



RIC 2010

Trends in Shutdown Events

Back to Fundamentals

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History

- Industry recognized need to address shutdown issues in early 1990's based on several plant events
- Events disrupted outages and undermined regulatory and public confidence
- Industry pursued formal initiative through NUMARC to commit industry to improved assessment and management of outage activities



Overview

- Industry Initiative adopted November 1991:

ASSESS CURRENT PRACTICES, USING NUMARC 91-06, "GUIDELINES FOR INDUSTRY ACTIONS TO ASSESS SHUTDOWN MANAGEMENT," TO PLAN AND CONDUCT OUTAGES.

IMPROVEMENTS ADOPTED AS A RESULT OF THE ASSESSMENT WILL BE IMPLEMENTED FOR OUTAGES STARTED AFTER DECEMBER 31, 1992.



Maintenance Rule Revision

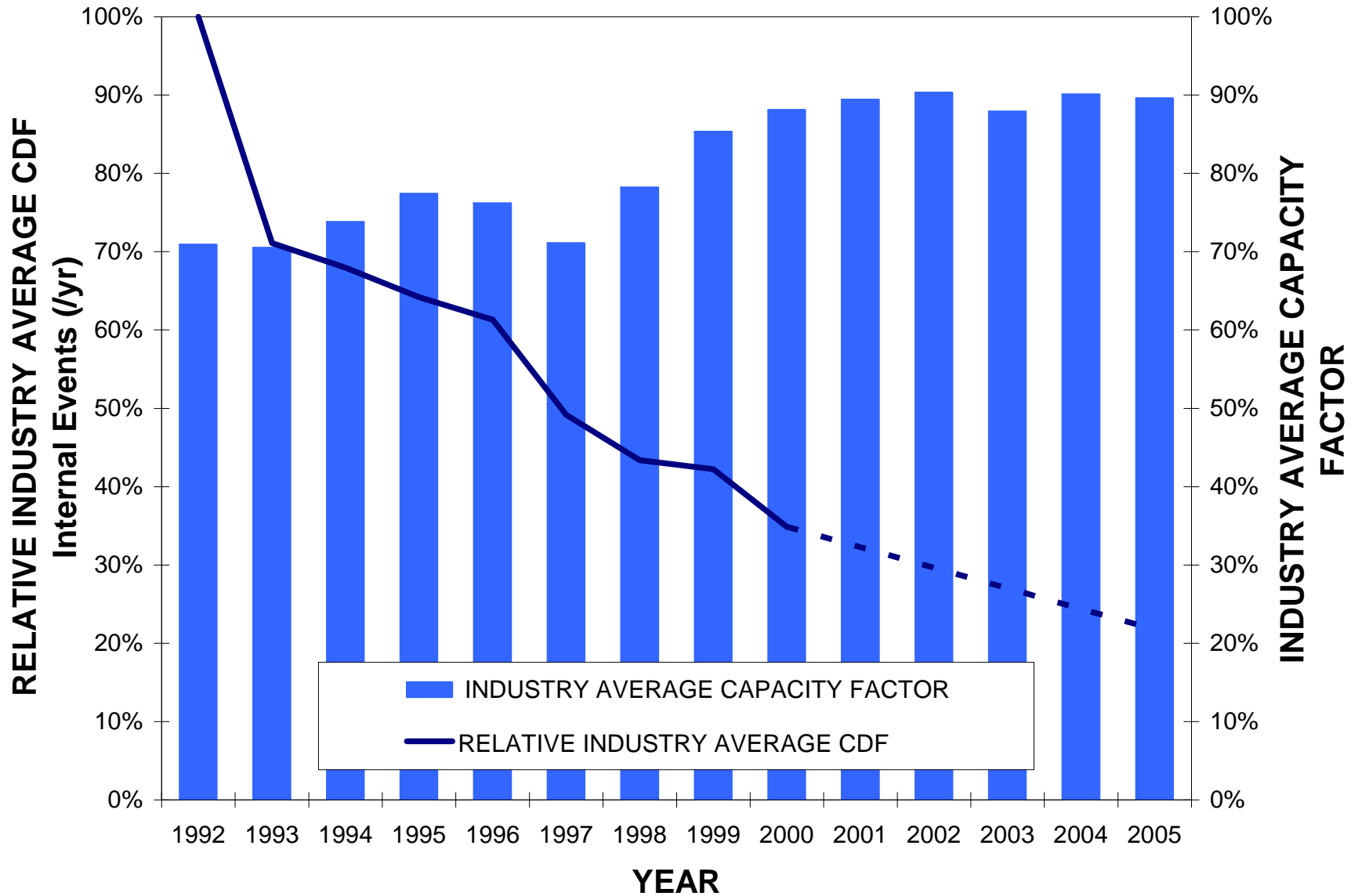
- In 1999, NRC revised 10 CFR 50.65 (a)(4) to provide requirement for assessment and management of risk due to maintenance activities
- Scope of § 50.65 was also expanded to explicitly include shutdown
- NRC had previously considered separate rulemaking on shutdown



Maintenance Rule Revision

- (a)(4) revision codified regulatory basis for online and shutdown maintenance activities
- This facilitated the transition of maintenance activities from shutdown to online, and resulted in
 - Increased capacity factors
 - Improved overall safety

CDF versus Capacity Factor





NUMARC 91-06

- Main portion of shutdown guidance was captured in NUMARC 93-01 and endorsed by NRC Regulatory Guide 1.182 when 10 CFR 50.65(a)(4) was promulgated in 1999
- This provides regulatory basis for inspection and enforcement
- INPO also has key role in reviewing outage management practices



NUMARC 91-06

Guidelines for Industry Actions to Assess Shutdown Management

- This guidance provides considerations for maintaining defense in depth for outage key safety functions
- Guidance has been in use for 18 years, and has been effective in maintaining outage safety
- Challenges:
 - Maintaining proper use of guidance in light of continuing focus on managing outage activities efficiently
 - Ensuring knowledge turnover as new personnel are transitioned into outage management



NUMARC 91-06 Philosophy

1. The outage schedule should establish the systems, structures and components that will provide backup for **KEY SAFETY FUNCTIONS** that is commensurate with plant conditions.
2. Outage planning should optimize safety system **AVAILABILITY**. Systems should be returned to service as soon as practicable following completion of scheduled work.
3. The **FUNCTIONALITY** of systems and components should be assured by post maintenance testing, monitoring of key parameters with the system in service, or through verification of system alignment and administrative control by operations personnel.



NUMARC 91-06 Philosophy

4. Systems, structures and components identified to provide DEFENSE IN DEPTH during periods of the outage should be controlled such that they remain AVAILABLE during these periods.
5. Procedures should be developed that are designed to mitigate the loss of KEY SAFETY FUNCTIONS
6. Guidance also addresses contingency planning and higher risk evolutions (e.g. PWR reduced inventory)



Key Safety Functions

- Decay heat removal capability
- Inventory control
- Power availability
- Reactivity control
- Containment – primary/secondary



Effectiveness

- Industry does not believe additional or enhanced regulatory guidance is necessary
- Effectiveness of shutdown risk management can be maintained through proper focus on existing guidance, combined with NRC inspection and enforcement under § 50.65(a)(4)



Quantitative Methods

- LPSD PRA standard is under development
- Not well suited to outage management application
- Defense in depth methods provide more pragmatic and effective approach
- Risk insights have been effectively incorporated



Conclusion

- Industry guidance has stood test of time and provided effective control
- Like any process, a continuous effort is needed to maintain proper focus in light of turnover, etc
- We have recognized the perceived trend in shutdown events, and have communicated the need for continued focus