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GOULDS PUMPS

December 20, 2004

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington DC 20555

References:
(1) LER 2004-001-01, Perry Nuclear Power Plant, Docket No. 50-440, PY-CEI/NRR-2830L, Lew W. Myers to NRC, September 18, 2004
(2) Goulds Letter from Shashank Patel to NRC, November 29, 2004

Goulds Pumps Inc. ("Goulds"), a subsidiary of ITT Industries, has revised its submittal to the U.S. Nuclear Regulatory Commission ("NRC") dated November 29, 2004, in order to incorporate new information that recently came to light. That submittal and this revision address Goulds' position on Licensee Event Report ("LER") 2004-001-01, filed by First Energy Nuclear Operating Company on September 18, 2004, regarding an event that occurred at the Perry Nuclear Power Plant ("PNPP") on May 21, 2004. For purposes of administrative ease and clarity, Goulds is providing the NRC with an entire copy of its revised report herewith. This submittal completely supercedes the November 29, 2004 document.

As a threshold matter, Goulds reiterates its position that it should not be the focus of a 10 C.F.R. Part 21 report submitted by PNPP as part of an LER submitted to the NRC (Reference 1). In addition, it does not appear that a 10 C.F.R. Part 21 designation is appropriate in that PNPP and the NRC have concurred that the failure of Emergency Service Water ("ESW") Pump A on September 1, 2003 was of very low safety significance. (See Reference 1 and NRC Inspection Report 05000440/200413 dated October 24, 2004.) Goulds reiterates that NRC Part 21 reporting requirements are applicable only to a defect that represents a substantial safety hazard.

Specifically, as detailed in Attachments 1 and 2, the ESW pump shaft couplings provided to Enertech by Goulds for use at PNPP are of robust design. The May 21, 2004, ESW A pump failure at PNPP – as well as the preceding failure at PNPP on September 1, 2003 – was not caused by Goulds actions and/or a defective pump design. Rather, as set forth in Attachments 2 and 3, the pump failure was the result of

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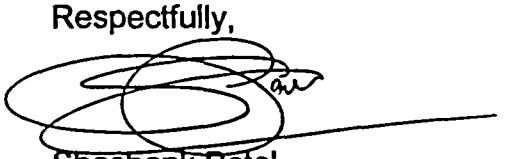
installation modifications (without Goulds' knowledge), which damaged the keyway and caused surface anomalies that were susceptible to stagnation-induced corrosion and resultant stress corrosion cracking.

A Goulds service entity contracted by Enertech (without Goulds' factory knowledge) did participate in ESW A disassembly at the PNPP on September 2 and 3, 2003; however, the representative left the site (without further contact with PNPP) on September 3, 2004. Goulds was not present on site for pump reassembly on September 4 and 5, 2004 when the coupling keyway issues arose. Nor was Goulds involved in correcting the fit-up issues presented by keyway dimensional inaccuracies. This matter, along with a summary of Goulds' position regarding this matter, is provided in Attachment 1. Attachment 2 provides a detailed technical report that supports these positions. Attachment 3 provides a root cause evaluation performed by Rush Engineering Inc. on behalf of Goulds. Please note that Attachments 2 and 3 have been labeled "Proprietary Information Pursuant to 10 C.F.R. 2.390(a)(4)" due to commercial sensitivity. The appropriate affidavits also are included, as appropriate. If the NRC disagrees with this designation, Goulds respectfully requests the opportunity to address areas of dispute and to be allowed to redact this report, as necessary, prior to any public release. Please contact me with any questions regarding this submittal. I can be reached at (562) 949-2113.

Respectfully,



Shashank Patel
General Manager, Vertical Product Operations
Goulds Pumps Inc.

cc: C. Vernon Hodge
J. Dobson, Assoc. General Counsel, ITT Industries, Inc., Fluid Technology Division
Roberto Brenes, Goulds Pumps, Inc.,
R. Allen, Rush Engineering

Attachments:

(1) Corporate Summary by Goulds Pumps, Inc.
(2a) Failure Mode Technical Analysis Rebuttal by Rush Engineering, Inc., Text
(2b) Failure Mode Technical Analysis Rebuttal by REI, Appendices 1 and 2
(3) Review of PNPP Root Cause Analysis of ESW 1P45C0001A by REI

1) Corporate Summary by ITT

Attachment 1

A. Background

On May 21, 2004, at 0150 hours with the Perry Nuclear Power Plant ("PNPP") operating in MODE 1 at 100 percent power, the PNPP declared Emergency Service Water ("ESW") pump A "inoperable" due to a pump shaft coupling failure. Subsequent to that failure, First Energy Nuclear Operating Company ("FENOC") issued a Licensee Event Report ("LER") to the Nuclear Regulatory Commission ("NRC"), which stated in part that Goulds had provided pump shaft couplings to PNPP that were defective.[1]

The PNPP LER states in relevant part:[2]

> The nature of the deviation is that a critical component, the ESW pump shaft sleeve coupling, is marginally designed. The coupling is constructed of A-582 Type 416 stainless steel material. The material from which the coupling is constructed is tempered to obtain elevated hardness, however, the higher hardness increases the materials susceptibility to intergrannular stress corrosion cracking (IGSCC). The operating stress in the installed coupling is significantly high such that high transient motor start-up torque and improper tolerance of parts result in stress levels sufficient to promote stress corrosion cracking of the coupling....
>
> The supplied parts with unacceptable dimensional variations is a deviation in the critical characteristics of the coupling's fabrication. In addition, the material choice and technical requirement to harden the material are questionable given the fact that corrosion was occurring in an environment with less chloride content than the original procurement specification. The material chosen with the heat treatment as specified are unacceptable from a design perspective. It has been concluded that the dimensional variations (fabrication deviation) and poor material selection (design deficiency) issues described herein require reporting under 10CFR Part 21.

Failure Number One

Actually, two failures are addressed in the subject LER. The first ESW A pump coupling problem began in July 1997 due to excessive stresses caused by PNPP installation errors.[3] This led to a failure of a shaft coupling sleeve on September 1, 2003 (74 mos. later), as identified and acknowledged by PNPP in the LER.[4] Because of the improper installation, the couplings experienced an increase in local stresses by more than 35% due to the reduction in the bearing area of the top key within the coupling. Though improperly installed with a theoretical load increase exceeding 35%, the couplings still operated without failure for seventy-four months (~9140 hours) a testament to their robustness and design margin.

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1 See LER-2004-001-Rev. 1 and associated 10 CFR Part 21 Report dated September 18, 2004; PY-CEI/NRR-283OL; from L. Meyers to NRC; pp 6-8.

2 Id., p. 6.

3 Note that the coupling installations on ESW A had in excess of 12 years of IGSCC free operation prior to an improper installation in July 1997.

4 LER p. 8 (Previous Similar Events).

PNPP corrective actions regarding the 1997 installation and the remedial actions noted in the LER demonstrate a clear concern by PNPP for the potential of stress corrosion cracking with the 416SS material and with faulty PNPP installation procedures. Goulds agrees with the acknowledged impact of installation procedures, but does not agree with PNPP that the 416SS material also was at fault. Goulds suggests that stagnation-induced corrosion, which resulted from the pump not being used for more than approximately one hour per month with no effective corrosion prevention in place, was a significant contributor to this coupling failure.

Failure Number Two

The second improper installation occurred on September 4, 2003, when entities (other than Goulds) modified the design integrity of the line shaft couplings by broaching and filing the coupling sleeves. These actions have been acknowledged by PNPP in various documents discussed herein. This led to the second failure of ESW A on May 21, 2004, the focus of the PNPP LER.[5] Goulds does not believe that the significance of several key contributors, including these PNPP activities, is adequately addressed in the LER.

In September 2003, Goulds supplied couplings to Enertech for use at PNPP. Goulds was aware prior to shipping that the couplings it sent to Enertech in September 2003 exceeded drawing specifications by .001 to .002 inches regarding the width of the keyway. However, the dimensional discrepancy was approved by Goulds Engineering as being acceptable based on the continued ability of the couplings to satisfy the required form, fit and function. This discrepancy was documented on a Goulds nonconformance report and provided to Enertech. The nonconformance report was subsequently submitted to PNPP. PNPP directed, via e-mail, that the coupling be shipped with the outstanding nonconformance. However, Goulds was not aware when it shipped the couplings to Enertech that they also were not consistent with the drawing specification regarding keyway depth. Measurements taken prior to shipment from Goulds were consistent with its commercial processes and focused on keyway depth at the end of the coupling. The end result is the arrival of couplings at PNPP which had multi-directional dimension errors which had to be addressed during installation to facilitate pump shaft/coupling assembly.

The appropriate responses by PNPP on September 4, 2003, once the assembly difficulties were encountered, would have been to request new couplings from Enertech or to consult with Enertech regarding a solution which would not adversely impact pump operation. Unfortunately, the machining actions taken by parties other than Goulds caused the ultimate corrosion-induced failure of the coupling sleeve. This action by parties other than Goulds should not be assigned to Goulds in a 10 CFR Part 21 setting as the cause of the coupling failures. More directly, machining by parties other than

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[5] Also noted by PNPP, ESW pump B continued to operate until removed from service for inspection and upgraded to the new PNPP coupling configuration.

Goulds adversely affected protections against corrosion and stress concentration that were part of the original coupling design.

We note that PNPP states in various documents that a vendor representative was on site during the sleeve machining which led to the failure. Goulds has researched this claim and notes that a representative from Cleveland Pro Services Center (Pro Serv), part of the Pro Services Division of Goulds Pumps, Inc., was requested by Enertech just after the September 1, 2003, failure to be on site. Enertech directly hired this representative without the knowledge of the Goulds division that originally supplied the subject pumps. This is not significant, however, because the Pro Serv representative ultimately was tasked only with assisting in the disassembly of the pump and according to his field records, departed the site on September 3, 2004. This is a noteworthy date in that based on our records, the sleeve couplings of interest were not manufactured until September 3, 2004 at another location, and were not delivered to PNPP via Enertech until September 4 and 5, 2004. Based on this timing, and based on notes taken by the Pro Serv representative at the time, he was not involved in the decision to machine the out of tolerance couplings.

It appears that PNPP's reference to a vendor representative being involved in machining the couplings actually refers to another subcontractor hired by Enertech (also unbeknownst to Goulds at the time and unrelated to Goulds). Specifically, we have confirmed that two representatives from Rotating Technology Services (RTS) were on site from September 3 through September 5, 2004. The trip report by one of the RTS representatives states for September 4, 2004, "Tonight worked on rebuilding pump. Installed top shaft and two columns, had to work on keys and keyway. Installed line shaft and column, installed pump head and leveled, torqued all bolting...." This comports to the time period that the machining occurred. Goulds has not been able to obtain other details regarding whether, as PNPP claims, the RTS representative was directly involved in advising regarding the machining of the ESW A coupling sleeve. That would be a matter between Enertech, RTS and PNPP. It is clear, however, that Goulds did not have a role in that advice, if provided by those entities.

Goulds believes that the importance of the field machining operations on September 4, 2003 must not be minimized. These actions adversely impacted margins of safety built into the coupling design by Goulds and set the stage for subsequent failure of the component initiated by stagnation induced corrosion. PNPP had alternatives to broaching and filing the stress sensitive coupling sleeve, e.g., the keys could have been undersized to accept the tight keyway height without jeopardizing the inherent safety factors of the design.

Perry Precedent

Goulds is unaware of any previous signs of IGSCC/corrosion in 19 years of operation of these couplings at PNPP. The absence of a similar failure on ESW B, which operated under the same environmental conditions, as pump A with the same type of coupling, begs the question, "What was different about ESW A that caused repeated failures?" Goulds answers this question in this submittal by stating that the difference is the PNPP installation difficulties in 1997 and the machining that occurred in September 2003. Installation of the ESW B pump couplings was in accordance with licensee design criteria – Pump A was not.

The PNPP LER notes the contribution of the operating environment to pump coupling failure and the related use by Goulds of inappropriate materials. The attached technical evaluation demonstrates that the couplings operated successfully from 1985 to 2003 in the PNPP forebay environment without failure or signs of IGSCC with the periodic biocide and chlorination treatment on two identical pumps. Through inadequate attention to corrosion inhibitors and the remedial effects of stirring the stagnant water in the ESW system on a more frequent basis, e.g., once per week, PNPP failed to credit the safety factors of an otherwise robust design. The corrosion issues, in concert with inappropriate actions during installation, caused the operating conditions to exceed the compromised safety margin.

We conclude that PNPP created the potential for the adverse operating environment which accelerated any corrosion type failure based on (1) PNPP's own admission of inadequate installation processes (the first failure), (2) inappropriate machining of the coupling when it was determined that dimensional "corrections" were needed before the coupling(s) could be installed, thereby leading to the second shaft coupling failure and (3) PNPP's apparently inadequate attention to the need to ensure protection against corrosion prior to either failure. Goulds does not challenge that the attempt to provide a replacement coupling in the time-frame demanded by its client may have led to the provision of a non-conforming coupling to Enertech. However, Goulds believes that it should not be held at fault for inappropriate methods used by parties other than Goulds in an attempt to remedy the problem without first consulting Goulds.

B. The 10 CFR Part 21 Test

Title 10 of the Code of Federal Regulations, Part 21, "Reporting of Defects and Noncompliance" requires "an individual director or responsible officer of a firm, constructing, owning, operating or supplying the components of any facility or activity...who obtains information reasonably indicating...(b) that the facility, activity, or basic component supplied to such facility contains defects, which could create a substantial safety hazard, to immediately notify the Commission...."[6] Emphasis added. The attached technical evaluation demonstrates that the basic component defect, which

[6] 10 CFR § 21.1

led to the ESW pump coupling, failure was not due to Goulds actions. More specifically, the component supplied by Goulds for installation in 1997 failed on September 1, 2003 due to installation errors at PNPP. Furthermore, the ESW pump coupling installed on September 4, 2003, by parties other than Goulds, failed due to modifications not approved by Goulds but made after the coupling components had been received from Enertech on 24-hours notice to provide the replacements. While Goulds acknowledges that an ESW pump is very important to plant operation, even PNPP and the NRC have acknowledged that the subject failures were of very low safety significance.[7] The presence of a substantial safety hazard is necessary to support a valid 10 C.F.R. Part 21 report.

Goulds would add that its actions, more specifically, its supplying of a coupling to Enertech in September 2003, with dimensional concerns, did require follow-up engineering action. Entities other than Goulds chose to make machined modifications to the coupling component, which as discussed below, by PNPP's own admission adversely affected component stress limitations.[8] While it may be fortuitous, the component, as supplied by Goulds to Enertech, could not be installed as-is and therefore, could not potentially cause a substantial safety hazard because dimensional clearance problems prevented pump reassembly. Thus, Goulds' activities could have caused a delay in returning the pump to operation (until a new component could be manufactured and transported to Enertech/PNPP), but its activities did not cause the actual pump failure. When PNPP made the decision not to wait for re-manufacture of the component or re-engineering of the situation by Enertech or Goulds and re-machined (or had re-machined) the couplings itself, parties other than Goulds created the condition that led to coupling failure.

C. Discussion

The following discussion summarizes other key points made by the attached technical evaluation and root cause documents.[9]

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7 Note that notwithstanding PNPP's claim that this matter warranted a 10 CFR Part 21 report, which requires the defect to represent a significant safety hazard, PNPP and the NRC also have concluded that this event is of very low safety significance. Goulds finds these dual positions to be inconsistent.

8 See LER at p. 4, which states, "The reduction in the keyway radius has a significant impact on the stress concentration which translates to the applied stress." Contrary to PNPP's subsequent statement that "This could not be proven to be manufacturer or assembly techniques," Goulds believes that the cause of the reduction in keyway radius clearly was created through the filing performed by parties other than Goulds.

9 Goulds design changes were needed due to corrosion during the first seven years of operation that caused seizing of threaded couplings.

1. Procurement of the Shaft Couplings

PNPP initially procured the ESW pump shaft configurations (i.e., keyed couplings) in 1984. PNPP reviewed the Goulds-proposed design in 1984 and states "Goulds Pumps drawing C2359 on Keyed Line shaft coupling Assembly has been reviewed by CEI [the prior operator of the PNPP] and the new shaft design is acceptable...Upon written confirmation from Goulds that the new shafts meet all analytical requirements of SP-501 a change order to our Purchase Order P-8744 will be issued...."[10] As discussed herein, Goulds did perform its analyses based on the operating conditions provided by CEI at the time. These analyses demonstrate robust design and conclude that the materials selected (i.e., 416 SS) are appropriate as designed. A rigorous discussion of the design criteria is provided in Attachment 2, with further discussion regarding improper motor load specifications made by PNPP provided in Attachment 3. Should the NRC desire to review the detailed concerns regarding operating stresses, Goulds has provided herein sufficient verification of the robustness of the original (1977) and modified (1984) pump shaft components, as well as the present (2004) installation.

2. Environmental Issues

The actual operating environment for the couplings differed from what Goulds had anticipated when utilizing the 416 SS material in the coupling design. The variance is discussed in substantial detail in Attachment 2. Briefly, PNPP specified the operating environment in the forebay of the ESW intake. However, PNPP failed to notify Goulds that the ESW systems have a 2% normal duty cycle. This means that PNPP should have also defined the non-operating environment of the ESW pump and piping systems. The stagnant conditions within the pump are potentially more corrosive by several orders of magnitude than the conditions outside the pump in the fore bay as specified by PNPP. This is what caused the pitting PNPP found on the PNPP ESW A sleeves. Moreover, the variance in the specified environment and the actual environment should have been anticipated by PNPP, and specified in the original purchasing documents. Had that been done, then Goulds would have made recommendations regarding safeguarding the pump shaft material during long stagnation related states. Goulds has been unable to identify any documentation wherein PNPP informed it that the couplings would see a stagnant vapor environment for extended periods. Such an environment has significantly different corrosion consequences.

Based on our review of PNPP documents, it does not appear that PNPP has taken into consideration the corrosion potential of the stagnating water within the pump as part of its design criteria and subsequently its preventative maintenance program. The potential for IGSCC is dependent upon long periods of soaking during corrosion enhancing periods of stagnation that result in acute stress risers during the short burst of pump operations for shutdown uses of the emergency service water system. IGSCC is simply the final stages of brittle corrosion fracture in high strength 416 stainless steel.

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[10] Letter from A. P. Pusateri, Responsible Engineer and P. A. Nichols, Lead NSSS Engineer, Cleveland Electric Illuminating Company (CEI); PY/SO-501-22783; February 22, 1984.

This final mode of failure is a main branch of an environmental issue that has a root cause in the source locations where IGSCC action can take hold. The source locations were provided by stress concentration due to key position in the first failure and scarred surfaces at the keyway in the second failure. Improper attention to corrosion potential during installation is at the root cause for the two coupling failures.

PNPP notes in its LER the following:[11]

> An environment conducive for stress corrosion cracking is necessary for the failure mechanism. The ESW pumps take suction from the fore bay that is fed from Lake Erie. Lake Erie water chemistry includes 20-30 parts per million (ppm) of chlorides. The pumps are subjected to monthly chemical treatment for biological control, intermittently increasing the chloride level to 30-40 ppm. The location of the first two couplings closest to the pump-to-motor rigid adjustable coupling are above the normal sump level. As such, these two couplings are out of the environment when the pumps are not running. **This has the potential of concentrating contaminants in the coupling/shaft interface region making it potentially more susceptible to SCC.**

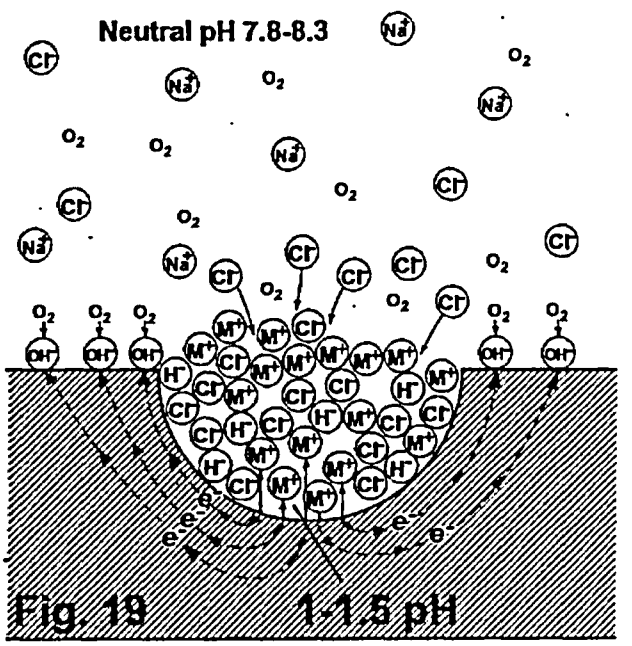
Emphasis added.

Emergency Service Water Partial Pump Assembly Procurement Specification No. PRS-1550, Rev 5.

2.10.3 The pump components shall be compatible with lake water that has passed through 3/8" mesh traveling screens having the chemical characteristics below:

1.pH	7.8 to 8.3
2.Total Dissolved Solids	179 to 260 ppm
3.Total Suspended Solids	3 to 25 NTUs
4.Total Hardness (CaCO3)	130 to 145 ppm
5.Total Alkalinity (CaCO3)	80 to 90 ppm
6.Average Chlorides	30 to 60 ppm

As previously stated and further discussed herein, the standby environment for the shaft couplings was inconsistent with conditions initially provided to Goulds as the operating environment. Goulds was not asked to consider the standby conditions until after the filing of the LER by FENOC. After proving that the coupling design met all safety factor criteria, Goulds had to investigate the standby environment as the potential root cause.



Autocatalytic processes occurring in a corrosion pit. The metal, M, is being pitted by an aerated NaCl solution. Rapid dissolution occurs within the pit, while oxygen reduction takes place on the adjacent surfaces. [REI definition of stagnant pool corrosion.]

11 See LER, p. 4.

At the time of the first failure event, PNPP had not yet identified the standby environment involved when the couplings are not continuously immersed in a flowing stream. Furthermore, PNPP had not provided Goulds information during the design stage that would have placed it on notice that this potentially important factor would be present. As such, vapor likely was created within the pump column and corrosive tendencies significantly increased with no remedial actions identified nor an opportunity given to Goulds to assist PNPP to resolve potential corrosion related problems. The vapor within the pump column included free oxygen and chlorine ions that were inclined to condense on the top of the exposed line shaft where gravitational effects would concentrate corrosive ions at the top coupling sleeve after normal stagnant pool action in the pump column. This situation has been addressed in significant detail in Attachment 2, Section 5.0 *Forebay Environment Issues.* (See the discussion on page 25 regarding Fig. 19 provided above.)

In summary, while stagnant pool corrosion is not a desirable condition, based upon nineteen years of failure free operation regarding the couplings, the autocatalytic processes would have been acceptable were it not for the local stress concentration and ion attraction within surface flaws in the keyway of the coupling sleeve caused by improper machining. The normal "ion pumping" action of the trapped vapors in the pump column resulted in stress intensities at the corrosion pits reaching the Stage II Plateau Velocity Region for IGSCC within a matter of weeks of operation. Consequentially, stagnant pool corrosive degradation of the coupling sleeve led to IGSCC Stage III Terminal Fracture and then rupture of the sleeve under normal operating loads where extreme stress concentration factors tipped the scale in favor of intergranular stress corrosion cracking induced failure. The above conditions, while present throughout failures one (7/24/97-9/1/03) and two (9/5/03-5/21/04), were overshadowed during the analysis of failure one due to the acknowledged installation errors. However, for failure two, these environmental conditions had a direct impact. In both cases the subsequent analyses of IGSCC terminal fracture overshadowed the potential for corrosion during standby conditions. This led the PNPP to mistakenly identify IGSCC as the root cause of failure, for which the 416SS material was an essential participant.

3. Extent of Use of the Coupling in Industry

As discussed in Attachment 2, since 1985, Goulds has provided several thousand couplings to many users in both the nuclear and non-nuclear industry using 416SS stainless steel. The use of this coupling at PNPP is not materially different than its use in other nuclear plants or other industries given its application in a service water pump. Neither Goulds nor PNPP have identified any failures of this coupling similar to what occurred at PNPP, save one incident at V. C. Summer in which they acknowledged that a threaded coupling was damaged due to improper installation and failed after more than four years of standby operation.

In comparison, the Fermi plant has been operating ten Goulds pumps for twenty years each that are in Lake Erie water service with the 416SS shaft material. Goulds believes that this concurrent experience, without relevant incident, validates the design criteria employed by Goulds for Lake Erie water service. This begs the question, why Perry and not elsewhere?

As discussed in Attachment 2, a historical review of keyed pump line shaft couplings similar to what was used at PNPP concludes that out of 6,228 general industry pumps (nuclear and non-nuclear applications), 324 keyed coupling pumps, 168 nuclear-use pumps and 24 keyed coupling nuclear-use pumps, only one pump (PNPP's ESW A pump) has experienced a stress corrosion cracking induced failure in a keyed coupling. With the extenuating circumstances of stagnation conditions and improper installation at PNPP, Goulds concludes that its design is sound and is not representative of a defect.

Goulds believes that through information provided in Attachments 2 and 3, it has been demonstrated that the "defect" was not created by Goulds on September 4, 2003 when parties other than Goulds modified the coupling and that the decision to use the coupling after its modification shifts responsibility for the resultant pump failure to parties other than Goulds. Tight dimensions in the keyway supplied by Goulds did not cause the pump failure because it could not be installed in the pump shaft as received. However, the damaged keyway, as modified by parties other than Goulds involved in this decision, caused surface anomalies susceptible to stagnation induced corrosion and resultant SCC was installed in the pump and subsequently contributed to the pump failure. Goulds did not supervise, nor inspect for adequacy, the modified keyway prior to installation. Nor did Goulds recommend the coupling sleeve modification as an appropriate short-term remedial action. More specifically, the Pro Serv representative contracted by Enertech (without Goulds' knowledge) who was on site on September 2 and 3, 2004, was only focused on pump disassembly and left before reassembly had begun.

On September 3, 2003, the PNPP BETA materials laboratory and PNPP notified the maintenance personnel that used couplings from ESW A could have been damaged by IGSCC and new couplings must be acquired to replace the potentially damaged couplings that had seen service over the previous six years. This led to the 24-hour turn around of the couplings that were damaged on September 4, 2003. Subsequent analysis by PNPP BETA verified the existence of incipient IGSCC in the ESW A used couplings (M-03294), and confirmed the need for replacement sleeves.

The PNPP BETA analysis results of M-03284 of September 3, 2003 reported IGSCC and led to the removal of the used ESW A couplings after installation, as mentioned above. The subsequent analysis of M-03294 demonstrated substantial "spongy" metal characteristic of stagnant pool corrosion from which all incipient SCC generated. <u>One of these coupling sleeves (#3) was found to have 1800 ppm chlorine in OD deposits, or thirty (30) times the concentration specified in their purchasing documents.</u> Goulds believes that PNPP BETA should have acknowledged that the IGSCC resulted after

non-stress related corrosion that was the root corrosion leading to the terminal fracture phase of IGSCC.

D. Cause(s)

Goulds had prepared its own cause assessment for PNPP, prior to the LER submittal, regarding the subject events. This document, which is provided as Attachment 3 (as modified), concludes:

1. The root cause of the September 1, 2003 coupling was inappropriate coupling assembly procedures by PNPP, and

2. The root cause of the May 21, 2004 failure was improper machining of coupling components by parties other than Goulds.

E. Conclusions

1) The coupling provided by Goulds' is a robust design.

2) When a robust component made of 416SS is scratched and placed in an autocatalytic corrosive environment, the otherwise robust component may fail prematurely if surface damage occurs in areas subject to tensile stress.

3) In this light, Goulds concludes as discussed in Attachments 2 and 3, that the May 21, 2004 ESW pump A coupling failure and the preceding failure occurring on September 1, 2003 at the PNPP were not caused by Goulds actions and do not represent a defect caused by Goulds.

4) As such, if the NRC concludes that a generic issuance to the industry is appropriate, Goulds requests that its perspective be appropriately represented in any such issuance.

5) Notwithstanding the above positions, a 10 C.F.R. Part 21 report is not appropriate in this instance since PNPP and the NRC agree that the pump failure had very low safety significance.

6) If the NRC determines that a generic issuance is necessary, Goulds requests a meeting with the NRC to better ensure that its perspectives are clearly understood by the NRC and that any recommended corrective actions regarding its supplied product are appropriate.