

**DRESSER-RAND - Wellsville Operations  
FINAL REPORT 10CFR PART 21  
REPORT OF A POTENTIAL SAFETY HAZARD**

Report No. 41  
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PREPARED BY: <u>George Hermann <i>G. Hermann 11-21-01</i></u>	Date: <u>11/21/01</u>
TITLE: <u>Nuclear Product Engineer</u>	File No: <u>Various</u>
PART NAME: <u>Terry Turbine</u>	Serial No: <u>See Attached</u>
<u>Gimpel Trip Throttle Valve Screw Spindle</u>	Type: <u>GS &amp; ZS Frames</u>
REVIEWED BY: <u><i>G. Hermann 11/21/01</i></u>	Ref: <u>Aux. Feed / RCIC</u>
	DR Part No: <u>105245A18</u>
	DR Dwg No: <u>105245A</u>
	Rev. Level: <u>J</u>

**1. DESCRIPTION OF DEFECT OR NON-COMPLIANCE**

Material substitution of grade 12xx (tested as 1212 & 1215) steel in place of grade 1018 carbon steel specified by design.

Additional background information provided on Pages 2 & 3.

**2. POTENTIAL SAFETY HAZARD OR NON-COMPLIANCE**

Substitution of material could contribute to screw spindle failure resulting in isolation of steam from emergency feedwater pump turbine rendering it unable to perform its safety-related function.

**3. NUMBER AND LOCATION OF ALL COMPONENTS**

See Attached Listing – Pages 4-7.

<b>4. CORRECTION ACTION BY:</b>	<u>N/A</u>	<b>COMPLETED BY</b>	<u>N/A</u>
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Dresser-Rand believes that effective controls are currently in place to prevent recurrence of this Type of substitution. The current level of quality and material control on these components far exceeds those in place at the time of this subvendor material substitution, and is verified and maintained through both the Gimpel and Dresser-Rand quality systems. The discovery of this defect does serve as an important example and reminder that continued vigilance and attention to rigorous quality control standards must be maintained throughout the entire chain of component supply.

**5. ADVICE TO EFFECTED CLIENT RELATED TO THIS REPORT**

- Units using Gimpel T&T Valves identified as affected in the attached serial number listing, which may have the original screw spindle installed should replace the screw spindle at their next maintenance opportunity. The original screw spindles should be discarded. A listing of affected valve serial numbers is attached as pages 4-7.
- It is additionally recommended that any Gimpel screw spindles in-stock or in-service which may have been supplied in the 1974-75 timeframe be treated as suspect and be tested to confirm that the material is correct. (Grade 1018 Carbon Steel).

*IEI9*  
*Rec'd 01/18/02*

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**Background:**

Following the failure of an installed screw spindle in the trip valve of the Catawba unit #2, May 25, 2000 the material of the failed screw was subsequently analyzed and found to be Grade 1212 steel in place of the design specified grade 1018 carbon steel material.

Steels in the Grade 12xx family are known as re-sulfurized, steels. The structure of these steels is such that there are banded inclusions within the material resulting in directional reduction of impact properties. In this application this material is less desirable than the design 1018 carbon steel material which does not have banded inclusions.

Following testing, the failed screw spindle was returned to Gimpel for analysis. Gimpel gave verbal confirmation that the screw material was incorrect (Grade 1213 and 1215 steel) at the Terry Turbine Users Group meeting on July 18, 2001. Gimpel had traced the supplied material to a single lot of approximately 50 original screw spindles manufactured in 1974. The material was manufactured and certified correct by Royal Screw & Machine Co. who was Gimpel's supplier at that time.

Following the incident at Catawba, additional information was received indicating that a screw spindle installed in Palo Verde Unit 1 was found cracked in 1992, and was determined to be grade 1213 steel.

A third failure was also reported to have occurred at the Callaway site in the late 1980's. The root cause of this failure was determined to be a specific problem with the Limitorque valve actuator. In this incident, the torque switch failed to stop the motor operator when the valve reached and subsequently passed full open position. The material of this failed spindle screw is unknown.

Dresser-Rand tested the material of a functional, undamaged screw spindle removed from an in-house test valve (serial number 74-12243) and determined the material was grade 1212.

Gimpel has subsequently performed testing of a spindle screw specifically manufactured from 1215 material for increased validation of its functionality. The test valve was cycled 300 times (equivalent to at least 10-15 years of service). No indication of failure was found.

It is unknown whether the material substitution was a contributing factor in the failures of the spindle screws at these sites. The trip valves in question have been in operation for many years, and although the material used is less desirable in this application than the design specified material, the limited number of failures indicates that the immediate risk of continued operation is minimal. The testing performed by Gimpel also supports this assertion.

**Applicability:**

Gimpel has provided information linking the supply of incorrect material to a single lot of material purchased and supplied in approximately 50 valves in the 1974 timeframe. The subvendor material certifications provided with this lot of material, in fact certified that the material was the correct grade (1018). Gimpel provided written confirmation of this defect and the following listing of affected valves to Dresser-Rand on 10/11/01.

According to Gimpel, the Trip & Throttle valve serial numbers affected are: 74-12201-01 to 74-12244-02 inclusive, 78-13215-01, and 78-13091-01. This list has been expanded and revised due to the factors below. It is recognized that the full listing identifies slightly in excess of the actual 50 valves affected; however the valves identified are the most likely to have the nonconforming material.

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It is important to note that physical verification of the valve serial number on the valve or testing of the screw material is the ONLY positive means of identifying an affected valve. The site information listed in the attached table is not 100% accurate as order processing at Terry Turbine resulted in various re-assignments of the supplied valves. As an example, the test valve currently located at Dresser-Rand Wellsville was originally assigned to St. Lucie unit 2.

In addition, when major valve re-work was performed by Gimpel, such as adding a motor operator to an existing valve, the valves were re-numbered, although most components remained unchanged. Whenever possible the attached listing of Gimpel Valves lists these serial number changes.

It is also possible that nonconforming spindle screws or trip valves originally supplied to a site which was never commissioned could have been installed or maintained as spares in another site.

**Effect Of Failure:**

Failure of this component results in the T&T valve disc dropping onto its seat, thereby isolating steam from the emergency feedwater pump drive turbine. This renders the turbine inoperable although limit switch indication (when present) may indicate that the valve is open.

**Additional Information:**

Also attached (Page 8) is Gimpel documentation including the procedure for replacing the spindle screw, as well as recommendations for valve inspection and maintenance activities.

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**APPLICABILITY:**

Because both original valves and spare valves / spindle screws could be affected, the attached listing of affected sites includes **ALL nuclear sites supplied with Gimpel valves on their Terry Turbines**. Note that the valve serial numbers are **NOT** correctly matched to the turbine serial number in all cases. **ALL** listed sites **MUST** verify the actual valve serial number on their unit and address this issue accordingly. Valves in bold and marked with an asterisk ( \* ) are affected.

INSTALLATION LIST  
NUCLEAR POWER PLANTS

GIMPEL Job / Valve #	Valve Size	Turbine Serial No.	Owner	Valve Location
67-10154-01	3-900	35691A	PECO / GE	Peach Bottom 2
67-10154-03	3-900	35692A	PECO / GE	Peach Bottom
67-10154-04	3-900	35686A	TVA	Browns Ferry 2
67-10154-05	3-900	35687A	TVA	Browns Ferry 3
67-10155-01	2-900	35688A	Commonwealth Edison	Quad Cities
67-10155-02	2-900	35685A	TVA	Browns Ferry 1
67-10155-03	2-900	35938A	NOW 80-13710-01	Vermont Yankee
67-10155-04	2-900	35689A	Commonwealth Edison	Quad Cities
67-10190-01	2-900	35690A	Northern States Power	Monticello
68-10284-01	2-900	35693A	NOW 81-13978-01	Pilgrim 1
68-10284-02	2-900	35939A	Nebraska Public Pwr.	Cooper
68-10284-03	2-900	35940A	NOW 82-14098-01	Fitzpatrick
68-10371-01	2-900	36181A	Wisconsin Power	Point Beach
68-10372-01	2-900	36182A	Wisconsin Power	Point Beach
68-10386-01	3-900	36178A	Virginia Electric	Surry 1
68-10386-02	3-900	36179A	Virginia Electric	Surry 2
68-10416-01	4-900	36318A	Virginia Electric	Surry 2
68-10416-02	4-900	36319A	Virginia Electric	Surry 2
68-10416-03	4-900	36320A	Virginia Electric	Surry 2
68-10416-04	4-900	36321A	Virginia Electric	Surry 2
69-10539-01	3-900	36555A	Duquesne Light Co.	Beaver Valley 1
70-10908-01	3-900	37008A	Northern States	Prairie Island 1
70-10908-02	3-900	37008B	Northern States	Prairie Island 2
70-10910-01	3-900	37035A	Wisconsin Public Svc.	Kewaunee
71-10961-01	4-900	37168A	Sacramento Util. Dist.	Rancho Seco
71-10963-01	3-900	37059A	Virginia Electric	North Anna 1
71-10963-02	3-900	37059B	Virginia Electric	North Anna 2
71-11013-01	4-900	37273A	Northeast Utilities	Millstone 2
72-11371-01	4-900	37665A	Arkansas Nuclear	ANO
72-11372-01	4-900	37686A	Toledo Edison	Davis Besse
72-11372-02	4-900	37686B	Toledo Edison	Davis Besse
73-11690-01	3-900	37948B	NOW 83-14276-01	Duke - McGuire 2
73-11690-02	3-900	37948A	NOW 81-13951-01	Duke - McGuire 1
73-11697-01	4-900	38117A	Electricite De France	Fessenheim
73-11697-02	4-900	38117B	EDF	Fessenheim
73-11715-01	3-900	38032A	Cancelled	N. Anna 3 used as 73-11759
73-11715-02	3-900	38032B	Cancelled	N. Anna 4 used as 73-11759
73-11759-01	3-900	38032A	Virginia Electric	North Anna 3

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73-11759-02	3-900	38032B	Virginia Electric	North Anna 4
* 74-12201-01	4-900	38170A	Spain	Cofrentes
* 74-12202-01	4-900	38171A	Niagara Mohawk	Nine Mile Point 2
* 74-12203-01	4-900	38172A	Taiwan Power Co.	Kuo Sheng
* 74-12204-01	4-900	38173A	ENL	Alto Lazio
* 74-12205-01	4-900	38174A	Swiss, Power	Liebstadt
* 74-12206-01	4-900	38175A	Miss. Power & Light	Grand Gulf 1
* 74-12207-01	4-900	38176A	Cleveland Electric	Perry
* 74-12208-01	4-900	38177A	Houston L & P Co.	Allens Creek
* 74-12209-01	4-900	38178A	Taiwan Power Co.	Kuo Sheng
* 74-12210-01	4-900	38179A	Spain	CNV
* 74-12211-01	4-900	38180A	Miss Power & Light	Grand Gulf
* 74-12212-01	4-900	38181A	Cleveland Electric	Perry
* 74-12213-01	4-900	38182A	Gulf States	Riverbend
* 74-12214-01	4-900	38183A	Puget Sound P & L	Shagit 1
* 74-12215-01	4-900	38184A	TVA	Hartsville
* 74-12216-01	4-900	38185A	TVA	Hartsville
* 74-12217-01	4-900	38186A	Spain	CNV
* 74-12218-01	4-900	38187A	Illinois Power	Clinton
* 74-12219-01	4-900	40040A	TVA	Hartsville
* 74-12220-01	4-900	38280A	Entergy Corporation	Waterford 3
* 74-12222-01	4-900	41062A	NOW 80-13521-01	Seabrook
* 74-12223-01	4-900	38467A	Spain	Almaraz 1
* 74-12223-02	4-900	38467B	Spain	Almaraz 2
* 74-12224-01	4-900	38483A	NOW 78-13106-01	CPL - Shearon Harris
* 74-12224-02	4-900	38483B	NOW 78-13106-02	CPL - Shearon Harris
* 74-12224-03	4-900	38483C	NOW 78-13106-03	CPL - Shearon Harris
* 74-12224-04	4-900	38483D	NOW 78-13106-04	CPL - Shearon Harris
* 74-12225-01	3-900	38492A	Duquesne Light Co.	Beaver Valley 2
* 74-12226-01	4-900	38498A	EDF	Bugey
* 74-12226-02	4-900	38498B	EDF	Bugey
* 74-12227-01	4-900	38587A	Northeast Utilities	Millstone 3
* 74-12228-01	4-900	38880A	EDF	Bugey
* 74-12228-02	4-900	38848B	EDF	Bugey
* 74-12229-01	4-900	38765A	So. Carolina E & G	Summer 1
* 74-12230-01	4-900	38677A	TVA	Watts Bar 1
* 74-12230-02	4-900	38677B	TVA	Watts Bar 2
* 74-12231-01	4-900	39622A	Texas Utilities	Comanche Peak 1
* 74-12232-01	4-900	38848A	Furnas Cent. Elec. SA	Angra
* 74-12233-01	4-900	39622B	Texas Utilities	Comanche Peak 2
* 74-12234-01	4-900	39623A	Spain	Asco 1
* 74-12234-02	4-900	39623B	Spain	Asco 2
* 74-12235-01	4-900	40101A	Southern Cal Edison	San Onofre
* 74-12235-02	4-900	40101B	Southern Cal Edison	San Onofre
* 74-12236-01	4-900	40225A	Consumer Power Co.	Midland
* 74-12236-02	4-900	40225B	Consumer Power Co.	Midland
* 74-12237-01	4-900	40096A	NOW 81-14021-01	Duke - Catawba
* 74-12237-02	4-900	40096B	NOW 81-14021-02	Duke - Catawba
* 74-12238-01	4-900	40176A	NOW 83-14239-01	Union - Callaway
* 74-12239-01	4-900	40177A	NOW 83-14260-1	Wolf Creek
* 74-12240-01	4-900		Used As 80-13689-01	Seabrook 2
* 74-12241-01	4-900	Cancelled	Union Electric Co.	Callaway #2

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* 74-12242-01	4-900	Cancelled	Northern States Power	Tyrone #1
* 74-12243-01	4-900	40230A	FPL - St. Lucie 2	(At Dresser-Rand)
* 74-12244-01	4-900	40349A	Wash. Public Power	WPPS 1
* 74-12244-02	4-900	40349B	Wash. Public Power	WPPS 4
77-12872-01	4-900	40042A	TVA	Phipps Bend
77-12872-02	4-900	40041A	TVA	Hartsville
77-12872-03	4-900	40043A	TVA	Phipps Bend
77-12873-01	4-900	40568A	Arizona Public Service	Palo Verde 1
77-12873-02	4-900	40568B	Arizona Public Service	Palo Verde 2
77-12873-03	4-900	40568C	Arizona Public Service	Palo Verde 3
77-12874-01	4-900	40593A	Belgium	Doel 3
77-12874-02	4-900	40814A	Belgium	Hay, Liege
77-13015-01	4-900	40716A	ENL	Alto Lazio 2
* 78-13091-01	4-900	40366A	Yugoslavia	Krsko
* 78-13106-01	4-900	38483A	Was 74-12224-01	Shearon Harris
* 78-13106-02	4-900	38483B	Was 74-12224-02	Shearon Harris
* 78-13106-03	4-900	38483C	Was 74-12224-03	Shearon Harris
* 78-13106-04	4-900	38483D	Was 74-12224-04	Shearon Harris
78-13126-01	4-900	40905A	Tokyo Electric Power	Fuku 2-1
78-13127-01	4-900	40893A	Taiwan Power Co.	Maanshan 1
78-13127-02	4-900	40893B	Taiwan Power Co.	Maanshan 2
* 78-13136-01	4-900	40749A	Now 80-13805-01	South Texas
* 78-13215-01	4-900	40749B	Now 80-13804-01	South Texas
79-13274-01	4-900	41170A	Belgium	Doel 4
79-13279-01	4-900	41171A	Korea Electric Co.	KORI 2
79-13280-01	4-900	41172A	National Power Corp.	AGAC 1 (Philippines)
79-13281-01	4-900	40809A	NOW 80-13768-02	WPPSS 3
79-13281-02	4-900	40809C	Wash Public Power	WPPSS 5
79-13281-03	4-900	40809D	Wash Public Power	WPPSS 5
79-13281-04	4-900	40809B	NOW 80-13768-03	WPPSS 3
79-13338-01	4-900	41056A	CPL	Shearon Harris 1
* 80-13521-01	4-900	41062A	Was 74-12222-01	Seabrook 1
80-13547-01	4-900	41411A	Tokyo Electric Power	Fuku 1-2
80-13639-01	4-900	41482A	Korea Electric Co.	KORI 5
80-13639-02	4-900	41482B	Korea Electric Co.	KORI 6
* 80-13689-01	4-900	41063A	Was 74-12240-01	Seabrook 2
80-13710-01	2-900	35938A	Was 67-10155-03	Vermont Yankee
80-13748-01	4-900	41696A	Tepco	Kashiwazaki Kariwa
80-13748-02	4-900	41695A	Tepco	Fuku 2-3
80-13748-03	4-900	41862A	Tepco	Fuku 2-4
80-13749-01	4-900	41173A	Georgia Power	Vogtle 1
80-13749-02	4-900	41173B	Georgia Power	Vogtle 2
80-13768-01	4-900	41057A	CPL	Shearon Harris 2
80-13768-02	4-900	40809A	Wash Public Power	WPPSS 3
80-13768-03	4-900	40809B	Wash Public Power	WPPSS 5
* 81-13804-01	4-900	40749B	Was 78-13215-01	South Texas 1
* 81-13805-01	4-900	40749A	Was 78-13136-01	South Texas 2
81-13808-01	3-900	41812A	Florida Power & Light	Turkey Point 3 & 4
81-13808-02	3-900	41812B	Florida Power & Light	Turkey Point 3 & 4
81-13808-03	3-900	41812C	Florida Power & Light	Turkey Point 3 & 4
81-13843-01	4-900	41930A	Korea Electric co.	KORI 7
81-13843-02	4-900	40930B	Korea Electric-co.	KORI 8

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81-13908-01	3-900	42054A	EDF	Paulel
81-13908-02	3-900	42055A	EDF	Paulel
81-13910-01	4-900	42006A	Belgium	Tihange 3
81-13951-01	3-900	37948A	Was 73-11690-01	Duke - McGuire 1
81-13978-01	2-900	35693A	Was 67-10284	Boston Ed. - Pilgrim
81-13978-02	2-900	35940A	NOW 82-14098-01	Fitzpatrick
* 81-14021-01	4-900	40096A	Was 74-12237-01	<b>Duke - Catawba 1</b>
* 81-14021-02	4-900	40096B	Was 74-12237-02	<b>Duke - Catawba 2</b>
82-14086-01	3-900	42265A	EDF	St. Alban
82-14086-02	3-900	42272A	EDF	Paulel
82-14086-03	3-900	42266A	EDF	St. Alban
82-14098-01	2-900	35940A	Was 81-13978-02	Fitzpatrick
82-14143-01	3-900	42319A	EDF	Cattenom
82-14143-02	3-900	42320A	EDF	St. Alban
82-14207-01	4-900	42264A	Arkansas Power	ANO
82-14218-01	3-900	42374A	EDF	Cattenom
82-14237-01	3-900	42423A	EDF	Flamanville
* 83-14239-01	4-900	40176A	Was 74-12238-01	<b>Union - Callaway</b>
* 83-14260-01	4-900	40177A	Was 74-12239-01	<b>Wolf Creek</b>
83-14276-01	3-900	37948B	Was 73-11690-02	Duke - McGuire 2
83-14289-01	3-900	42461A	EDF	Paulel
83-14289-02	3-900	Unknown	EDF	
83-14301-01	4-900	41925A	Spain	Vandellos 2
83-14376-01	4-900	Unknown	EDF France	
84-14450-01	4-900	Unknown	EDF France	
85-14531-01	4-900	Unknown	EDF France	
87-14817-01	4-900	Unknown	EDF France	
87-14818-01	4-900	Unknown	EDF France	
88-14979-01	3-900	Unknown	EDF France	
88-14980-01	3-900	Unknown	EDF France	
90-15205-01	3-900	Unknown	EDF France	
90-15291-01	3-900	Unknown	EDF France	
90-15292-01	3-900	Unknown	EDF France	
90-15309-01	3-900	Unknown	EDF France	
90-15310-01	3-900	Unknown	EDF France	
90-15339-01	3-900	Unknown	EDF France	
91-15481-01	3-900	Unknown	Yankee Electric Rowe, Massachusetts	
92-15585-01	2-900	Unknown	Unknown	
93-15684-01	4-900	Unknown	EDF France	
93-15685-01	3-900	Unknown	EDF France	
93-15687-01	4-900	Unknown	PSE&G - Hancocks, Bridge, NJ	
93-15687-02	4-900	Unknown	PSE&G - Hancocks Bridge, NJ	
94-15804-01	4-600	Unknown	EDF France	
94-15811-01	4-600	Unknown	EDF France	
94-15811-02	4-600	Unknown	EDF France	

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**Schedule Inspection & screw spindle Replacement  
For Gimpel 4" CL 900 TMTTV**

**Inspect every Five(5) years (or 200 operational cycles-which ever comes sooner) and replace at least every Ten(10) years (or 200 operational cycles-which ever comes sooner).**

**Reference:  
Part List P4975**

Instruction Manuals  
GC - 103,124  
GC - 277

**Visual Inspection:**

All disassembled parts to be checked for abnormal wear, galling, permanent deformation and corrosion. The damaged parts must be replaced.

**Dimensional Inspection:**

Check clearance between moving parts. Stem (pc # 28) and bushing (21 and 22) clearance in excess of 0.006" may require replacement of stem, or bushing.

Check axial clearance of screw spindle (pc # 32). It should be approximately 0.005". Clearance in excess of 0.005" may require replacement of screw spindle and/or thrust washer (pc # 10).

Inspect disc pin (pc # 27) for deformation. TIR should be within 0.002". Replace if deformed, or if TIR exceeded 0.002".

**NDT Inspection:**

All seating surfaces and screw spindle head are to be PT inspected for unacceptable indication and check Seat contacts. Rework or replace parts as necessary.

**Limitorque Setting**

The switches are to be set according to Gimpel Procedure GC 124. The valve is position seated in open position (not torque seated).

**Screw Spindle Replacement**

In addition to the inspection and replacement requirements for five(5) to ten(10) year cycles, the original screw spindle (pc # 32) installed in the following valve serial numbers should be replaced with a new screw spindle made of AISI 1018 material. The split ring (pc #9) should also be replaced. The valves suspected to have wrong AISI 1213/1215 material are: (S/N 74-12201-1 to 74-12244-02), 78-13136-01, 78-13215-01 and 78-13091-01.

Note: Any time valve is opened for inspection, all gaskets (pc # 17) and packing (pc # 25) must be replaced.