

FINAL SUPPORTING STATEMENT
FOR
HYDROGEN CONTROL REQUIREMENTS

10 CFR 50.44

DESCRIPTION OF THE INFORMATION COLLECTION

10 CFR 50.44, "Combustible Gas Control for Nuclear Power Reactors," contains requirements for controlling combustible gases that may be generated by accidents inside the containments of nuclear power reactors. Separate sections of the regulation cover (1) 10 CFR 50.44(b), currently-licensed reactors; (2) 10 CFR 50.44(c), future water-cooled reactor applicants and licensees (of reactor types similar to currently-licensed reactors); and (3) 10 CFR 50.44(d), future non-water-cooled reactor applicants and licensees and certain future water-cooled reactor applicants and licensees not covered by (2). As used in the regulation, "future" means after October 16, 2003.

There was a major revision of the regulation, effective October 16, 2003. The revision eliminated or modified many requirements and put into place the three sections described above. The revision consolidated combustible gas control regulations for future reactor applicants and licensees. The revised rule eliminated the requirements for hydrogen recombiners and hydrogen purge systems, and relaxed the requirements for hydrogen and oxygen monitoring equipment to make them commensurate with their risk significance. This action stemmed from the NRC's ongoing effort to risk-inform its regulations, and was intended to reduce the regulatory burden on present and future reactor licensees.

The old rule had several information collection requirements which had previously been completed for all currently-licensed reactors. The revised rule was particularly written so that no new requirements, including new information collection requirements, would be imposed on currently-licensed reactors. The revised regulations contain the following information collection requirements:

10 CFR 50.44(b)(1), (2), (3), and (4) contain requirements for a mixed atmosphere, combustible gas control, equipment survivability, and monitoring of hydrogen and oxygen concentrations during an accident, for currently-licensed reactors. Further, 10 CFR 50.44(b)(5) requires each current holder of an operating license for a boiling water reactor (BWR) with a Mark III-type of containment or for a pressurized water reactor (PWR) with an ice condenser-type of containment to perform certain detailed analyses regarding hydrogen control, structural capability, and equipment survivability. However, as noted above, all of the requirements have already been met for currently-licensed reactors.

10 CFR 50.44(c) requires future water-cooled reactor applicants and licensees to:

(1) *Mixed Atmosphere*: Have a mixed atmosphere during accidents;

(2) *Combustible Gas Control*: Either have an inerted atmosphere or limit hydrogen concentrations in containment during and following an accident that releases an equivalent amount of hydrogen as would be generated from a 100 percent fuel clad-coolant reaction, uniformly distributed, to less than 10 percent (by volume) and maintain containment structural integrity and appropriate accident mitigating features.

(3) *Equipment Survivability*: Containments that do not rely upon an inerted atmosphere to control combustible gases must be able to establish and maintain safe shutdown and containment structural integrity with systems and components capable of performing their functions during and after exposure to the environmental conditions created by the burning of hydrogen. Environmental conditions caused by local detonations of hydrogen must also be included, unless such detonations can be shown unlikely to occur. The amount of hydrogen to be considered must be equivalent to that generated from a fuel clad-coolant reaction involving 100 percent of the fuel cladding surrounding the active fuel region.

(4) *Monitoring*: Equipment must be provided for monitoring oxygen in containments that use an inerted atmosphere for combustible gas control, and for monitoring hydrogen in all containments. Equipment for monitoring oxygen and hydrogen must be functional, reliable, and capable of continuously measuring the concentration of the monitored gas in the containment atmosphere following a significant beyond-design-basis accident for combustible gas control and accident management, including emergency planning.

(5) *Structural Analysis*: An applicant must perform an analysis that demonstrates containment structural integrity. This demonstration must use an analytical technique that is accepted by the NRC and include sufficient supporting justification to show that the technique describes the containment response to the structural loads involved. The analysis must address an accident that releases hydrogen generated from 100 percent fuel clad-coolant reaction accompanied by hydrogen burning. Systems necessary to ensure containment integrity must also be demonstrated to perform their function under these conditions.

10 CFR 50.44(d) requires future non-water-cooled reactor applicants and licensees and certain future water-cooled reactor applicants and licensees to provide:

(1) Information addressing whether accidents involving combustible gases are technically relevant for their design; and,

(2) If accidents involving combustible gases are found to be technically relevant, information (including a design-specific probabilistic risk assessment) demonstrating that the safety impacts of combustible gases during design-basis and significant beyond-design-basis accidents have been addressed to ensure adequate protection of public health and safety and common defense and security.

A. JUSTIFICATION

1. Need for and Practical Utility of the Collection of Information

The accident at Three Mile Island, Unit 2 (TMI-2), resulted in a severely damaged reactor core, a concomitant release of radioactive material to the primary coolant system, and a fuel cladding-water reaction which resulted in the generation of a large amount of hydrogen. The NRC has taken numerous actions to correct the design and operational limitations revealed by the accident. Included in these actions are rulemakings intended to improve the hydrogen control capability of light-water nuclear power reactors and to provide specific design and other

requirements to mitigate the consequences of accidents resulting in a degraded reactor core.

Specific hydrogen control analysis requirements for BWRs with Mark III containment and PWRs with ice condenser containment have been completed. Ice condenser and Mark III plants were required to submit analyses to justify the hydrogen control systems selected and to provide assurance that containment structural integrity will be maintained and important safety systems will continue to function following a hydrogen burn. The information was submitted by licensees and reviewed and approved by the NRC. This effort is complete for currently- licensed reactors.

10 CFR 50.44 was revised 2003 in the Combustible Gas Control in Containment final rule. As a result, future reactor license applicants have a reduced burden associated with this analysis. The revised rule no longer defines a design-basis loss-of-coolant accident (LOCA) hydrogen release and eliminates requirements for hydrogen control systems to mitigate such a release. The revised rule reduced the regulatory burden by eliminating the requirements for hydrogen recombiners and hydrogen purge systems and relaxing the requirements for oxygen monitoring equipment to make them commensurate with their safety significance. Thus, the revised rule decreased the burden on new applicants to complete the hydrogen control analysis.

2. Agency Use of Information

The information contained in the analyses is necessary to permit the NRC staff to evaluate whether the requirements are met for hydrogen control and safety equipment functioning during a hydrogen burn. Without this information, the NRC staff cannot evaluate the design of the hydrogen control systems selected, or determine whether or not needed safety equipment could indeed function during a hydrogen burn.

3. Reduction of Burden Through Information Technology

There are no legal obstacles to reducing the burden associated with this information collection. The NRC encourages respondents to use information technology when it would be beneficial to them. NRC issued a regulation on October 10, 2003 (68 FR 58791), consistent with the Government Paperwork Elimination Act, which allows its licensees, vendors, applicants, and members of the public the option to make submissions electronically via CD-ROM, e-mail, special Web-based interface, or other means. It is estimated that approximately 95% of the potential responses are filed electronically.

4. Effort to Identify Duplication and Use Similar Information

No sources of similar information are available. There is no duplication of requirements. NRC has in place an ongoing program to examine all information collections with the goal of eliminating all duplication and/or unnecessary information collections.

5. Effort to Reduce Small Business Burden

The requirements do not affect small businesses.

6. Consequences to Federal Program or Policy Activities if the Collection is Not Conducted or is Conducted Less Frequently

This effort is complete for currently-licensed reactors.

The revised requirement for future reactor licenses is at the minimum frequency that will ensure the health and safety of the public.

7. Circumstances which Justify Variation from OMB Guidelines

This information collection does not vary from OMB guidelines.

8. Consultations Outside the NRC

Opportunity for public comment on the information collection requirements for this clearance package was published in the Federal Register on May 14, 2013 (78 FR 28244). No comments were received.

9. Payment or Gift to Respondents

Not applicable.

10. Confidentiality of Information

Confidential and proprietary information is protected in accordance with NRC regulations 10 CFR 9.17(a) and 10 CFR 2.390(b). However, no information normally considered confidential or proprietary is requested.

11. Justification for Sensitive Questions

No sensitive information was requested for currently licensed reactors and no sensitive information will be requested under 10 CFR 50.44 for future license applicants.

12. Estimated Industry Burden and Burden Hour Cost

This effort is complete for currently-licensed reactors.

For new reactor facilities, the NRC reviews applications submitted by prospective licensees, and (when appropriate) issues standard design certifications, early site permits, limited work authorizations, construction permits, operating licenses, and combined licenses. The burden on new applicants to complete the hydrogen control analysis is 203 hours per request. It is estimated that the agency will receive 10 new reactor facility applications during this clearance period.

This results in a reporting burden for new applicants of 2030 hours, or annualized over the three years, 677 hours (10 apps./3 yrs. X 203 hrs.) at a cost of \$185,498

annually (677 hrs. x \$274).

The recordkeeping burden for existing plants is estimated to be one hour or less per year per plant or (104 + 3.33 apps) = 107 hours annually at a cost of \$29,318.

Burden totals

Reporting burden = 677 hours

Recordkeeping burden = 107 hours

Total Annual Burden = 784 hours annually

Total Cost = \$214,816 (784 hours x \$274/hr)

Responses = 3.33 responses annually (10 applications / 3 years)

13. Estimate of Other Additional Costs

The NRC has determined that the quantity of records to be maintained is roughly proportional to the recordkeeping burden and, therefore, can be used to calculate approximate records storage costs. Based on the number of pages maintained for a typical clearance, the records storage cost has been determined to be equal to 0.0004 times the recordkeeping burden cost. Because the recordkeeping burden is estimated to be 107 hours, the storage cost for this clearance is \$12 (107 hours x 0.0004 x \$274/hour).

14. Estimated Annualized Cost to the Federal Government

60 hours of NRC staff review time is estimated for each of the 10 new reactor facility applications during this period. The total of 600 hours at \$274 per hour equals \$164,400.

This cost is fully recovered through fee assessments to NRC licensees pursuant to 10 CFR 170 and/or 10 CFR 171.

15. Reasons for Changes in Burden or Cost

There has been an increase in burden from 240 hours to 784 hours, an increase of 544 hours. The estimated burden per responses has remained the same, however, the number of expected application submittals during this clearance period as indicated by industry has increased from 3 in the previous cycle to 10 in the current submission, thus increasing the annual responses from .66 to 3.33. In addition, the total cost has increased due to the increase in the fee rate from \$257 to \$274.

16. Publication for Statistical Use

The collected information is not published for statistical purposes.

17. Reason for Not Displaying the Expiration Date

The requirement is contained in a regulation. Amending the Code of Federal Regulations to display information that, in an annual publication, could become obsolete would be unduly burdensome and too difficult to keep current.

18. Exceptions to the Certification Statement

None.

B. COLLECTIONS OF INFORMATION EMPLOYING STATISTICAL METHODS

Not applicable.