

Nuclear

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US Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Dear Sirs:

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Use of Air as the Secondary Gas for
the Plasma Arc Torch

Attached for your information is a safety evaluation for use of air as the secondary gas for the Plasma Arc Torch. Currently, nitrogen is used as the primary and secondary gas. Use of air as the secondary gas is anticipated to improve Plasma Arc Torch performance by achieving longer and more efficient cuts.

Based on the attached evaluation, GPU Nuclear believes that this activity does not constitute an unreviewed safety question pursuant to 10 CFR 50.59.

Sincerely,

M B Roche

M. B. Roche
Director, TMI-2

RDW/emf

Attachment

cc: D. M. Johnson - Acting Senior Resident Inspector, TMI
W. T. Russell - Regional Administrator, Region I
J. F. Stolz - Director, Plant Directorate IV
L. H. Thonus - Project Manager, TMI Site

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SAFETY ANALYSIS

SA No. 4710-3261-88-01

Rev. No. 0

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TITLE

USE OF AIR AS THE SECONDARY GAS
FOR THE PLASMA ARC TORCH

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Title

USE OF AIR AS THE SECONDARY GAS FOR THE PLASMA ARC TORCH

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Rev.

SUMMARY OF CHANGE

Approval

Date

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Initial submittal.



2/89

SAFETY EVALUATION FOR USE OF AIR AS
THE SECONDARY GAS FOR THE PLASMA ARC TORCH

INTRODUCTION

References 1 and 2 require that nitrogen be used as the primary and secondary gas when operating the Automated Cutting Equipment System (ACES) Plasma Arc Torch. Review of the performance and reliability of the ACES Plasma Arc Torch in the TMI-2 Reactor Vessel indicates that operational improvements might be expected if the nitrogen secondary gas were replaced with air. Vendor suggestions regarding a substitute gas indicate that air might perform better than nitrogen due to its better oxidizing effects. Consequently, GPU Nuclear intends to switch from a nitrogen secondary gas to an air secondary gas for the Plasma Arc Torch. The capability will still exist to use the plasma arc torch in its current configuration (i.e., use of nitrogen as secondary gas) in the event that use of air as the secondary gas does not result in improved plasma arc torch performance. The secondary gas acts as a cover gas that segregates the ionized plasma gas stream from the surrounding environments (i.e., borated water) and aids in blowing the molten cut material from the cut. The secondary gas does not participate in the ionization process. Consequently, no additional safety concerns associated with the use of air as a secondary gas are known to exist.

GPU Nuclear has initiated a broad effort to improve plasma torch performance. The expected results from this effort are longer torch life, more efficient cuts (i.e., less recuts), and longer component life. These results lead to more rapid completion of the task and lowered personnel exposure to radiation. The specific change from using nitrogen as the secondary gas to air is expected to provide better, cleaner cuts with less dross adhesion and perhaps more penetrating power. The relative time for a cut that is completed in one pass versus a cut that is incomplete in the first pass can be a factor of from 3 to 6 times longer because of the extra steps involved for inspection, cleaning, and recutting.

SYSTEM DESCRIPTION

The source of the air to be used as the secondary gas will be the service air system, whose present major use is as breathing air supplied to workers in the Reactor Building. This system supplies air at approximately 100 psig at several stations in the Reactor Building. At each station, there is a Bullard filter regulator. There will be no breathing air apparatus connected to this Bullard. This system capacity is 75 scfm, and for the present usage, this is much more capacity than is needed. The plasma torch will be supplied from a branch that is now serving the metal cut-up area on the 347'-6" elevation. Inadvertent cross connection of air and the nitrogen system is minimized by using a double check valve downstream from the air filter, and by the requirement that for non-breathing applications the system cannot use the fittings used for breathing. Both these measures are standard practices in effect governing the use of the breathing air system. Cross-connecting primary (N₂) and secondary (air) systems will also be precluded by administrative procedure. However, should this occur, rapid electrode oxidation would be expected with subsequent torch failure.

EVALUATION OF HEALTH AND SAFETY CONSEQUENCES

Air is recommended and has been used as a secondary cutting gas commercially and there are no known adverse effects from using air as a secondary gas. The physical change essentially is to go from 100% nitrogen to a mixture that is 78% nitrogen, 21% oxygen, and 1% argon. No additional hydrogen gas should evolve due to this change. The work platform off-gas system will be operated per References 1 and 2 to exhaust the plasma gas effluents from the area above the Reactor Vessel water surface, to the Reactor Building purge system. Additionally, per References 1 and 2, the Reactor Building purge system will be operated whenever cutting is in progress. During the first cuts made using the air as the secondary gas, samples will be taken from above the water surface to be analyzed for toxic substances. Further, the configuration of the system as described in the previous section should preclude the potential for inadvertent cross connection of the nitrogen and service air systems.

10 CFR 50.59 EVALUATION

10 CFR 50, Paragraph 50.59, permits the holder of an operating license to make changes to the facility or perform a test or experiment, provided the change, test, or experiment is determined not to be an unreviewed safety question and does not involve a modification of the plant Technical Specifications.

10 CFR 50, Paragraph 50.59, states a proposed change involves an unreviewed safety question if:

- a. The probability of occurrence or the consequence of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report may be increased; or
- b. The possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report may be created; or
- c. The margin of safety, as defined in the basis for any Technical Specification, is reduced.

Each of the above criteria is evaluated below:

Has the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report been increased?

The potential for the generation of off-gases during plasma arc cutting has been evaluated in previous GPU Nuclear correspondences (References 3 and 4) and reviewed by NRC correspondences (References 1 and 2). The primary concern addressed in the referenced correspondences is the potential for generating nickel carbonyl and other toxic substances during plasma arc cutting. To date, use of the Plasma Arc Torch has not created any adverse health effects. Since air contains less nitrogen than pure nitrogen, it is expected that use of air as the secondary gas for the ACES Plasma Arc Torch will not increase the potential for worker exposure to toxic substances. However, per References 1 and 2, the defueling work platform off-gas system and the containment purge system shall be operated whenever plasma arc cutting is

Performed to ensure the proper ventilation of any off-gases that may be generated. As an additional precaution, during the first cuts made with air as the secondary gas, samples will be taken from above the water surface to be analyzed for toxic substances. Thus, this activity does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report.

Has the possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report been created?

Based on previous commercial use and vendor's recommendations, the use of air as the secondary gas for the ACES Plasma Arc Torch is not expected to create any event type different from those previously evaluated in the referenced GPU Nuclear and NRC correspondences. The controls described in the above paragraph will provide further assurance that this activity does not create the possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report.

Has the margin of safety, as defined in the basis for any Technical Specification, been reduced?

Technical Specification safety margins at TMI-2 are concerned with criticality control and prevention of further core damage due to overheating. The substitution of air for nitrogen as a plasma torch secondary gas will not effect any of the existing Technical Specifications. Thus, this activity does not reduce the margin of safety as defined in the basis for any Technical Specifications.

Based on the above evaluation, GPU Nuclear concludes that use of air as the secondary gas for the Plasma Arc Torch does not constitute an unreviewed safety question pursuant to 10 CFR 50.59.

REFERENCES

1. NRC Letter dated April 1, 1988, "Lower Core Support Assembly Defueling."
2. NRC Letter NRC/TMI-87-064 dated August 20, 1987, "Plasma Arc Cutting."
3. GPU Nuclear letter 4410-87-L-0067, dated May 7, 1987, "Plasma Arc Cutting."
4. GPU Nuclear letter 4410-87-L-0012, dated January 20, 1987, "Plasma Arc Cutting."