

August 31, 2007

Mr. Robert Peterson, Plant Manager  
Target Rock, Inc.  
Division of Curtiss-Wright Flow Control Corporation  
1996 E. Broadhollow Road  
East Farmingdale, NY 11735

SUBJECT: NRC INSPECTION REPORT 99900060/2007-201, AND NOTICE OF  
NONCONFORMANCE

Dear Mr. Peterson:

On June 25-28, 2007, U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the Target Rock, Inc. (Target Rock) facility in East Farmingdale, New York. The enclosed report presents the results of that inspection.

This was a limited scope inspection which focused on assessing your compliance with the provisions of Part 21 of Title 10 of the *Code of Federal Regulations* (10 CFR Part 21), "Reporting of Defects and Noncompliance," and selected portions of Appendix B to 10 CFR Part 50, "Quality Assurance Program Criteria for Nuclear Power Plants and Fuel Processing Plants." This NRC inspection report does not constitute NRC endorsement of your overall quality assurance or Part 21 programs.

Additionally, the inspectors conducted a review of Target Rock's welding activities and assessed the safety significance of the failure to use Code qualified welding procedures to perform seal welds on the main steam pressure relief valves (PRVs) at Duane Arnold Energy Center (DAEC) and Monticello nuclear power plant (Monticello).

Based on review of Target Rock welding procedures and qualification records, the inspectors identified that three welding procedures were not qualified in accordance with ASME Code Section IX requirements. This included an unqualified weld procedure previously identified by Region III inspectors. Based on further review, the inspectors concluded that Target Rock's qualification method, demonstrated by the completion of Project 07Z511, constitutes an acceptable alternative to the ASME Code Section IX requirements for the qualification of the three welding procedures for seal welds on PRV parts (involving CS to K-Monel, Stainless Steel to K-Monel and Inconel to K-Monel material combinations.)

In addition, based on review of other welding activities, nondestructive examination (NDE) procedures and NDE certification records, review of drawings and non-conformance packages involving weld repairs, and witnessing in process welding and NDE activities, the inspectors concluded that Target Rock's welding activities are being accomplished in accordance with ASME Code Section III and IX requirements and thus meet NRC regulations.

During this inspection, it was found that the implementation of your quality assurance program failed to meet certain NRC requirements which are discussed in the enclosed Notice of

Mr. R. Peterson

- 2 -

Nonconformance (NON), and NRC Inspection Report. Specifically, a review of Target Rock's implementation of the audit process identified that a Target Rock commercial-grade survey failed to ensure that a supplier had verified critical characteristics of an item, as required by Appendix B to 10 CFR Part 50. The nonconformance is cited in the enclosed NON, and the circumstances surrounding it are described in the enclosed report.

The NRC has concluded that information regarding the reason for the nonconformance, the corrective actions taken and planned to correct the nonconformance and prevent recurrence and the date when full compliance will be achieved is already adequately addressed in subsequent correspondence. Therefore, you are not required to respond to this letter unless the description herein does not accurately reflect your corrective actions or your position. In that case, or if you choose to provide additional information, you should follow the instructions specified in the enclosed Notice.

In accordance with 10 CFR 2.390 of the NRC's "Public inspections, exemptions, requests for withholding," of 10 CFR Part 2, "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter, its enclosures and any associated correspondence will be placed in the NRC's Public Document Room (PDR) or from the NRC's document system (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

Sincerely,

**/RA/**

Patrick L. Hiland, Director  
Division of Engineering  
Office of Nuclear Reactor Regulation

Docket No.: 99900060

Enclosure: 1. Notice of Nonconformance  
2. Inspection Report No. 99900060/2007-201

During this inspection, it was found that the implementation of your quality assurance program failed to meet certain NRC requirements which are discussed in the enclosed Notice of Nonconformance (NON), and NRC Inspection Report. Specifically, a review of Target Rock's implementation of the audit process identified that a Target Rock commercial-grade survey failed to ensure that a supplier had verified critical characteristics of an item, as required by Appendix B to 10 CFR Part 50. The nonconformance is cited in the enclosed NON, and the circumstances surrounding it are described in the enclosed report.

The NRC has concluded that information regarding the reason for the nonconformance, the corrective actions taken and planned to correct the nonconformance and prevent recurrence and the date when full compliance will be achieved is already adequately addressed in subsequent correspondence. Therefore, you are not required to respond to this letter unless the description herein does not accurately reflect your corrective actions or your position. In that case, or if you choose to provide additional information, you should follow the instructions specified in the enclosed Notice.

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Sincerely,

**/RA/**

Patrick L. Hiland, Director  
Division of Engineering  
Office of Nuclear Reactor Regulation

Docket No.: 99900060

Enclosure: 1. Notice of Nonconformance  
2. Inspection Report No. 99900060/2007-201

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## NOTICE OF NONCONFORMANCE

Target Rock, Inc.  
1996 E. Broadhollow Road  
East Farmingdale, NY 11735

Docket Number 99900060  
Inspection Report Number 2007-201

Based on the results of a Nuclear Regulatory Commission (NRC) inspection conducted June 25-28, 2007, of activities performed at Target Rock, Inc. (Target Rock), it appears that certain activities were not conducted in accordance with NRC requirements which were contractually imposed upon Target Rock by NRC licensees.

1. Criterion VII, "Control of Purchase Material, Equipment, and Services," of Appendix B to 10 CFR Part 50, states in part, that "Measures shall be established to assure that purchased material, equipment, and services, whether purchased directly or through contractors and subcontractors, conform to the procurement documents. These measures shall include provisions, as appropriate, for source evaluation and selection, objective evidence of quality furnished by the contractor or subcontractor, inspection at the contractor or subcontractor source, and examination of products upon delivery.

Section 8.0 of Target Rock Report No. 5041 (TR-5041), Revision N, "Dedication Requirements for Commercial Grade Items," states in part that, commercial-grade surveys are used to accept items based on the merits of the supplier's commercial quality controls which shall consist of documented quality programs, procedures and/or practices. This section also states that implementation of the commercial-grade survey requires confirmation that specified critical characteristics are being controlled under the scope of the supplier's documented commercial quality system activities and that reasonable assurance is established that the commercial suppliers activities adequately control the supplied items. The survey will be specific to the scope of the particular item being purchased.

Contrary to the above,

The Target Rock survey of Stonite Coil Corporation did not provide objective evidence that the critical characteristics of the hi-pot electrical resistance testing and insulation resistance testing for a solenoid valve coil assembly were controlled under the supplier's documented commercial quality program. These tests provide a basis for establishing reasonable assurance that the supplied item will perform its intended safety function.

This issue has been identified as Nonconformance 99900060/2007-201-01.

The NRC has concluded that information regarding the reason for the nonconformance, the corrective actions taken and planned to correct the nonconformance and prevent recurrence and the date when full compliance will be achieved is already adequately addressed in subsequent correspondence. However, you are required to submit a written statement or explanation pursuant to 10 CFR 2.201 if the description therein does not accurately reflect your corrective actions or your position. In that case, or if you choose to respond, clearly mark your response as a "Reply to Notice of Nonconformance; 99900060/2007-201-01," and send it to the

Enclosure 1

U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001 with a copy to the Chief, Quality and Vendor Branch within 30 days of the Date of the letter transmitting this Notice of Nonconformance (Notice).

If you choose to respond, your response will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/NRC/ADAMS/index.html> (The Public Electronic Reading Room). Therefore, to the extent possible, the response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

Dated this 31<sup>st</sup> day of August 2007.



## 1.0 INSPECTION SUMMARY

The purpose of this inspection was to review selected portions of the quality assurance (QA) and 10 CFR Part 21 (Part 21) controls that Target Rock, Inc. (Target Rock) has established and implemented. Additionally, the inspectors followed up on an operating experience issue concerning the lack of Target Rock's welding procedures being qualified by testing, as required by the American Society of Mechanical Engineers (ASME) Code. Specifically, the weld procedures were not qualified by performing tensile and bend tests intended to demonstrate that the weld procedures produced welds with satisfactory strength and ductility for the intended service (see Inspection Report 05000331/2007002 for details). The inspection was conducted at Target Rock's facility in East Farmingdale, New York. The NRC inspection bases were:

- Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Part 50 of Title 10 of the *Code of Federal Regulations*, and
- 10 CFR Part 21, "Reporting of Defects and Noncompliance."
- 10 CFR 50.55a, "Codes and Standards."

### 1.1 NONCONFORMANCES

- Nonconformance 99900060/2007-201-01 was identified and is discussed in Section 3.2 of this report.

## 2.0 STATUS OF PREVIOUS INSPECTION FINDINGS

There were no recent previous NRC inspections performed at Target Rock's facility in East Farmingdale, New York, prior to this inspection.

## 3.0 INSPECTION FINDINGS AND OTHER COMMENTS

### 3.1 10 CFR Part 21 Program

#### a. Inspection Scope

The inspectors reviewed the Target Rock policies and procedures governing the Part 21 program to assure those guidelines provided an adequate description of the process and implementation requirements described in 10 CFR Part 21, "Reporting of Defects and Noncompliances."

#### b. Observations and Findings

##### b.1. Postings

The inspectors evaluated whether Target Rock had complied with the posting requirements of 10 CFR 21.6. The inspectors found that Target Rock had posted notices which included a copy of Section 206 of the Energy Reorganization Act of 1974, a current copy of 10 CFR Part 21, and a note with the title of the responsible person and

title and location of the procedure. The inspectors did not identify any findings in this area.

b.2. 10 CFR Part 21 Procedure

Procedure QMP-1014, "Corrective and Preventive Action," Revision E, established the procedures and responsibilities to identify, control, document, and resolve conditions or items that do not conform to specified requirements. Additionally, it established the methods used to ensure significant conditions adverse to quality are promptly identified and corrected. Section 5 of procedure QMP-1014 described the procedure for reporting defects and noncompliances under Part 21.

The inspectors found that procedure QMP-1014 also established the responsibilities and timeliness guidance to comply with the reporting requirements of Part 21. The procedure provided adequate guidance to identify and evaluate deviations pursuant 10 CFR 21.21(a). Procedure QMP-1014 described the methodology for issuing a corrective action request (CAR), but did not provide examples of a condition adverse to quality requiring a CAR to be written. The inspectors reviewed Target Rock's Quality Assurance Manual (QAM), Edition 8. The QAM provided adequate examples of when a CAR should be generated. The Manager of Commercial Quality Assurance issued a CAR to evaluate revising QMP-1014 to provide examples of when to generate a CAR. The inspectors had no further concerns.

Procedure QMP-1014 was issued on June 19, 2007, just prior to the inspection. The procedure replaced Quality Control Instruction (QCI) 1306, which previously contained the guidance for performing a Part 21 evaluation. The inspectors reviewed QCI 1306 and found that it lacked sufficient guidance to perform an evaluation in order to meet the requirements of 10 CFR 21.21(a). Therefore, as detailed in the following inspection report section, the inspectors reviewed several of Target Rock's problem reports, which contain evaluations for potential Part 21 reportability, issues to ensure an adequate evaluation was performed.

b.3. 10 CFR Part 21 Program Implementation

The inspectors reviewed several Part 21 problem reports and evaluated whether Target Rock had implemented a program consistent with the requirements described in 10 CFR Part 21. The inspectors verified that Target Rock's program included a method of identification, an adequate evaluation, and timely reporting.

As previously discussed, Procedure QMP-1014 described the process to control nonconforming conditions and corrective actions. The procedure established that nonconforming conditions identified by licensees will be documented in a Corrective Action Request (CAR). In addition, CARs are used to document and resolve customer complaints, internal corrective actions, and issues and trends identified by management. The inspectors noted that the CAR form provided a method to screen for Part 21 applicability and evaluation.

Target Rock's usual methodology for identifying and evaluating potential Part 21 issues was unique. However, it seemed to function properly. Most Part 21 evaluations started



as a problem identified in the field by either Target Rock or a licensee. The problem was then documented on a Problem Report. The inspectors noted that the Problem Reports that were reviewed contained a detailed description of the issue and an evaluation of the problem. Additionally, a determination of nonconformance status was performed. For the determination, two choices were offered to the evaluator. If the issue was a product nonconformance, a nonconformance report (NCR) should be issued. If the issue was a system deficiency, then a CAR should be issued. Finally, an evaluation of potential Part 21 reportability was performed.

The inspectors found that the Part 21 evaluations adequately documented the problem and justified the decision of whether to report. The inspectors determined that none of the recent problem report evaluations had determined that a Part 21 report was required. The inspectors noted that the problem reports contained relevant supporting documentation.

The inspectors did question the completeness of the documentation in Problem Report 58. This problem report concerned the weld procedure used in repairing a safety relief valve at Duane Arnold. Specifically, the weld procedures used during the repair did not have the procedure qualification records (PQRs) referenced. The PQRs are required in accordance with ASME Boiler and Pressure Vessel Code, Section IX, 1968 Edition through the Summer 1968 Addenda. The weld procedures in question were for the second stage seat to base seal weld and for the bellows to base seal weld. The inspectors questioned if any other affected licensees had been notified of the issue. Target Rock management subsequently provided a list of three other affected licensees and confirmed the licensees had been notified of the problem and its resolution. This information was added to the existing problem report documentation. Section 3.3 of this inspection report details the inspectors' determination of the safety significance, extent of condition, and the adequacy of Target Rock's response to the operating experience issue. The inspectors did not identify any issues with the other problem report evaluations or associated documentation.

c. Conclusions

The inspectors concluded that Target Rock's administrative controls for documenting and evaluating 10 CFR Part 21 reportability issues were adequate. Additionally, a review of Part 21 evaluations completed by Target Rock did not identify any significant problems associated with implementing Part 21 requirements.

3.2 Commercial-Grade Dedication

a. Inspection Scope

The inspectors reviewed Target Rock's Quality Assurance Manual, Edition 8, Revision 0, and the implementation process for commercial-grade item dedication activities. This assessment included a review of the procedures which govern the implementation of commercial-grade dedication activities, interviews with individual process participants, witnessing performance of dedication activities and performing reviews of the related documentation.

b. Observations and Findings

b.1 Commercial-Grade Dedication Process

The inspectors reviewed Target Rock's procedure governing commercial-grade dedication, Report No. 5041 Rev. N, "Dedication Requirements for Commercial Grade Items." This procedure provided guidance for the methodology used to dedicate commercial-grade items.

Target Rock is an original equipment manufacturer to the commercial nuclear power industry, and maintains the original designs associated with its product lines. These original designs were evaluated, tested and qualified years ago. The documentation of the original design efforts and the associated testing and equipment qualifications establish the design bases for subsequent modifications and evolutions to the original designs. As customers request alterations or adaptations to the originally qualified designs, Target Rock's engineering and quality staff review the Certified Design Specifications (CDS) submitted along with the customer's Request For Quote (RFQ) against the qualified baseline design. If the technical and quality requirements of the new valve's design can be enveloped by the established qualification, the engineer begins to construct job specific design, manufacturing and quality details from pre-qualified design templates. These details include the bills of material at the various production levels. Each individual piece part has been pre-evaluated to determine its commercial-grade dedication classification. This classification establishes the procurement method and quality requirements for the part to remain within the qualified parameters of the original design. Critical quality requirements are then communicated to their sub-tier suppliers via the purchase order and to Target Rock's personnel via the Critical Characteristics Attribute Verification (CCAV) form. The quality attributes specified on the purchase order were determined by Target Rock Engineering to be critical to ensure that the procured item will meet design bases requirements. The CCAV form attributes ensure that the item Target Rock received was the item procured.

When the CDS for a new item cannot be qualified using the existing baseline design, engineering generated a Technical Evaluation of Replacement Items (TERI). This process is used to evaluate and document alternate replacement parts when substitution is necessary. Appendix I, "Technical Evaluation of Alternate or Replacement Items (TERI)" of Target Rock Report No. 5041, Revision N, "Dedication Requirements for Commercial Grade Items," provided the procedural guidance for this process. If the item cannot be qualified with the TERI process, a new qualification package is developed and the qualification testing is re-performed.

Target Rock treats all parts installed on or in a safety-related component to be safety-related regardless of the item's specific safety function, if any. This conservative approach allows Target Rock to eliminate the need to segregate safety from nonsafety items and have separate processes for safety and nonsafety-related parts. This policy is particularly advantageous in the shop, since all parts are treated with the same quality significance.

Target Rock maintains four commercial-grade dedication classifications:

- **C-1** - ASME Section III Boiler and Pressure Vessel Code: pressure containing or retaining safety-related items.
- **C-2** - (Safety-Related): basic components which are not pressure containing or retaining items.
- **CG** - (Commercial-Grade): purchased materials, items and production services not procured as basic components and not having nuclear unique specification documents imposed.
- **C-5** - (Electrical Components): purchased materials and items in positioner and current control unit assemblies not procured as basic components and not having nuclear unique specification documents imposed.

Each classification of commercial-grade item has a corresponding procedure for implementing the respective dedication process. The list below captures the association of an item to the respective procedure:

- **C-1:** Report No. 1848, Revision N, "General Control for Manufacturing and Inspection of Target Rock Class C1 Items;"
- **C-2:** Report No. 1849, Revision N, "General Process Requirements for Valve parts or Assemblies;"
- **CG:** Report No. 5041, Revision N, "Dedication Requirements for Commercial Grade Items;" and
- **C-5:** Report No. 7337, Revision J, "TR Class C5 Electronic Component Hardware Number Definitions."

## b.2 Implementation of the Commercial-Grade Dedication Process

The implementing document for Target Rock's commercial-grade dedication process is the CCAV form. This form and the associated implementation guidelines are presented in Target Rock's Report No. 5041. The CCAV form documents the Commercial Project Engineer's evaluation of the specific item's safety function and those characteristics deemed critical for providing reasonable assurance the item will effectively perform those functions. Additionally, the CCAV form serves as the receipt inspector's record of the results of the tests performed to verify those characteristics. The results of the inspection are documented directly onto the CCAV form and the receiver's comments and initials are placed next to the critical characteristics attribute. The inspectors witnessed CCAV form verifications being performed by Target Rock personnel and determined that the requirements governing the receipt of commercial-grade items were adequately implemented.

The inspectors reviewed a sample of Target Rock commercial-grade dedication activities. This review included witnessing the individual performing the associated duties as well as a review of the supporting documentation generated during the

dedication process. The inspectors verified that the selected critical characteristics of the item could be traced back to the original design bases and were correctly passed along to the sub-tier suppliers and the receipt inspectors. The following is a brief overview of completed CCAV forms reviewed by the inspectors for several items/components which Target Rock had processed, based on licensee purchase orders:

- Part Number (P/N) 205674-6, 6 Lug Terminal Strips, Target Rock Drawing No. 205674, Revision E: The purchase order was for 300 terminal strips of the specified part number. The conditions of the purchase order required the supplier to provide lot traceability. It was observed during this review, that the supplier had satisfied the purchase request using multiple lots but had failed to provide adequate documentation relative to lot homogeneity. The issue was discussed with the responsible Target Rock supervisors and the inspectors determined upon further evaluation, this issue originated from a misinterpretation of the Certificate of Conformance wording on the supplier's part. The issue was viewed as an isolated incident by the inspectors and not indicative of a programmatic deficiency in Target Rock's procurement process. Target Rock subsequently performed inspection activities as specified on the CCAV form for each lot in the shipment in accordance with the sample population guidance presented in Target Rock Report No. 5087, Revision E, "Sample Inspection Procedure."
- P/N 118-0006, Lock Nut, Target Rock Drawing No. 118-0006, Revision (none): This activity involved receipt inspection activities for 99 lock nuts. The inspectors witnessed the receiving activities as specified on the CCAV form. The calibration of the alloy separator used in the material verification activity was verified to be calibrated using material standards recorded in Target Rock's measuring and test equipment program. The inspectors also verified that the material standards were traceable to the National Institute of Standards and Technology (NIST). No issues were identified during the performance of this activity.
- P/N 302706, Solenoid Valve Coil Assembly, Target Rock Drawing No. 302706, Revision G: This review was selected as verification that the critical characteristics specified on the CCAV form had been evaluated against the original qualified design baseline and that the customer's requirements had been appropriately reviewed by Target Rock and translated to the CCAV form. During the inspectors' review, it was noted that Target Rock had out-sourced verification of two of the critical characteristics to a sub-tier supplier. The supplier was not listed as a safety-related supplier in Target Rock's Approved Supplier's List. Subsequently, the inspectors reviewed target Rock's audit of this supplier to determine if Target Rock had incorporated an evaluation of the sub-supplier's performance of these activities in their commercial-grade survey as a source surveillance. The results of this review are documented below.

The inspectors reviewed a sample of Target Rock's supplier audits taken from the population of CCAV forms discussed in this inspection report. The following Target Rock supplier audits were evaluated:

- Target Rock Audit No. 04-11-01 of Baron Consulting Company, issued December 13, 2004. This vendor provides material analysis and Certified Material Test Reports of Target Rock materials. The vendor is listed as a 10 CFR 50 Appendix B supplier on Target Rock's Approved Supplier's List. The audit was verified as being performed as a 10 CFR 50 Appendix B audit and in accordance with Target Rock governing procedure, QMP1017, "Quality Audits," Revision A. The inspectors determined this audit was adequately performed.
- Target Rock Audit No. 06-09-01 of Stonite Coil Corporation, issued October 6, 2006. This audit was performed as a commercial-grade survey in accordance with Target Rock's governing procedure, QMP1017, "Quality Audits," Revision C. The vendor manufactured solenoid valve coil assemblies required for P/N 302706 above. A review of the CCAV form associated with this part number indicated that responsibility for verification of certain safety-related critical characteristics had been transferred to Stonite for verification. The CCAV form specified a "Supplier Test Data Sheet" under the requirements block for both hi-pot testing and insulation resistance testing. After discussions with Target Rocks's QA Manager and a review of the audit documentation the inspectors determined that the survey failed to evaluate the verification activities associated with those critical characteristics transferred to Stonite. This issue is identified as Nonconformance 99900067/2007-201-01.

A programmatic finding had been identified by a Nuclear Procurement Issues Committee audit team during their audit of Target Rock, performed in January 2007. Target Rock documented the findings on CAR No. 07-C003. The staff reviewed the associated CAR and it's proposed corrective action and determined that Target Rock had not adequately addressed the immediate concern that other commercial-grade suppliers may not have had sufficient surveys performed to assess if critical characteristics were verified. Target Rock revised CAR No. 07-C003 to expand the corrective actions to all of Target Rock's commercial-grade suppliers. Target Rock subsequently performed and documented a review of applicable commercial-grade surveys to verify that each survey adequately addressed the specified critical characteristics. This review identified one survey that did not adequately address the critical characteristics. An audit is scheduled to be performed within 90 days. The inspectors found Target Rock's response to be adequate. No additional response is required to address the nonconformance.

Additionally, the inspectors performed a document review of a sample of Target Rock Inspection Reports (IRs). It was concluded from this review that the form effectively assures that appropriate testing specified by a Target Rock design engineer is being performed and documented. The following IRs were reviewed:

- IR No. WOT 122527, P/N 204995-1, Revision A, "Bonnet Cap," classification C-1, including NDT IR No. 63102;
- IR No. WOT 125079, P/N 104764-1, Revision (none), "Stud," classification C-1; and

- IR No. WOT 125731, P/N 303159-1, Revision (none), "Bonnet Assembly," classification C-1, including Welding Report No. WR-61979 and NDT Inspection Report No. 51676.

c. Conclusions

The inspectors determined through a review of Target Rock's commercial-grade dedication process and implementation for several items/components, that Target Rock is generally implementing a dedication process in compliance with regulatory and industry guidance.

However, the inspectors identified that Target Rock's survey of a supplier was inadequate. Specifically, Target Rock did not provide assurance that the supplier verified certain safety-related critical characteristics of the parts being procured (Nonconformance 99900060/2007-201-01).

Additionally, the inspectors identified that a CAR did not adequately consider the extent of condition for proposed corrective actions associated with other audits performed for suppliers and verification of critical characteristics. This deficiency was subsequently corrected by Target Rock.

3.3 Followup on Target Rock Welding Operating Experience Issue

a. Inspection Scope

The inspectors conducted a review of Target Rock's welding activities and assessed the safety significance of the failure to use Code qualified welding procedures to perform seal welds on the main steam pressure relief valves (PRVs) at Duane Arnold Energy Center (DAEC) and Monticello nuclear power plant (Monticello). The inspectors reviewed a sample of valve drawings, non-conformance reports, welding procedures, nondestructive examination (NDE) procedures, qualification test records, and welder and NDE personnel qualification records. In addition, the inspectors observed in process welding, NDE activities and hydrostatic tests associated with seal welds on a PRV being manufactured for a nuclear power plant.

*Background Information*

During a routine inspection at DAEC, the NRC Region III inspectors identified that Target Rock's welding procedure was not qualified by tensile and bend tests as required by ASME Boiler and Pressure Vessel Code Section IX. The welding procedure was used for seal welds of parts in main steam PRVs manufactured by Target Rock. Target Rock uses seal welds in three specific areas of its PRVs: (1) second stage valve seat to valve body, (2) pilot valve seat to valve body, and (3) valve bellows to valve body. The second stage seat is installed by chilling the seat insert and then inserting it into the valve base to achieve a tight press fit. The pilot valve seat is also press fit into the valve base. The design does not credit the seal weld for holding the second stage and pilot valve seat in place. The valve bellows is threaded into the base and the threads are designed to withstand the full pressure of the process fluid. Therefore, the seal welds are installed to

provide for leak tightness and the pressure retaining function of the joint is maintained by the bellow's threads.

Because of this finding, NRC Region III inspectors reviewed Target Rock's welding procedures at Monticello and confirmed that the same issue existed. As a result of this finding, Monticello performed an operability assessment of the affected systems and concluded that the systems are operable but nonconforming because Target Rock's welding procedure used to weld the above mentioned seal welds was not qualified by tests as required by ASME Code Section IX. The NRC staff of the office of Nuclear Reactor Regulation concurred with the licensee's determination and concluded that the most efficient way to review the extent of condition and determine the safety significance of the issue would be to conduct an inspection at Target Rock's facilities.

b. Observations and Findings

The inspectors reviewed Drawing No. 7467F-000, Revision 10, "Assembly 6 x 10 Pilot Operated Relief Valve," to confirm the location and function of the seal welds identified by the NRC Region III inspectors. The review confirmed that the seal welds do not provide a pressure retaining function and are used to provide only leak tightness for the joint.

The inspectors also reviewed the documentation associated with Project 07Z511, ASME Submittal Documentation. Target Rock completed Project 07Z511 in order to address the NRC Region III finding at DAEC that welding procedure W-6d, "GTAW Procedure for Seal Welding K-Monel to ASME A216 Grade WCB," did not meet the ASME Code Section IX requirements because the procedure was not qualified by test. Specifically, the project employed the original welding procedure (W-6d) that was used to place seal welds on valves supplied to DAEC and used the procedure to prepare new welding procedure qualification test plates. The test plates were subsequently tested using tensile and bend tests as required by the ASME Code Section IX. As a result, welding procedure W-6d was properly qualified by test in accordance with the requirements of the ASME Code Section IX, 2004 Edition, 2006 Addenda.

The inspectors also interviewed Target Rock's welding personnel to determine why the Code required tests were not performed prior to placing the seal welds on valves supplied to DAEC. Target Rock stated that it was their understanding that ASME Code Section III, paragraph NX-4360, "Qualification Requirements for Welding Specially Designed Welded Seals," allows seal welds to be qualified by test assembly (mockup) instead of mechanical tests. The inspectors disagreed with Target Rock's interpretation because the paragraph only applies to seal welds affecting omega shaped seal membranes. Nonetheless, the inspectors reviewed the process that was used to qualify the original welding procedure (W-6d) and established that the procedure was qualified by welding on a test assembly that closely resembled the production weld assembly. Subsequently, the test assembly was sectioned and examined using the visual examination and liquid penetrant (LP) methods. In addition, a metallographic sample was prepared to provide for examination of the test assembly. Target Rock's acceptance criteria were: (1) visual examination: undercutting, cracks, linear indications and crater defects are not acceptable; (2) LP examination: linear indication, cracks and rounded indications exceeding 1/32 inch diameter are not acceptable and a maximum of

five 1/32 inch diameter indications are permitted per linear inch of weld; and (3) metallographic examination: the examination shall show sufficient penetration, a good sound fusion zone, the weld shall be free of porosities exceeding 0.010 inch diameter, and shall be free of cracks.

Based on the review of Target Rock’s original welding procedure (W-6d) qualification method, the inspectors determined that Target Rock’s original qualification method constitutes an acceptable alternative to the ASME Code Section IX requirements for welding procedure qualification of seal welds on PRV parts. This conclusion is also supported by the fact that the valves have been operating for many years without problems and no degradation of the seal welds have been identified to date. Further, the valves are required to be serviced once every five years and at that time, if the seal welds had leaked because of service-induced conditions, the seal welds would have been repaired. Also, as demonstrated by the completion of Project 07Z511, the original welding procedure (W-6d) that was used to place seal welds on valves supplied to DAEC, was also used to weld on new welding procedure qualification test plates. The test plates were tested employing tensile and bend tests as required by the ASME Code Section IX, with Code acceptable results.

The inspectors requested that Target Rock provide a complete list of nuclear power plants that have valves of similar design as the valves supplied to DAEC and Monticello. Target Rock engineers provided this information to the inspectors and stated that the types of valves that were supplied to DAEC and Monticello apply only to boiling water reactor (BWR) plants, and the valves can be categorized as 2-stage valve and 3-stage valve designs. See Tables 1 and 2 below for details.

Table 1  
2-Stage Valve<sup>1</sup>

| <u>Utility</u>   | <u>Plant</u>       | <u>Installed</u> | <u>Spares</u> |
|------------------|--------------------|------------------|---------------|
| TVA              | Browns Ferry 1,2,3 | 39               | 3             |
| Progress Energy  | Brunswick 1,2      | 22               | 10            |
| NPPD             | Cooper             | 8                | 1             |
| Detroit Edison   | Fermi 2            | 15               | 18            |
| Entergy          | Fitzpatrick        | 11               | 8             |
| Southern Nuclear | Hatch 1,2          | 22               | 10            |
| Nuclenor         | Santa Maria        | 4                | 2             |
| Entergy          | Pilgrim            | 4                | 4             |
| PSEG             | Hope Creek         | 14               | 11            |

<sup>1</sup> No body-to-bellows seal welds used in the 2-stage valve configuration.

Table 2  
3-Stage Valve<sup>2</sup>



| <u>Utility</u> | <u>Plant</u>     | <u>Installed</u> | <u>Spares</u> |
|----------------|------------------|------------------|---------------|
| Exelon         | Dresden 2,3      | 2                | 4             |
| FPL Energy     | Duane Arnold     | 6                | 0             |
| Exelon         | Limerick 1,2     | 28               | 14            |
| FPL Energy     | Monticello       | 11               | 11            |
| Exelon         | Peach Bottom 2,3 | 22               | 6             |
| Exelon         | Quad Cities 1,2  | 2                | 11            |
| Entergy        | Vermont Yankee   | 6                | 10            |

<sup>2</sup> Seal welds for the 3-stage valve are K-Monel to Carbon Steel (CS) except for Limerick 1,2, which is Inconel to CS.

Section 3.1 of this inspection report details the inspectors' determination of the adequacy of Problem Report PR-058, which contains Target Rock's potential Part 21 technical evaluation and subsequent resolution of this issue.

The inspectors also requested that Target Rock provide a list of all welding procedures and applicable material combinations used for the manufacturing of 3-stage PRVs. The Target Rock engineers stated that valve models 67F, 7367F and 7467F utilize a 3-stage design and provided the welding procedures that were used to weld seal welds for the various material combinations. See Table 3 below for additional details.

Table 3  
Material Combinations

| <u>Customer</u> | <u>Plant</u>    | <u>Applicable JWP</u> | <u>Material Combination</u> |
|-----------------|-----------------|-----------------------|-----------------------------|
| FPL Energy      | Duane Arnold    | W-1B, Rev. C          | CS - CS                     |
|                 |                 | W-6D, Rev. C          | CS - K-Monel                |
| FPL Energy      | Monticello      | W-1B, Rev. C          | CS - CS                     |
|                 |                 | W-6D, Rev. C          | CS - K-Monel                |
| Entergy         | Vermont Yankee  | W-1B, Rev. C          | CS - CS                     |
|                 |                 | W-6D, Rev. C          | CS - K-Monel                |
| Exelon          | Dresden 2,3     | W-1B, Rev. C          | CS - CS                     |
|                 |                 | W-6D, Rev. C          | CS - K-Monel                |
| Exelon          | Peachbottom 2,3 | W-1B, Rev. C          | CS - CS                     |
|                 |                 | W-6D, Rev. C          | CS - K-Monel                |
| Exelon          | Quad Cities 1,2 | W-1B, Rev. C          | CS - CS                     |
|                 |                 | W-6D, Rev. C          | CS - K-Monel                |
| Exelon          | Limerick 1,2    | 12.1016NI, Rev. -     | Inconel - Inconel           |
|                 |                 | 12.1023NI, Rev. -     | Inconel - Inconel           |
|                 |                 | 12.1041, Rev. -       | Inconel - K-Monel           |
| First Energy    | Beaver Valley 1 | 1050SS-NiCu           | SS - K-Monel                |

The inspectors reviewed the welding procedures identified in Table 3 above and found that all procedures were qualified by test in accordance with the requirements of ASME Code Section IX, with the exception of welding procedures 1050SS-NiCu and 12.1041 involving stainless steel to K-Monel and Inconel to K-Monel material combinations.

As a result, Target Rock subsequently prepared new weld procedure qualification test plates and the procedures were qualified by tests as specified in ASME Code Section IX. The NRC inspectors reviewed the associated welding procedures, procedure qualification records, and test reports. The inspectors found that the documentation met applicable ASME Code, Section IX requirements.

The inspectors also reviewed a sample of welder qualification test records in order to determine if the welders were qualified in accordance with the requirements of the ASME Code Section IX. The records for five Target Rock welders identified by Weld Stamp Numbers 544, 2663, 4956, 7381 and 886 were reviewed. No problems were identified as a result of this review. The review results showed that the welders were properly qualified in accordance with the requirements of the ASME Code Section IX.

The inspectors also reviewed a sample of certification records for NDE personnel. The qualification records for three NDE personnel were sampled for review. One of the individuals was qualified as NDE Level III, liquid penetrant, magnetic particle, and radiographic examination methods. The other two NDE technicians were qualified as Level II, liquid penetrant method. All reviewed certification records were found to be in compliance with the requirements of the ASME Code, Section III and the American Society for Non-Destructive Testing (ASNT) Practice SNT-TC-1A.

The inspectors reviewed one work package in order to determine if Target Rock personnel conducted work activities in accordance with written procedures, as specified in the company's quality assurance manual. Target Rock Work Package 04Z-016, Purchase Order # 04-3, "6 x 10, Model 73/7467F, 3 Stage Design / Pilot and Partial Main Valve Ass'y, Pilot S/N: 226," was sampled for review. The review results showed that the work was accomplished in accordance with written procedures as specified in the Target Rock Quality Assurance Manual. No problems were identified as a result of this review.

The inspectors witnessed in process welding involving bellows to valve body seal welds and the subsequent LP examination performed on those welds. The welding and NDE activities were performed in accordance with written procedures and no weld defects were revealed as a result of the LP examination. The welded valve parts were part of a purchase order to supply valves for the Beaver Valley Nuclear Power Plant, Unit 1.

The inspectors witnessed a hydrostatic shop test of the valve pilot assembly shell shown on Target Rock Drawing No. 303845. The test was performed to the test requirements of Target Rock Report No. 1021. The results of the test were separately documented on the Production Test Data Sheet. The valve pilot assembly shell was pressurized to 3350 pounds per square inch (psi) for a period of 30 minutes. The Authorized Nuclear Inspector (ANI) also witnessed the test. The results of the test were satisfactory. No problems were identified during the conduct of the test.

The inspectors selected for review a sample of four nonconformance packages from about 100 nonconformance packages that Target Rock had prepared in 2006. The four selected nonconformance packages were the only nonconformance packages that involved weld repair work. Two of the nonconformance packages were completed and

two were in the process of being completed. The review results showed that the nonconforming conditions were addressed in accordance with written procedures as specified in the Target Rock Quality Assurance Manual. No problems were identified as a result of this review.

#### 4. Conclusions

Based on review of Target Rock welding procedures and qualification records, the inspectors identified that three welding procedures were not qualified in accordance with ASME Code Section IX requirements. This included an unqualified weld procedure previously identified by Region III inspectors. Based on further review, the inspectors concluded that Target Rock's qualification method, demonstrated by the completion of Project 07Z511, constitutes an acceptable alternative to the ASME Code Section IX requirements for the qualification of the three welding procedures for seal welds on PRV parts (involving CS to K-Monel, Stainless Steel to K-Monel and Inconel to K-Monel material combinations.)

In addition, based on review of other welding activities, nondestructive examination (NDE) procedures and NDE certification records, review of drawings and non-conformance packages involving weld repairs, and witnessing in process welding and NDE activities, the inspectors concluded that Target Rock's welding activities are being accomplished in accordance with ASME Code Section III and IX requirements and thus meet NRC regulations.

Additionally, the inspectors found that the new weld procedure qualification test plates and procedures were properly qualified by tests as specified in ASME Code Section IX. The test plates were tested employing tensile and bend tests as required by the ASME Code Section IX, with code acceptable results. This conclusion is also supported by the fact that the valves have been operating for many years without problems and no degradation of the seal welds have been identified to date. Further, the valves are required to be serviced once every five years and at that time if the seal welds had leaked because of service-induced conditions, the seal welds would have been repaired.

### **4.0 MANAGEMENT MEETINGS AND PERSONNEL CONTACTED**

#### 4.1 Entrance and Exit Meetings

In the entrance meeting on June 25, 2007, the inspectors discussed the scope of the inspection, outlined the areas to be inspected, and established interfaces with Target Rock's Plant Manager and several staff personnel. During the exit meeting on June 28, 2007, the inspectors discussed the inspection findings and observations with Target Rock's Plant Manager and staff.

#### 4.2 Personnel Contacted

|             |   |
|-------------|---|
| J. White    | General Manager, Target Rock                  |
| R. Peterson | Plant Manager, Target Rock                    |
| S. Pauly    | Vice President - Energy Products, Target Rock |

|            |  |
|------------|--|
| R. Frole   | Director, Commercial Engineering, Target Rock      |
| B. Maher   | Quality Control Manager, Target Rock               |
| R. Glazier | Manager, Commercial Quality Assurance, Target Rock |
| A. Szeglin | Manager, Field Service, Target Rock                |
| A. DiMeo   | Commercial Engineering Manager, Target Rock        |
| T. Bryant  | Welding Engineer                                   |
| C. Gregg   | Senior Laboratory Technician                       |
| A. Micari  | Field Service                                      |
| D. Miller  | Quality Engineer                                   |
| S. Para    | Welding Engineer                                   |
| F. Riley   | ANI  |