was a reformulation of the existing circadian component of a previously developed model of performance (McCauley et al., 2013) in the form of a limit-cycle oscillator during wakefulness and a damped oscillator during sleep (tending to zero during extended sleep), which captures the dependence on time awake of the expression of circadian rhythmicity in performance. **Discussion:** Through simulations we found that the temporal dynamics of jet lag may depend not only on the number of time zones crossed, but also on the path taken from one location to another, and on the timing of sleep during and after long-distance travel.

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Associations between Shiftwork Organization and Sleep Disturbance in the Oil Industry

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Introduction: Rotating shiftwork is common in high hazard industries, despite documented associations with sleep disturbance and impairment. In the oil industry, work intensification and increasing overtime have been broadly documented over the last few decades, where rotating and extended shift schedules are used to staff safety-sensitive positions. Since the trend towards extended (12-hour) shifts and increasing overtime, research on the impacts of these work schedules on sleep and health has been limited for this work force. Further, the prevalence of certain morbidities that are uniquely associated with shiftwork is not well characterized. **Methods:** We examined sleep duration and quality among rotating shiftworkers in the oil industry, and explored associations between work organization and sleep disturbance (and associated health outcomes). We administered a survey on work schedules, sleep, and health outcomes to volunteers recruited from West and Gulf Coast oil sector members of the United Steelworkers union. **Results:** Our findings reveal a high prevalence of sleep deficit and disorders; these were associated with health outcomes found to be common in shiftworkers. Early rise and start times were associated with shorter sleep duration and poorer sleep quality. Sleep durations were shortest for 12-hour shiftworkers, and averaged <5 hours following shift rotation. **Discussion:** After three 8-hour shift schedules were eliminated, the swing shift--previously shown to provide recovery--was lost. Our data suggests that the 12-hour shift may further limit recovery by reducing available hours for sleep, and also limiting time for exercise and leisure activity (which were positively correlated with improved sleep). Later start times could be a tool to improve worker sleep quality and quantity, and help improve chronotype desychrony on days off and during shift transitions. Shiftwork intolerance and difficulty with shift transitions have been shown to increase with age, making these interventions crucial for this aging workforce.

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Regulatory Position on Managing Worker Fatigue - Intersection between Science, Benchmarking and Public Consultation

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Introduction: The Canadian Nuclear Safety Commission (CNSC) published a regulatory document (REGDOC) entitled REGDOC-2.2.4, Fitness for Duty: Managing Worker Fatigue (2017). The REGDOC includes a comprehensive suite of requirements and guidance for managing worker fatigue. These measures are intended to reduce high levels of fatigue and fatigue-related errors. The presentation will explain how CNSC staff addressed comments received during public consultation while maintaining a basis that is defensible based on science and benchmarking. **Methods:** Two phases of public consultation on REGDOC-2.2.4 resulted in numerous comments about operational needs and administrative burden. Each comment was considered and dispositioned in view of both research about the effects of fatigue on human performance and benchmarking with requirements of other domestic and international regulatory bodies. In addition, requests for changes to limits on hours of work were evaluated using the bio-mathematical fatigue model, FAID. **Results:** Several changes were made to REGDOC-2.2.4 during the consultation process. For example, instead of applying prescriptive hours of work limits to all workers, the modified REGDOC includes two populations. Performance-based requirements apply to all, and prescriptive limits apply to those in safety-sensitive positions. In addition, the disposition of consultation comments increased the focus on the highest risk aspects of shiftwork - extended shifts and night work. **Discussion:** REGDOC-2.2.4 establishes a modern regulatory framework for managing worker fatigue. It provides a risk-informed basis for assessing fatigue management and for enforcing compliance. CNSC staff continue to monitor fatigue science and regulatory practices domestically and internationally. New information will be considered for incorporation into subsequent versions.

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Keynotes

When Can You Start Trusting an Awakening Brain?

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The awakening period is often characterized by grogginess and impaired performance. These effects, referred to as *sleep inertia*, have been reported to last everything from a few minutes up up to several hours. It is at present a poor understanding of how fast one can expect an awakening person to make swift and accurate decisions. The presentation will focus of how fast the brain wakes up, and factors affecting the awakening process. The audience can expet a review of the literature, and to see data from a series of recent experimental and field studies that have determined how different cognitive functions return to normal in abrubtly awakened individauls. The results are important since on-call duty is common in the modern society, and staff is often expected to make safety critical decisions immediately upon awakening.

Health and Safety Risks Related to Specific Characteristics of Shift Work Scheduling

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It is well documented that shift work particularly when including night shifts is associated with shorter and disturbed sleep, increased fatigue, poorer work performance, and higher work-life interference. Furthermore, many studies suggest that shift workers have increased risk of cardiovascular disease, breast and prostate cancer, diabetes, and gastrointestinal disorders, although the causal relationship between night work and adverse health outcomes remains to be established. Night work can be organised in many ways e.g. as part of a rotating or permanent schedule, few or many consecutive night shifts (speed of rotation) and short or long time between shifts. The choices have consequences