would be escorted.

Answer: Personnel under escort (i.e., unbadged individuals) are not subject to work hour limitations.

Example 2: Removal of Risk-Significant Component from System

A risk significant component is removed from on-site to be refurbished or repaired. Is the work off-site on this component considered covered work?

Answer: No, work on a component that is off-site is not covered work. The work for removal, installation and testing the component is covered work.

Example 3: Risk Significance Status When in Outage

Part 26 states to use 10 CFR 50.65(a)(4) for determining safety significance of systems but many items in a(4) are not safety-significant during outages. For example, auxiliary feedwater is not risk-significant during an outage. Must the work be covered during an outage?

Answer: The auxiliary feed water system is safety significant when the unit is operating. If an individual works on the auxiliary feed water system either during an outage or operations, the individual would be considered to be subject to the work hour controls.

Example 4: Directing

Example 4A:

On Sunday morning at 0400, while running the # 1 Diesel Generator (DG), a problem develops that requires the System Engineer to return to site to provide technical assistance. The maintenance crew performing work on the #1 DG is being supervised by a first line maintenance supervisor. The system engineer provides technical information and makes recommendations to the maintenance supervisor. Is the System Engineer a covered individual?

Answer: The System Engineer is providing information to the supervisor of a maintenance crew. The maintenance supervisor in this case would be responsible for deciding what information is to be acted on and for directing the maintenance

activities associated with the job. The system engineer is not directing and therefore not performing covered work.

Example 4B:

A DG system engineer is supporting a diesel generator system window by providing technical decisions in the field directly to workers who are acting on the input without subsequent review or challenge by the job supervisor. Is the system engineer directing?

Answer: Yes, the system engineer is directing as defined by the rule as the covered workers are taking and acting on the input provided by the engineer without subsequent review, challenge, or decision-making processing by a supervisor.

Example 4C:

The Reactor Engineer is required by station procedures to be present during fuel movement. The Reactor Engineer's function is to observe the fuel movement activity and provide technical recommendations to the fuel handling SRO. Is the Reactor Engineer a covered individual?

Answer: The Reactor Engineer is not directing, they are providing technical information and observing and therefore not conducting covered work. The fuel handling SRO would be directing and is a covered individual.

Example 4D:

The Reactor Engineer is required by station procedures to be present during reactor startup. The Reactor Engineer's function is to provide information to the control room supervisor on the reactivity of the reactor during the approach to criticality. Is the Reactor Engineer a covered individual?

Answer: The Reactor Engineer is not directing, they are providing technical information and therefore not conducting covered work. The control room supervisor would be directing and is a covered individual.

Example 5: 34-Hour Break

Assume that John Doe is a staff engineer in the Operations department who holds an active license. John works a nominal 8-hour day. John's normal work duties are NOT within the scope of the work hours rule. Over the last 6 weeks John has had weekends off except for the 6th week; i.e., during the 6th week (i.e., last week) John worked Monday through Friday, came in on Saturday for 4 hours to catch up on work; and also came in on Sunday for 4 hours. John resumed his normal duties on Monday this week. Today, (Tuesday), John is asked to stand an 8-hour shift schedule SRO watch. Can he stand the watch since Tuesday is the 9th day in a row that John will be working?

Answer: No, John has not had a 34-hour break in the last 216-hour (9-day) period nor has John had a day off in the last 7 days.

Example 6: 34-Hour Break and MDO

Assume that Jane Doe is a staff engineer in the Operations department who holds an active license. Jane works a nominal 8-hour day. Jane's normal work duties are NOT within the scope of the work hours rule. Over the last 6 weeks Jane has had weekends off except that Jane as a normal routine works 4 hours every Saturday morning. Jane resumed her normal duties on Monday this week. Today, (Tuesday), Jane is asked to stand a 12-hour shift schedule SRO watch. Can she stand the watch?

Answer: Yes, Jane has had a 34-hour break in the last 216 hours (9 days). Jane also has worked less than 72 hours in the last 168-hour (7-day) period. Jane works an 8-hour shift and a look back over the last 7 days shows that she does meet the minimum 1 day off requirement to transition to covered work.

Example 7: Average Shift Length MDO Requirement and Other Limits

Assume that John Smith works in the energy delivery part of his company and sometimes is needed to perform covered work in the switchyard of the nuclear plant. He has unescorted access to the plant, but only works here occasionally when needed. The rest of the time, he works out on the distribution system. What are the requirements for John to start performing covered work in the switchyard?

Answer: If John's average shift length in the preceding 7 days is 9 hours or less, he requires 1 day off in the preceding 7 days. If his average shift length is greater than 9 hours, he requires 2 days off in the preceding 7 days. In addition the following maximum work hours and minimum breaks apply prior to performing covered work:

16 work hours in the preceding 24-hour period

26 work hours in the preceding 48-hour period

72 work hours in the preceding 168-hour (7-day) period

A 10-hour break between the previous work period, or an 8-hour break between the previous work period when a break of less than 10 hours was necessary to accommodate a crew's scheduled transition between work schedules or shifts.

A 34-hour break in the preceding 216-hour (9 day) period.

Example 8: Call-In Work Period

An individual's normal schedule is from 0700 to 1530 (8-hour day) and the individual is called back to work at 1900 and he/she works until 2100.

- a) The separate work period method cannot be used as a 10-hour break is not available prior to the call-in period.
- b) The call-in is considered an extension of the previous work period, 0700 to 1530. The hours counted for this work period would be 14. A ten-hour break is required prior to the individual starting an additional work period; therefore, the individual could return at the normal start of their work period at 0700 the next day.
- c) A waiver to the 10-hour break between successive work periods could be performed. The hours counted for the work day would be 10.5. The individual could return at the normal start of their work period at 0700 the next day.

Example 9: Call-In Work Period

An individual's normal schedule is from 0700 to 1530 (8-hour day), and the individual is called back to work from 0200 to 0400 the next day.

- a) The call in period is considered a separate work period. The 2 hours worked for the licensee is counted. The individual had a 10-hour break prior to the start of the work period and must be given a 10-hour break following the end of the work period.
- b) The call-in is considered an extension of the succeeding work period, 0700 to 1530. The hours counted for this work period would be 13.5.
- c) A waiver should not be necessary in this example.

Example 10: Phone Call at Home – Incidental Duties

An individual performs risk-significant work for 10 hours (0700 - 1700) and goes home. At 2200 he/she receives a call from work and talks for 1 hour until 2300 pm. Can he/she return to work at 0700 the next day?

Answer: The individual did not have a 10 hour break prior to receiving the call. The hours from 1700 through 2200 do not count with respect to calculating hours worked. The individual worked a total of 11 hours with the work period ending at 2300. However, the individual cannot return to work at 0700 the next day; he/she would not meet the 10-hour break requirement. The individual could begin work at 0900 the next day.

Example 11: Phone Call at Home – Incidental Duties

If an individual is on a day off and is required to talk with licensee personnel at the plant on 3 occasions, with each call lasting 20 minutes, totaling 1 hour, can that day still be considered a day off since that one hour shall be included in the work hour total.

Answer: The total time spent on the phone shall be counted since it exceeds a nominal 30 minutes during a single break period; therefore, the total time spent on the telephone call must be documented as an hour worked. The day is considered a work day.

Example 12: Day-Off and Work at Home

What "work-related" activities may be done at home on a day off without violating the "day off" intent? For example, may an individual read procedures, catch up on administrative tasks, or study for a license requalification exam for a number of hours and still count that day as a "day off"?

Answer: Activities initiated by the individual (not required by the licensee) may be performed at home on a day off and not be considered "work," e.g., studying, reading work-related material, reading email. These activities would not violate the 30 minute incidental duties requirement and would, therefore, not be counted toward the work hour total.

Example 13: Outage Minimum Day Off Extension

If during the 1st 60 days, a covered worker gets a 7-day block where he works not more than 48 hours, you can extend the 60-day period by 7 days. If the worker gets 2 7-day blocks where he does not work more than 48 hours and the 2 periods do not overlap, can you extend the 60-day period by 14 days?

Answer: Yes, you can extend the 60-day period by 14 days. This extension can be made anytime in the outage period after the less than 48-hour work week. Since this extension is calculated by a week defined as 7 days and if every week of the initial 60 days is used for the extension only 56 days (8 weeks) are available for the extension. The 48-hour allowance can only be banked during the first 60 days of the outage and used no later than day 116 of the outage.

Example 14: Outage Minimum Day Off Extension

An individual has not worked for a licensee on a nuclear unit outage with work hour controls for 14 days. The individual starts work on outage day 15. Can the worker be placed under the outage work hour controls only for a period of 45 days?

Answer: The 60-day period is defined by the start of the outage. The worker can be placed under the outage work hour controls only for a period of 45 days. The worker may also be available for a 14-day extension if the worker did not work more than 48 hours during each of the prior weeks. A worker that was on vacation during the 14-day period would be eligible for a 14-day extension. This extension

Example 15: Forced Outage Truncating On-Line Shift Cycle

What does it look like to be in compliance if the schedule would have been in compliance should the forced outage not have occurred?

Conditions: Plant Online Week 1 (Days 1-7), Forced Outage Weeks 2-5 (Days 8-35).

After Week 1, Crews adopt outage schedule, adhering to outage work hour restrictions.

Work schedule		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35		
Crew/Day		M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S		
A		N							N	N	N						D	D	D	D				T	T	T	T		D	D	D				N	N	N	
B		D					N	N	N	N							N	N	N						D	D	D	D			T	T	T	T			D	D
C		T	T	T	T		D	D	D				N	N	N	N									N	N	N				D	D	D	D				
D			D	D	D	D			T	T	T	T			D	D	D				N	N	N	N							D	D	D	D				
E		N	N	N					D	D	D	D				T	T	T	T				D	D	D				N	N	N	N						

Legend
Day Shift ■ Night Shift ■ Training ■

Days Off Per Week, Averaged Over Shift Cycle during Periods of Normal Operations (i.e., during Week 1)

- Crew A: 6
- Crew B: 3
- Crew C: 1
- Crew D: 3
- Crew E: 4

Answer: The above schedule show that the licensee was currently in compliance and would have been in compliance with the minimum days off over the remainder of the shift cycle and thus is considered in compliance with the rule when transitioning to the unplanned outage work hours. Each crew has an average of 3.4 days off per week over the 5 weeks (17 days off/5 weeks). The licensee then must meet the outage work hour requirements during the outage.

Example 16: Directing

Give clarification of what activities the supervisor is a covered employee due to directing.

Answer:

The following tasks are examples generally considered NOT directing:

- Engineering tasks
- Supervision in the plant of the maintenance on a non-covered SSC
- Supervision at the second level supervision
- NOTE: Position alone should not be the deciding factor. For example a Shift Manager is a second level supervisor but, in practice and as defined in 10CFR, has the authority to direct covered activities. Careful analysis, evaluating all the criteria, should occur prior to determining applicability or exclusion.
- Conducting Work Control Center documentation activities
- Writing a work procedure
- Preparing a work or modification package
- Review by senior management of work plans
- Training of personnel during which time the trainee is not operating or performing maintenance activities
- Providing recommendations from vendors and engineers on test performance, component and system operation, or other similar technical inputs
- Review and approval of documents
- Any work that is not operations or maintenance on risk significant SSCs
- Technical Staff providing only recommendation to control room staff

Example 17: Outage Activities

Provide some actual activities that are considered outage activities.

Answer:

Outage activities are activities associated with the outage unit and common systems including covered and non-covered tasks performed while the unit is disconnected from the electrical grid.

Examples of unit outage activities include but are not limited to the following;

- activities included in the outage schedule
- planning and scheduling activities
- emergent work that impacts the outage unit
- review and impact of activities included in the outage schedule
- switchyard activities,
- corrective maintenance,
- elective maintenance
- preventive maintenance

- calibrations,
- safety tagging,
- staging of equipment and tools,
- valve lineups and verifications,
- system readiness inspections,
- post maintenance testing,
- surveillance testing,
- system walk downs,
- containment mobilization and demobilization
- refueling
- fuel movement in the spent fuel pool
- Housekeeping walk downs and inspections
- FME activities
- Management observations
- Operation, monitoring and alarm response of outage systems and common systems
- Operation, monitoring and alarm response of stand alone systems required to support the outage unit such as auxiliary boiler
- Construction activities
- Scaffold installation and removal
- Temporary power installation and removal
- Decontamination activities
- Radiation protection activities
- Processing of waste water
- Outage work control and communication
- Participation in pre and post job briefs for outage tasks and common systems
- Outage unit project coordination
- Testing of component on the outage unit or common systems
- Pre and post shift turnover briefing of outage unit and common systems
- Sampling of outage unit and common systems
- Chemical addition to outage unit and common systems
- Post event investigation for outage unit and common systems

- Receipt of materials in support of the outage
- Just in time training of outage activities

Example 18: Infrequent Status Checks

After leaving site, a reactor operator who was relieved “at the controls” receives a telephone call about a component switch on the control board with a red tag that became unattached. The telephone call lasts less than 10 minutes and was before the relieved operator entered his traditional sleep period. Does this count as incidental time?

Answer: No, if the call was a one time only of short duration and did not interrupt his sleep, then there is no impact to fatigue and can be excluded from consideration of incidental time. If the telephone call interrupted the operator’s sleep period, then the supervisor authorisizing the call should consider the impact of fatigue if the operator is required to be at work the next work shift.

20 CONSIDERATIONS FOR FATIGUE MANAGEMENT

This section covers the normal long range schedule used for covered individuals. Licensees shall schedule the work hours of covered individuals consistent with the objective of preventing impairment from fatigue due to the duration, frequency, or sequencing of successive shifts. Licensees should have a procedure on establishing schedules.

The licensee may elect to use a rolling or fixed (maximum) 6-week period for the purposes of determining the minimum days off. The actual repeatability of the rotation may exceed 6 weeks; however, the shift cycle used for calculating the minimum days off cannot exceed 6 weeks.

Generally a rolling evaluation period for MDO evaluations takes into account the current day and looks back at the previous days in the evaluation period for compliance. For example, an individual on a 42-day (6 week) rolling evaluation period – for the purpose of compliance with the MDO requirement – the current day and the last 41 days of actual time are used to determine if the individual has had the required days off. When tomorrow is reached, it is that day and the previous 41 days, etc. For the purposes of predicting compliance, the current day and the next 41 days of scheduled time are used.

For a 42-day (6 weeks) fixed evaluation period, an individual must meet the MDO requirement for their job function and average shift length for days 1 to 42. The day following day 42 is a new day 1 and a new 42 day evaluation period begins. These evaluation periods go in blocks from 1-42 and then start over. Once the schedule goes beyond day 42, the evaluation period looks ahead another 42 days and does not look back like the rolling evaluation method does.

When establishing schedules the following should be applied consistent with the performance objective of preventing impairment from fatigue due to the duration, frequency, or sequencing of successive shifts:

- Duration of scheduled work period (not to exceed 12 hours)
- Duration of break period
- Consistent start times for work periods (e.g. 6 or 7 a.m.)
- Considerations of start times consistent with circadian factors.
- Consistent stop times for work periods
- Consistent rotation (e.g., if working a 5-week shift rotation, the scheduled work days and days off are repeated every five weeks)
- Stable 24-hour shift rotation (e.g., 3 X 8's, 2 X 12's, 2 X 10's with four hours un-staffed)
- The impact of backward shift rotation (rotation of the start of the shift from days to night to swings).

- Rotating schedules provide suitable transition between shifts (days/nights, days/swings/nights), 8-hour shift rotations rotate forward or provide more than 24 hours between work periods to adjust circadian rhythm; 12-hour shift rotations provide 34 hours off during day/night transitions.
- Long range predictability is a key aspect of fatigue mitigation.
- Circadian factors - fixed vs. rotating shifts
- Training requirements
- Vacation scheduling
- Consideration of the impact of unscheduled overtime

Staffing levels should be sufficient so that schedules for the covered individuals can be maintained based on vacation and training demand without relying on waivers. It is expected and allowed that normal variation in vacation and training demands may occasionally require additional work hours to be used. Management is responsible for understanding the total vacation, training, and workload demands, and for maintaining sufficient staff to do the work.