

August 25, 2003

G. R. Peterson, Vice President  
McGuire Nuclear Station  
Duke Energy Corporation  
12700 Hagers Ferry Road  
Huntersville, NC 28078-8985

SUBJECT: MCGUIRE NUCLEAR STATION, UNIT 1 RE: RELIEF REQUEST FOR  
ISOLATION VALVE TESTING, MC-SRV-CA-01 (TAC NO. MB9985)

Dear Mr. Peterson:

By letter dated July 15, 2003, as supplemented on July 16, 2003, Duke Energy Corporation (the licensee), requested that the U.S. Nuclear Regulatory Commission NRC staff grant temporary relief from certain requirements of the American Society of Mechanical Engineers (ASME), *Boiler and Pressure Vessel Code*, Section XI, regarding inservice testing of the auxiliary feedwater isolation motor-operated valve (MOV) 1CA-42B at the McGuire Nuclear Station, Unit 1.

Based on the information provided by the licensee, the NRC staff concludes that the licensee's request for temporary deferral of quarterly stroke-time testing of MOV 1CA-42B at McGuire, Unit 1 is justified on the basis that compliance with the test requirement in the applicable ASME Code would result in hardship without a compensating increase in the level of quality and safety. Therefore, the licensee's request for temporary relief, as described in the July 15 and July 16, 2003, letters is authorized pursuant to Title 10 of the *Code of Federal Regulations*, Section 50.55a(a)(3)(ii). This relief is authorized until the end of Cycle 16 for McGuire, Unit 1 (on or about March 5, 2004) or the plant enters a condition permitting the replacement of the valve stem in 1CA-42B, whichever is sooner.

The NRC staff verbally granted the requested relief on July 16, 2003. The NRC staff had completed its review and determined that the requested relief was acceptable, but had not yet formally documented its conclusions in a safety evaluation. The NRC staff's Safety Evaluation is enclosed.

Sincerely,

/RA/

John Nakoski, Chief, Section 1  
Project Directorate II  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket Nos. 50-369

Enclosure: As stated

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
OF REQUEST FOR TEMPORARY RELIEF FROM INSERVICE TESTING OF  
AUXILIARY FEEDWATER ISOLATION VALVE  
MCGUIRE NUCLEAR STATION, UNIT 1  
DUKE ENERGY CORPORATION  
DOCKET NUMBER 50-369

## 1.0 INTRODUCTION

By letter dated July 15, 2003, as supplemented on July 16, 2003, Duke Energy Corporation (licensee) submitted a request for temporary relief from the performance of quarterly stroke-time testing for auxiliary feedwater (AFW) isolation motor-operated valve (MOV) 1CA-42B at the McGuire Nuclear Station, Unit 1, until the next refueling outage (1EOC16). The licensee states that stroke-time testing of MOV 1CA-42B will be resumed following repair of the valve to its design configuration either during 1EOC16 or the earliest reasonable opportunity permitted by plant operating conditions. Based on the information submitted by the licensee, the Nuclear Regulatory Commission (NRC) staff authorized the initial implementation of this relief request during a telephone conference on July 16, 2003, in accordance with NRC procedures. This Safety Evaluation documents the staff's findings and conclusions in authorizing the relief request.

## 2.0 REGULATORY EVALUATION

Section 50.55a in Title 10 of the *Code of Federal Regulations* (10 CFR 50.55a) requires that inservice testing (IST) of certain American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 pumps and valves be performed in accordance with Section XI of the ASME *Boiler and Pressure Vessel (B&PV) Code* and applicable addenda. The NRC revised 10 CFR 50.55a to incorporate by reference the ASME *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code) to replace the IST provisions in the ASME B&PV Code. Alternatives to the Code IST requirements may be authorized, or relief may be requested by the licensee, and granted by the Commission pursuant to paragraphs (a)(3)(i), (a)(3)(ii), or (f)(6)(i) of 10 CFR 50.55a. In proposing alternatives or requesting relief, the licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety; (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety; or (3) conformance is impractical for its facility. Section 50.55a authorizes the NRC to approve alternatives and to grant relief from ASME Code requirements upon making the necessary findings. NRC guidance in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," provides alternatives to the Code requirements which are acceptable. Further guidance is given in GL 89-04, Supplement 1, and NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants."

As described in Revision 26 (dated August 2002) of the McGuire IST Program, the licensee is currently implementing its second 10-year IST interval at McGuire Nuclear Station that began on March 1, 1994. The McGuire IST Program indicates that testing of MOVs within the program is being conducted in accordance with the requirements of the 1989 Edition of the ASME B&PV Code by implementation of the 1987 Edition of the ASME/ANSI Operations and Maintenance Standards, Part 10, including OMa-1988.

The NRC staff's findings with respect to the request by the licensee in its submittals dated July 15 and 16, 2003, for temporary relief from quarterly stroke-time testing of MOV 1CA-42B at McGuire, Unit 1, are provided in this evaluation.

### 3.0 TECHNICAL EVALUATION

#### 3.1 Code Requirements

As incorporated by reference in 10 CFR 50.55a, paragraph 4.2.1.1 in Part 10 of ASME OMa-1988 requires the licensee to perform stroke-time testing of MOV 1CA-42B at McGuire, Unit 1, nominally every three months (i.e., quarterly).

#### 3.2 Proposed Relief

The licensee requests relief to defer quarterly stroke-time testing of MOV 1CA-42B at McGuire, Unit 1, until the next refueling outage (1EOC16) which is scheduled to begin on March 5, 2004. The licensee proposes that 1CA-42B be cycled and timed during 1EOC16. The licensee states that quarterly testing of 1CA-42B will be resumed following 1EOC16 during which time repairs will be made to the valve.

#### 3.3 Licensee's Basis for Relief

In its submittal dated July 15, 2003, the licensee provided the following basis for its request for temporary relief from quarterly stroke-time testing of MOV 1CA-42B:

On February 4, 2003, an Auxiliary Feedwater System motor operated valve (valve 1CA-42B) experienced a valve stem failure during planned maintenance. Duke described this event in Licensee Event Report 369/03-02, dated April 4, 2003. The valve stem failure was caused by an overload condition resulting from the failure of control functions of the motor actuator. The control function failure was due to previous vendor assembly deficiencies combined with the recent maintenance. A modification replaced the conventional valve stem with a custom two piece design as an interim corrective action. Long term plans include replacing the custom two piece stem on valve 1CA-42B with the original conventional design at the earliest reasonable opportunity permitted by plant operating conditions, which is no later than next refueling outage (1EOC16).

Quarterly stroke time testing the currently installed valve 1CA-42B poses an equipment damage potential which could be reduced by deferring quarterly stroke time testing until the next refueling outage.

The closing stroke of the quarterly stroke time test creates a compressive load which does not challenge a stem thread to carrier ring connection. However, the associated opening stroke (especially under differential pressure) creates a tensile load on the stem thread to carrier ring connection and thus could serve to fail this connection. Based on previous stroke time testing results since the modification, the closing function is not in question. However, the act of opening the valve to realign to normal operation may place excessive stress on the internals unnecessarily.

Valve 1CA-42B is maintained in the open position and fully capable of performing its intended safety function to close to provide containment isolation. This valve does not have any safety function to open.

Post maintenance testing as well as surveillance testing performed since the valve repair confirms that the valve's capability to perform its safety function to close has not been compromised by the loading in the open direction seen during the most recent test. Although the valve can be tested quarterly, the testing involves a hardship as described above (and as referenced in NUREG1482 Section 3.1.1) which could subject the valve to undue stress or reduce its life expectancy resulting in forced shutdown in the event the open stroke following testing were to result in a tensile failure. Such risk is considered to outweigh the benefit achieved by continued quarterly testing until the valve can be conveniently repaired during the next refueling outage (1EOC16).

This Relief Request evaluation concludes that adequate justification exists to warrant the proposed test deferral without compromise to safety or quality. Quarterly stroke testing will therefore be discontinued to prevent unnecessary stroking of and thus maintain continued operability of the valve for the balance of the current fuel cycle. During 1EOC16 or the earliest reasonable opportunity permitted by plant operating conditions, the valve will be returned to design configuration, at which time quarterly testing will be resumed.

### 3.4 NRC Staff's Evaluation of Relief Request

MOV 1CA-42B in the AFW system at McGuire, Unit 1 failed on February 4, 2003, when the valve stem broke as a result of an inadvertent mechanical overload condition. The licensee performed a temporary repair of 1CA-42B by replacing the upper portion of the valve stem and fitting the new upper stem to the lower portion of the original stem through the anti-rotation device. During the evaluation of the MOV failure, the licensee determined that the carrier ring to stem connection at the valve disc in 1CA-42B also may have been degraded as a result of the overload condition. During post-maintenance testing, the licensee performed a radiographic examination of the valve stem and conducted diagnostic tests of the performance of the MOV in its repaired condition. At that time, the licensee planned to conduct periodic diagnostic tests of the repaired MOV until the valve stem is replaced during the next refueling outage beginning March 5, 2004, or at the earliest reasonable opportunity permitted by plant operating conditions.

As incorporated by reference in 10 CFR 50.55a, the ASME Code of record for McGuire, Unit 1 requires the licensee to perform stroke-time testing of MOV 1CA-42B nominally every three months, where practicable. In its submittal dated July 15, 2003, the licensee requests relief

from this Code requirement pursuant to 10 CFR 50.55a(a)(3)(ii) on the basis that compliance with the applicable requirement would result in hardship without a compensating increase in the level of quality and safety. In particular, the licensee proposes to defer the testing of 1CA-42B until the next refueling outage (1EOC16) beginning on or about March 5, 2004, when the repaired valve stem will be replaced with the original conventional one-piece design. The licensee states in its relief request that valve 1CA-42B will be returned to its previous design configuration at the earliest opportunity permitted by plant operating conditions (which might occur prior to the next refueling outage) at which time quarterly testing will be resumed.

In its relief request dated July 15, 2003, the licensee explains that MOV 1CA-42B is normally open at McGuire, Unit 1 and is closed to perform its safety function to provide containment isolation for the AFW system or to conduct surveillance tests. In its supplemental submittal dated July 16, 2003, the licensee describes the post-maintenance tests of 1CA-42B conducted in February 2003 following the temporary stem repair, and the surveillance tests performed in accordance with the ASME Code in March 2003. During the post-maintenance tests of 1CA-42B in February 2003, the licensee performed (1) manual strokes to verify alignment of the repaired valve stem; (2) electrical functional strokes to verify MOV limit switch setup; (3) diagnostic tests using the motor power monitor to evaluate MOV performance; (4) stroke-time tests to verify compliance with the acceptance criteria of the IST program; and (5) radiography to verify the position of the internal parts of the repaired valve. The post-maintenance diagnostic tests of 1CA-42B revealed an increase in motor power at the end of the closing stroke as a result of water in the valve being compressed. During the surveillance testing in March 2003, the licensee performed diagnostic and stroke-time tests of MOV 1CA-42B. During the surveillance diagnostic test of 1CA-42B, the licensee identified an increase in motor power at the end of the closing stroke similar to the post-maintenance test due to compression of water in the valve. More significantly, the licensee observed an increase in motor power in the open direction during the surveillance test as a result of the additional force needed to open the valve due to fluid trapped in the valve bonnet. A delay between the closing and opening stroke during the post-maintenance diagnostic test of 1CA-42B in February 2003 had allowed the trapped fluid to escape from the valve bonnet without a resultant increase in motor power in the open direction. The stroke time during the surveillance test in March 2003 met the acceptance criteria of the IST program. Based on these post-maintenance and surveillance tests, the licensee determined that valve 1CA-42B is operable and capable of performing its safety function in the closing direction.

The NRC staff finds that the diagnostic tests of MOV 1CA-42B to evaluate its operational performance and the radiographic tests to verify the position of the valve internal parts provide reasonable assurance that the MOV is currently capable of performing its safety function in the closing direction to provide containment isolation of the AFW system. The staff has not identified concerns with the temporary repair of the valve stem that would prevent 1CA-42B from performing its safety function in the closing direction. Nevertheless, the staff concludes that the current repaired condition of the valve stem in 1CA-42B represents only a short-term corrective action and that the stem needs to be replaced at the earliest opportunity.

The mechanical overload of MOV 1CA-42B in February 2003 could have degraded the stem thread to carrier ring connection at the valve disc. Performance of periodic stroke-time and diagnostic tests requires 1CA-42B to be closed and then re-opened. Additional operation of 1CA-42B in the open direction could place tensile stress on the stem thread to carrier ring

connection. Any further degradation of the stem thread to carrier ring connection in 1CA-42B might not be observed until the MOV fails to operate during surveillance testing or abnormal plant conditions. Failure of 1CA-42B could result in the need to shut down the plant or could complicate operator response to abnormal plant conditions. Further, the length of time requested for deferral of the stroke-time test of 1CA-42B from the surveillance test in March 2003 to the scheduled refueling outage in March 2004 is consistent with the exercising frequency allowed for MOVs that undergo periodic diagnostic testing in ASME Code Case OMN-1, "Alternative Rules for Preservice and Inservice Testing of Certain Electric Motor-Operated Valve Assemblies in Light-Water Reactor Power Plants," as accepted in Regulatory Guide 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code," June 2003. As a result, the staff finds that the ASME Code requirement to perform quarterly stroke-time tests of 1CA-42B until the next refueling outage or plant operating conditions permit replacement of the valve stem (whichever is sooner) represents a hardship from potential failure of the MOV, and consequential plant shutdown or complication of plant response to abnormal conditions. Continuation of quarterly stroke-time testing until such time as the valve stem in 1CA-42B is replaced does not provide a compensating increase in the level of quality and safety in that the MOV is currently capable of performing its closing safety function and the length of time that the surveillance test will be deferred is consistent with accepted practices for MOVs that undergo diagnostic tests.

#### 4.0 CONCLUSION

The NRC staff concludes that the licensee's request for temporary deferral of quarterly stroke-time testing of MOV 1CA-42B at McGuire, Unit 1 is justified on the basis that compliance with the test requirement in the applicable ASME Code would result in hardship without a compensating increase in the level of quality and safety. On this basis, the licensee's request for temporary relief is authorized pursuant to 10 CFR 50.55a(a)(3)(ii). This relief is authorized until the end of Cycle 16 for McGuire, Unit 1 (on or about March 5, 2004) or the plant enters a condition permitting the replacement of the valve stem in 1CA-42B, whichever is sooner.

Principal Contributor: Thomas G. Scarbrough

Date: August 25, 2003

McGuire Nuclear Station

cc:

Ms. Lisa F. Vaughn  
Legal Department (ECIIX)  
Duke Energy Corporation  
422 South Church Street  
Charlotte, North Carolina 28201-1006

County Manager of  
Mecklenburg County  
720 East Fourth Street  
Charlotte, North Carolina 28202

Michael T. Cash  
Regulatory Compliance Manager  
Duke Energy Corporation  
McGuire Nuclear Site  
12700 Hagers Ferry Road  
Huntersville, North Carolina 28078

Anne Cottingham, Esquire  
Winston and Strawn  
1400 L Street, NW.  
Washington, DC 20005

Senior Resident Inspector  
c/o U.S. Nuclear Regulatory Commission  
12700 Hagers Ferry Road  
Huntersville, North Carolina 28078

Dr. John M. Barry  
Mecklenburg County  
Department of Environmental  
Protection  
700 N. Tryon Street  
Charlotte, North Carolina 28202

Mr. Peter R. Harden, IV  
VP-Customer Relations and Sales  
Westinghouse Electric Company  
6000 Fairview Road  
12th Floor  
Charlotte, North Carolina 28210

Ms. Karen E. Long  
Assistant Attorney General  
North Carolina Department of  
Justice  
P. O. Box 629  
Raleigh, North Carolina 27602

Mr. C. Jeffrey Thomas  
Manager - Nuclear Regulatory  
Licensing  
Duke Energy Corporation  
526 South Church Street  
Charlotte, North Carolina 28201-1006

NCEM REP Program Manager  
4713 Mail Service Center  
Raleigh, NC 27699-4713

Mr. Richard M. Fry, Director  
Division of Radiation Protection  
North Carolina Department of  
Environment, Health and Natural  
Resources  
3825 Barrett Drive  
Raleigh, North Carolina 27609-7721

Mr. T. Richard Puryear  
Owners Group (NCEMC)  
Duke Energy Corporation  
4800 Concord Road  
York, South Carolina 29745