

Proposed Work-Rest Outage Provisions



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48-Hr Break Requirement

Outages

- Option A
 - ▶ Requirement for 48-hour break in any 14 days not apply during first 14 days of outage
- Option B
 - ▶ Requirement for 48-hour break in any 14 days not apply during first 28 days of outage
 - ▶ Individuals are required to have a 48-hour break in any 28 day period

Routine 12-hour schedules

Recommendations

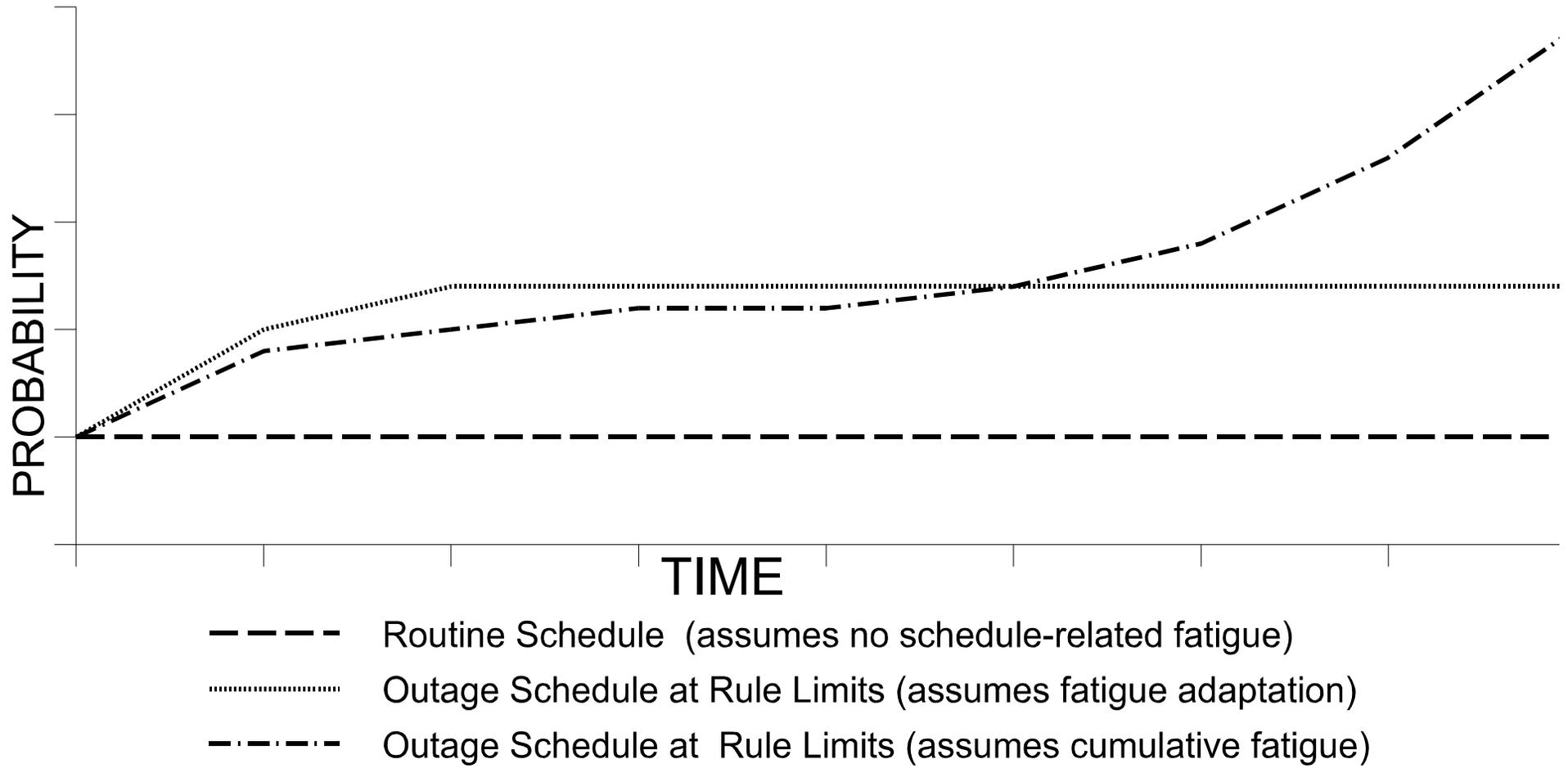
- NUREG/CR-4248, Recommendations for NRC Policy on Shift Scheduling and Overtime in Nuclear Power Plants
 - ▶ Schedule should contain a maximum of 4 consecutive 12-hour work days
 - ▶ The basic schedule should be “2-on, 2-off,” “3-on, 3-off,” “4-on, 4-off,” or a combination of these
- EPRI NP-6748, Control Room Operator Alertness and Performance in Nuclear Power Plants
 - ▶ Schedule no more than 3 - 4 consecutive days of 12-hour shifts
 - ▶ Have a break of at least 48 hours between any two blocks of shifts
 - ▶ Have at least one long break (3 or 4 days) every few weeks

Outage Work Scheduling

- Proposed Outage Provisions of draft Rule
 - ▶ Allow up to 6 consecutive days of 12-hour shifts
 - ▶ Require only one 24-hour break in 7-days and one 48-hour break in 14-days
 - ▶ Requirement for 48-hour break does not apply in first part of the outage
- The proposed work-rest provisions are less restrictive than routine 12-hr scheduling recommendations and consequently their application should be for limited durations

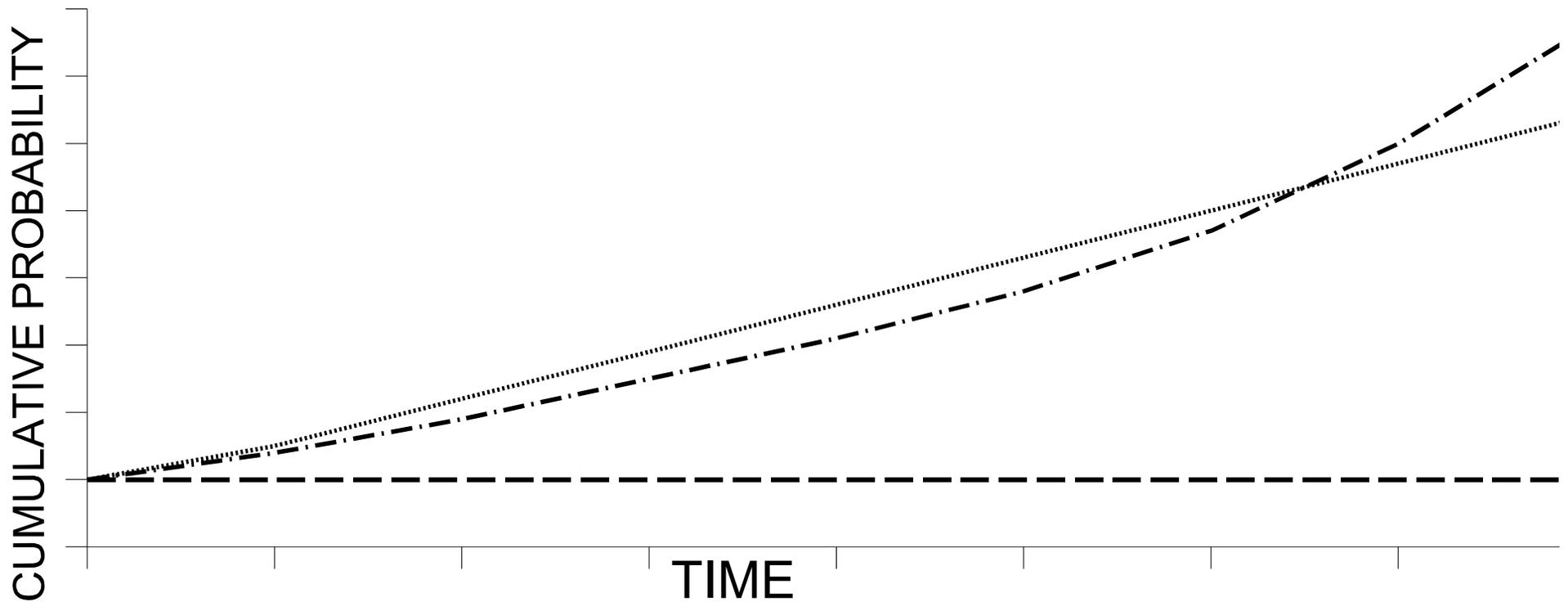
Probability of Fatigue-Related Errors

Theoretical Assumptions



Cumulative Probability of Fatigue-Related Errors

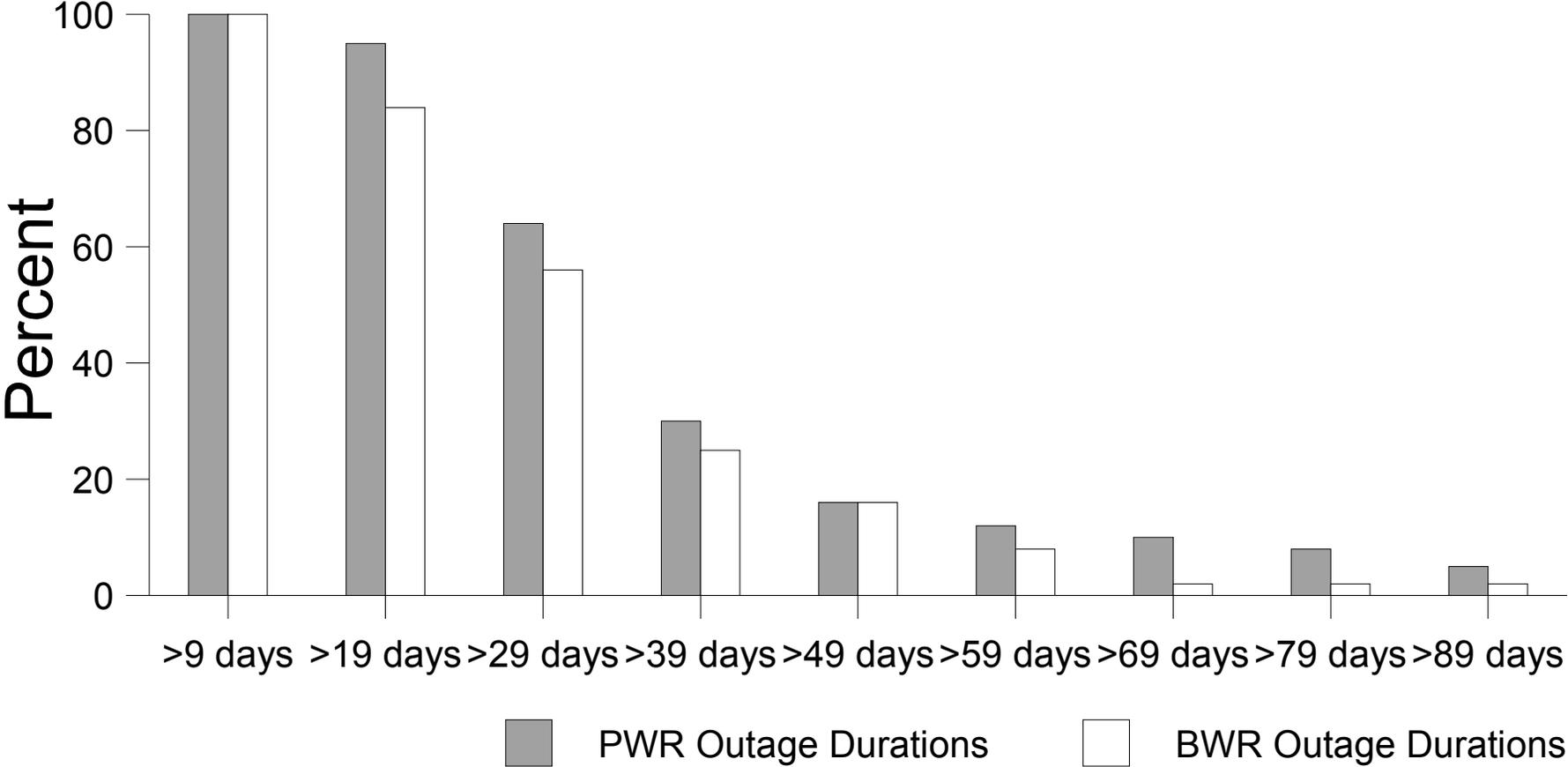
Theoretical Assumptions



- Routine Schedule (assumes no schedule-related fatigue)
- Outage Schedule (assumes fatigue adaptation)
- .-.- Outage Schedule at Rule Limits (assumes cumulative fatigue)

Distribution of Outage Durations

2000-2002



By the End of Outage Week 8

Working at the Proposed Outage Limits

- Workers will have
 - ▶ worked 17 of their normal 28 recovery days (Approximate 60% reduction)
 - ▶ worked an average of 67.5 hours per week (Approximate 60% increase)
 - ▶ accumulated 200+ hours (5 weeks) of overtime

Cost-Benefit Implications

- As the number of outage weeks that are excluded from group averaging increases:
 - ▶ Costs of complying with the group average provision decrease
 - ▶ Cumulative probability of fatigue-related errors increases

Conclusion

- Increasing limit from 8 weeks would minimally decrease costs with increasing potential for substantial worker fatigue
- Decreasing limit to less than 8 weeks would rapidly increase costs
- Staff believes an 8-week limit establishes an appropriate balance between risks and costs