



ENGINE SYSTEMS, INC.

175 Freight Road
Rocky Mount, NC 27804

Telephone: 252/977-2720
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October 25, 2019

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555-0001

Subject: 10CFR21 Reporting of Defects and Non-Compliance -
Engine Systems, Inc. Report No. 10CFR21-0127, Rev. 0

EMD Fuel Injectors – Seized Plunger and Bushing

Dear Sir / Madam:

The enclosed report addresses a reportable notification on EMD fuel injectors – seized plunger and bushing.

A copy of the report has been mailed to our affected nuclear customers.

Please sign below, acknowledging receipt of this report, and return a copy to the attention of Document Control at the address above (or, fax to number 252/446-1134) within 10 working days after receipt.

Yours very truly,

ENGINE SYSTEMS, INC.

Susan Woolard
Document Control

IE19
NRR

Please let us know if ANY of your mailing information changes - name of recipient, name of company/facility, address, etc. Mark the changes on this acknowledgment form and send to us by mail or FAX to the number above.

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DATE: _____



ENGINE SYSTEMS, INC.

175 Freight Road, Rocky Mount, NC 27804

Telephone: 252/977-2720

Fax: 252/448-1134

Report No. **10CFR21-0127**

Rev. 0: **10/24/19**

10CFR21 REPORTING OF DEFECTS AND NON-COMPLIANCE

COMPONENT: EMD Fuel Injector – seized plunger and bushing

SYSTEM: Emergency Diesel Generator

CONCLUSION: Reportable in Accordance With 10CFR21

Prepared By: *Ju Lin*
Engineering Manager

Date: 10/24/19

Reviewed By: *Dan Probst*
Quality Manager

Date: 10/24/19

| REV | DATE | PAGE | DESCRIPTION |
|-----|----------|------|----------------|
| 0 | 10/24/19 | | Initial issue. |

Pursuant to 10 CFR 21.21(d)(4), ESI is presenting the required information as follows:

- (i) Name and address of the individual or individuals informing the Commission.

| | |
|------------------------------|------------------------------|
| <i>John Kriesel</i> | <i>Dan Roberts</i> |
| <i>Engineering Manager</i> | <i>Quality Manager</i> |
| <i>Engine Systems Inc.</i> | <i>Engine Systems Inc.</i> |
| <i>175 Freight Rd.</i> | <i>175 Freight Rd.</i> |
| <i>Rocky Mount, NC 27804</i> | <i>Rocky Mount, NC 27804</i> |

- (ii) Identification of the basic component supplied within the United States which fails to comply or contains a defect.

EMD fuel injectors (new and refurbished) of the following part numbers:

| Description | Part Number |
|-------------------------------------------------------|--------------------|
| New Injector | 40084714 |
| | 40084715 |
| | 40084720 |
| | 40084724 |
| | 40084725 |
| | 40099335 |
| Refurbished Injector (Repair & Return) | 5228895-RR |
| | 5229250-RR |
| | 5229315-RR |
| | 5229325-RR |
| | 40084714-RR |
| | 40084720-RR |
| | 40084723-RR |
| | 40084724-RR |
| | 40099335-RR |

- (iii) Identification of the firm supplying the basic component which fails to comply or contains a defect.

Engine Systems Inc. (ESI)

- (iv) Nature of the defect or failure to comply and the safety hazard which is created or could be created by such defect or failure to comply.

ESI was notified by a nuclear customer that 3 of 20 recently installed fuel injectors seized after a short amount of engine run time. Examination of the plunger and bushing (P&B) from each injector identified particles consistent with the base material of the P&B embedded in the scar marks associated with the seizures. The root cause of the seizures is attributed to residual machining debris from the manufacturing process. This batch of injectors had been refurbished in 2013 and the P&Bs were replaced as part of the rework activity.

These part number mechanical unit fuel injectors are used on various model EMD 645 diesel engines. The engine utilizes one injector per cylinder, therefore failure of one injector will render the associated cylinder inoperable. An EMD 645 engine will typically tolerate one inoperable cylinder and maintain rated load; however multiple inoperable cylinders (as in the case of multiple injector failures) will further decrease engine output and likely prevent the engine from carrying its required load. This adversely affects the ability of the emergency diesel generator set to perform its safety-related function.

- (v) The date on which the information of such defect or failure to comply was obtained.

September 6, 2019

- (vi) In the case of a basic component which contains a defect or fails to comply, the number and location of these components in use at, supplied for, being supplied for, or may be supplied for, manufactured, or being manufactured for one or more facilities or activities subject to the regulations in this part.

Based on the findings of this investigation, ESI cannot conclusively limit the number of affected injectors by batch or date code and considers all part numbers listed in section (ii) to be suspect. A list of customers by injector part number is contained in Appendix A.

Note: This issue applies only to injectors in inventory that have not been installed.

For injectors that have been installed in an engine and have accumulated more than 2 hours of run time, then the injector is not susceptible to seizure from this type of issue. It has been shown that P&B seizures related to foreign material occur within the first 2 hours of engine operation.

- (vii) The corrective action which has been, is being, or will be taken; the name of the individual or organization responsible for the action; and the length of time that has been or will be taken to complete the action.

For end users:

- *Fuel injectors installed on engine:
No action is required. Successful completion of on-engine testing indicates the injector is not susceptible to failure due to foreign material.*
- *Fuel injectors in inventory (not-installed) on engine:
Fuel injectors in inventory are considered suspect and should be returned to ESI for evaluation, inspection, and additional testing.*

For ESI:

- *Corrective actions implemented as a result of 10CFR21-0115 (Jan 2017) remain in place and will continue to be utilized. ESI implemented a mandatory 2-hour extended run time test within the fuel injector functional test requirements. Because this test has only been applied since 2017, injectors supplied prior to 2017 did not benefit from this screening process.*

In addition to the extended run time test, ESI will implement the following new corrective actions:

- *Verification of the plunger and bushing cleaning process at the current manufacturer's facility prior to injector assembly. Note the fuel injector manufacturer changed in 2017 (part numbers now contain an "H" prefix). Injectors subject to this Part 21 were supplied by the previous manufacturer.*
- *Inspection, under magnification, of the plunger and bushing to ensure no visible debris or remnants of the machining process.*

These actions are currently underway and are expected to be completed within 30 days, but in all cases prior to future shipments.

- (viii) Any advice related to the potential defect or failure to comply about the facility, activity, or basic component that has been, is being, or will be given to purchasers or licensees.

Failures of fuel injection equipment on safety-related diesel engines have been the subject of previous Part 21 reports, among various engine brands, and typically involve seizing of the plunger and bushing (also referred to as plunger and barrel on other engines). These components have a design clearance measured to the millionth of an inch (μ in) and due to the tight clearance, cleanliness of all components is extremely important.

The purpose of this 10CFR21 report is to notify users that ESI has identified instances among several batches of injectors where undesired debris was detected that could potentially result in seizure of the P&B (as in the case of the Surry injectors). This is not to say that all injectors are susceptible to failure (it is believed the vast majority of the injectors contained in this notification are either functioning on an engine or have been replaced following a successful service life), but that ESI cannot conclusively limit the number of affected injectors. For this reason, it is recommended that injectors in storage be returned to ESI for further evaluation.

| Part Number | Description | ESI Order | Customer | Customer PO | Qty Shipped | C of C Date |
|-------------|---------------------------------------------|-----------|-----------------------------------------------|-------------------|-------------|-------------|
| 40084714 | Fuel Injector 16-645F4B, F7B (900 RPM) | 98456 | WESTINGHOUSE SAVANNAH RIVER CO | AC23503M | 32 | 31-May-02 |
| | | 3000786 | PROGRESS ENERGY FLORIDA INC- CRYSTAL RIVER | 00196797 | 7 | 25-Oct-04 |
| | | 9006669 | PROGRESS ENERGY FLORIDA INC- CRYSTAL RIVER | 00473749 | 10 | 07-Jan-10 |
| | | 3015928 | SAVANNAH RIVER REMEDIATION LLC | SRRA069144 | 32 | 06-Dec-16 |
| 40084715 | Fuel Injector 20-645F4B (900 RPM) | 3001260 | FLORIDA POWER & LIGHT - TURKEY POINT | 00081834 | 6 | 02-May-05 |
| | | 3004397 | FLORIDA POWER & LIGHT - TURKEY POINT | 00111101 | 5 | 08-May-08 |
| | | 3008230 | FLORIDA POWER & LIGHT - TURKEY POINT | 02288448 | 50 | 26-Apr-11 |
| | | 3011423 | FLORIDA POWER & LIGHT - TURKEY POINT | 02313521/00007 | 1 | 27-May-14 |
| | | 3014397 | FLORIDA POWER & LIGHT - TURKEY POINT | 02338838 | 2 | 13-Jul-15 |
| | | 95252 | EXELON GENERATION COMPANY | 703, REL 10719 | 20 | 19-Apr-02 |
| 40084720 | Fuel Injector 8,12,16,20-645E4 (900 RPM) | 100394 | FIRST ENERGY CORP - BEAVER VALLEY | 7095278 | 22 | 31-Jul-02 |
| | | 101802 | TENNESSEE VALLEY AUTHORITY - WATTS BAR | 00001690/00117 | 18 | 08-Oct-02 |
| | | 104475 | EXELON - CLINTON POWER PLANT | 00051404 | 9 | 22-Jan-03 |
| | | 105598 | EXELON GENERATION COMPANY | 703, REL 10849 | 20 | 19-Feb-03 |
| | | 106624 | EXELON GENERATION COMPANY | 00000703 / 10858 | 20 | 29-Apr-03 |
| | | 107189 | EXELON GENERATION COMPANY | 703, REL 10891 | 6 | 03-Mar-03 |
| | | 115365 | FLORIDA POWER AND LIGHT | 00070134, REV 003 | 2 | 11-Feb-04 |
| | | 115802 | TENNESSEE VALLEY AUTHORITY | 00001690/00290 | 12 | 12-Feb-04 |
| | | 3000317 | TENNESSEE VALLEY AUTHORITY-WATTS BAR | 00001690/00313 | 4 | 19-Apr-04 |
| | | 3000343 | FLORIDA POWER & LIGHT -TURKEY POINT | 00072444 | 10 | 30-Jun-04 |
| | | 3000366 | TENNESSEE VALLEY AUTHORITY-SEQUOYAH | 00001690/00316 | 4 | 27-May-04 |
| | | 3000462 | FLORIDA POWER & LIGHT-ST LUCIE PLANT | 00073328 | 4 | 27-May-04 |
| | | 3000764 | TENNESSEE VALLEY AUTHORITY-SEQUOYAH | 00001690/00346 | 16 | 20-Oct-04 |
| | | 3000792 | EXELON - CLINTON POWER PLANT | 00077164 | 29 | 20-Oct-04 |
| | | 3000992 | TENNESSEE VALLEY AUTHORITY-SEQUOYAH | 00001690/00364 | 124 | 13-Jan-05 |
| | | 3001077 | TAIWAN POWER COMPANY | 008931120148 | 16 | 29-Mar-05 |
| | | 3001158 | OMAHA PUBLIC POWER DISTRICT | 00079656 | 2 | 19-May-05 |
| | | 3001264 | SOUTHERN CALIFORNIA EDISON CO | 6H220906 A114 | 27 | 11-May-05 |
| | | 3001490 | TENNESSEE VALLEY AUTHORITY - SEQUOYAH | 00001690/00425 | 14 | 24-Aug-05 |
| | | 3001537 | GE ENERGY SERVICES SOURCING | 431004600 | 2 | 07-Oct-05 |
| | | 3001711 | FIRST ENERGY CORP - DAVIS BESSE | 45170000 | 25 | 04-Nov-05 |
| | | 3002308 | OMAHA PUBLIC POWER DISTRICT | 00093891 | 6 | 10-May-06 |
| | | 3002459 | FIRST ENERGY CORP - DAVIS BESSE | 45199725 | 40 | 14-Aug-06 |
| | | 3002598 | DUKE ENERGY-OCOONEE NUCLEAR | 00079123 | 4 | 22-Nov-06 |
| | | 3002812 | NUCLEAR MANAGEMENT - POINT BEACH | 00011858 | 6 | 22-Nov-06 |
| | | 3003011 | DOMINION ENERGY KEWAUNEE INC | 45493222 | 10 | 13-Mar-07 |
| | | 3003163 | EXELON - DRESDEN | 703, Rel 11505 | 3 | 18-May-07 |
| | | 3003592 | DOMINION VIRGINIA POWER - SURRY POWER STATION | 45532540 | 20 | 17-Aug-07 |
| | | 3004633 | EXELON - CLINTON POWER PLANT | 703, Rel 11682 | 28 | 13-Aug-08 |
| | | 3004759 | GE COMPANY | 437014200 | 2 | 24-Sep-08 |
| | | 3004839 | TENNESSEE VALLEY AUTHORITY - BROWNS FERRY | 00001690/00672 | 6 | 19-Aug-08 |
| | | 3004953 | FIRST ENERGY CORP - BEAVER VALLEY | 45280077 | 7 | 02-Jan-09 |
| | | 3005309 | TENNESSEE VALLEY AUTHORITY - SEQUOYAH | 00001690/00719 | 24 | 28-Jan-09 |
| | | 3005631 | DREMEL INC / CFE LAGUNA VERDE | 09-023 | 28 | 21-Aug-09 |
| | | 3005740 | TENNESSEE VALLEY AUTHORITY - WATTS BAR | 00001690/00763 | 20 | 10-Apr-09 |
| | | 3005983 | FIRST ENERGY CORP - BEAVER VALLEY | 45305855 | 1 | 25-Jun-09 |
| | | 3006088 | ENERGY NORTHWEST | 00329398 | 39 | 26-Aug-09 |
| | | 3006177 | ENERGY NORTHWEST | 00329499 | 20 | 24-Aug-09 |
| | | 3006587 | ENERGY NORTHWEST | 00330098 | 1 | 20-Nov-09 |
| | | 3007223 | EXELON AMERGEN - OYSTER CREEK NUCLEAR | 80 035799 | 21 | 30-Apr-10 |
| | | 3007412 | EXELON - CLINTON POWER PLANT | 703, Rel 12036 | 19 | 16-Aug-10 |
| | | 3007606 | DOMINION ENERGY KEWAUNEE INC | 45782155 | 20 | 27-Jan-11 |
| | | 3007661 | TENNESSEE VALLEY AUTHORITY - BROWNS FERRY | 00001690/159405 | 20 | 13-Sep-10 |
| | | 3007911 | FLORIDA POWER & LIGHT-ST LUCIE PLANT | 02264687 | 30 | 23-Nov-10 |
| | | 3007936 | ENTERGY OPERATIONS INC - ARKANSAS | 10301484 | 5 | 27-Jan-11 |
| | | 3008018 | ENTERGY OPERATIONS INC - ARKANSAS | 10302045 | 6 | 27-Jan-11 |
| | | 3008079 | FLORIDA POWER & LIGHT - TURKEY POINT | 02286336 | 20 | 31-Jan-11 |
| | | 3008168 | SOUTHERN CALIFORNIA EDISON COMPANY | 4500374038 | 36 | 23-Mar-11 |
| | | 3008230 | FLORIDA POWER & LIGHT - TURKEY POINT | 02288448 | 30 | 28-Apr-11 |
| | | 3008238 | EXELON - DRESDEN | 703, Rel 12143 | 20 | 23-Mar-11 |
| | | 3008782 | ENERGY NORTHWEST | 00334378 | 20 | 22-Jul-11 |
| | | 3008874 | EXELON AMERGEN - OYSTER CREEK NUCLEAR | 80 042815 | 20 | 06-Sep-11 |

| Part Number | Description | ESI Order | Customer | Customer PO | Qty Shipped | C of C Date |
|-------------|---------------------------------------------|-----------|-----------------------------------------------|-------------------------|-------------|-------------|
| 40084720 | Fuel Injector 8,12,16,20-645E4 (900 RPM) | 3009007 | FIRST ENERGY CORP - BEAVER VALLEY | 45379025 | 3 | 03-Feb-12 |
| | | 3009059 | FLORIDA POWER & LIGHT-ST LUCIE PLANT | 02297747 | 30 | 29-Nov-11 |
| | | 3009292 | ENERGY NORTHWEST | 00335018 | 3 | 02-Feb-12 |
| | | 3009306 | TENNESSEE VALLEY AUTHORITY - BROWNS FERRY | 344517 | 6 | 16-Feb-12 |
| | | 3009308 | FIRST ENERGY CORP - DAVIS BESSE | 45381868 | 20 | 02-Feb-12 |
| | | 3009382 | ENERGY NORTHWEST | 00335100 | 19 | 02-Feb-12 |
| | | 3009576 | FLORIDA POWER & LIGHT - ST LUCIE | 02303198 | 28 | 10-Apr-12 |
| | | 3009588 | ENERGY NORTHWEST | 00335326 | 38 | 13-Feb-12 |
| | | 3009888 | NEXTERA ENERGY POINT BEACH LLC | 02307153 | 13 | 10-May-12 |
| | | 3010118 | EXELON - DRESDEN | 703, Rel 12330 | 2 | 19-Jun-12 |
| | | 3010164 | TENNESSEE VALLEY AUTHORITY - BROWNS FERRY | 424011 | 21 | 18-Jul-12 |
| | | 3010214 | FIRST ENERGY CORP - DAVIS BESSE | 45401210 | 25 | 02-Oct-12 |
| | | 3010392 | TENNESSEE VALLEY AUTHORITY - BROWN'S FERRY | 453328 | 112 | 12-Nov-12 |
| | | 3010456 | DOMINION VIRGINIA POWER - SURRY POWER STATION | 4500015328 | 42 | 12-Oct-12 |
| | | 3010641 | ENTERGY OPERATIONS INC - ARKANSAS | 10365519 | 4 | 10-Dec-12 |
| | | 3010655 | NEXTERA ENERGY POINT BEACH LLC | 02314687 | 4 | 07-Dec-12 |
| | | 3010950 | NEXTERA ENERGY POINT BEACH LLC | 02313520/00001 | 3 | 28-Jun-13 |
| | | 3010959 | NORTHERN STATES POWER COMPANY - MONTICELLO | 00045592 | 20 | 12-Apr-13 |
| | | 3010981 | FIRST ENERGY CORP - BEAVER VALLEY | 45415892 | 6 | 12-Mar-13 |
| | | 3011150 | TENNESSEE VALLEY AUTHORITY - BROWN'S FERRY | 527037 | 14 | 25-Jun-13 |
| | | 3011440 | EXELON - DRESDEN | 00507145 | 20 | 28-Jun-13 |
| | | 3011596 | EXELON AMERGEN - OYSTER CREEK NUCLEAR | 80 053291 | 2 | 07-Oct-13 |
| | | 3011648 | ENERGY NORTHWEST | 00339091 | 4 | 11-Oct-13 |
| | | 3011879 | TAIWAN POWER COMPANY | 4200000187/008022006401 | 32 | 28-Oct-13 |
| | | 3011961 | ENERGY NORTHWEST | 00339360 | 20 | 30-Oct-13 |
| | | 3012288 | BMPC - KAPL | 7017027 | 16 | 13-Jan-14 |
| | | 3012316 | ENTERGY OPERATIONS INC - ARKANSAS | 10401961 | 6 | 18-Mar-14 |
| | | 3012510 | ENERGY NORTHWEST | 00340244 | 4 | 28-Feb-14 |
| | | 3012576 | FLORIDA POWER & LIGHT - TURKEY POINT | 02318321, Rel 00058 | 18 | 26-Mar-14 |
| | | 3012759 | BMPC - KAPL | 7017247 | 16 | 30-Apr-14 |
| | | 3012838 | TENNESSEE VALLEY AUTHORITY - WATTS BAR | 689489 | 50 | 15-Jul-14 |
| | | 3012886 | OMAHA PUBLIC POWER DISTRICT | 00204301 | 4 | 14-Jul-14 |
| | | 3012903 | FIRST ENERGY CORP - BEAVER VALLEY | 45453509 | 39 | 19-Sep-14 |
| | | 3012990 | DUKE ENERGY CAROLINAS LLC - OCONEE NUCLEAR | 00186653 | 12 | 14-Jun-14 |
| | | 3013125 | FIRST ENERGY CORP - BEAVER VALLEY | 45454656 | 20 | 19-Sep-14 |
| | | 3013260 | TENNESSEE VALLEY AUTHORITY - SEQUOYAH | 728428 | 2 | 14-Jan-15 |
| | | 3013350 | FIRST ENERGY CORP - DAVIS BESSE | 45463296 | 45 | 23-Jan-15 |
| | | 3013901 | TENNESSEE VALLEY AUTHORITY - WATTS BAR | 798548 | 8 | 27-Mar-15 |
| | | 3014048 | ENERGY NORTHWEST | 00343535 | 4 | 29-Apr-15 |
| | | 3014065 | DREMEL INC / CFE LAGUNA VERDE | 15-011/700453336 | 144 | 10-Jul-15 |
| | | 3014189 | ENERGY NORTHWEST | 00343840 | 40 | 30-Apr-15 |
| | | 3014734 | EXELON AMERGEN - OYSTER CREEK NUCLEAR | 80 066370 | 2 | 11-Jan-16 |
| | | 3014829 | ENERGY NORTHWEST | 00345349 | 4 | 30-Nov-15 |
| | | 3014961 | EXELON - DRESDEN | 703, Rel 12681 | 28 | 25-Jan-16 |
| | | 3015200 | ENTERGY OPERATIONS INC - ARKANSAS | 10470233 | 34 | 16-May-16 |
| | | 3015459 | OMAHA PUBLIC POWER DISTRICT | 00225211 | 2 | 28-Mar-16 |
| | | 3015475 | OMAHA PUBLIC POWER DISTRICT | 00225249 | 1 | 29-Mar-16 |
| | | 3016241 | NEXTERA ENERGY POINT BEACH LLC | 02358779 | 1 | 17-May-17 |
| | | 3016592 | NEXTERA ENERGY POINT BEACH LLC | 02362600 | 1 | 27-Nov-17 |
| | | 3017027 | EXELON - NINE MILE POINT | 00622245 | 30 | 12-Sep-17 |
| | | 3017182 | EXELON - DRESDEN | 00000703 Rel 12859 | 10 | 07-Aug-17 |
| | | 3017394 | EXELON AMERGEN - OYSTER CREEK NUCLEAR | 00625557 | 3 | 25-Sep-17 |
| | | 3018343 | BMPC - KAPL | 112732-25-2 | 2 | 03-May-18 |
| | | 8002077 | TENNESSEE VALLEY AUTHORITY - BROWN'S FERRY | 508382 | 1 | 25-Jun-13 |
| | | 8002111 | TENNESSEE VALLEY AUTHORITY - BROWN'S FERRY | 508382 | 5 | 25-Jun-13 |
| | | 8002126 | FIRST ENERGY CORP - DAVIS BESSE | 45401210 | 1 | 11-Oct-13 |
| | | 8002159 | FIRST ENERGY CORP - DAVIS BESSE | 45401210 | 21 | 27-Sep-13 |
| | | 8002160 | FIRST ENERGY CORP - BEAVER VALLEY | 45415892 | 6 | 07-Oct-13 |
| | | 8002165 | ENTERGY OPERATIONS INC - ARKANSAS | 10883872 | 4 | 25-Jul-13 |
| | | 8002168 | TENNESSEE VALLEY AUTHORITY - BROWN'S FERRY | 555349 | 56 | 25-Jun-13 |
| | | 8002191 | FLORIDA POWER & LIGHT - ST LUCIE | 02320675 | 2 | 31-Oct-13 |
| | | 8002677 | DREMEL INC / CFE LAGUNA VERDE | 16-010 | 9 | 23-Jan-17 |

| Part Number | Description | ESI Order | Customer | Customer PO | Qty Shipped | C of C Date |
|-------------|-----------------------------------------------|-----------|-----------------------------------------------|--------------------------|-------------|-------------|
| 40084724 | Fuel Injector 12,16,20-645E4/E4B (750 RPM) | 3004246 | PGS ENRIQUE MARIA HIERRO SL - ALMARAZ | N2008/001 | 10 | 18-Mar-08 |
| | | 3004273 | PGS ENRIQUE MARIA HIERRO SL - ALMARAZ | N2008/029 | 40 | 01-Jul-08 |
| | | 3004765 | PGS ENRIQUE MARIA HIERRO SL - COFRENTES | N2008/069 | 46 | 02-Oct-08 |
| | | 3005345 | PGS ENRIQUE MARIA HIERRO SL - ALMARAZ | N2009/024 | 40 | 06-May-09 |
| | | 3006472 | PGS ENRIQUE MARIA HIERRO SL - ALMARAZ | N2009/127 | 40 | 28-Jan-10 |
| | | 3008203 | NUCLEAR POWER PLANT KRSKO+ | NEK-11033/309 | 8 | 14-Jun-11 |
| 40084725 | Fuel Injector 12, 16-645 E4B | 107339 | KOREA HYDRO & NUCLEAR POWER CO | K02M1061H1 | 8 | 27-Jun-03 |
| | | 3005531 | KOREA HYDRO & NUCLEAR POWER CO | K080723241 | 10 | 22-May-09 |
| 40099335 | Fuel Injector 12,16,20-645F4B (750 RPM) | 3009667 | PGS ENRIQUE MARIA HIERRO SL - ALMARAZ | N2012/032 | 40 | 21-Aug-12 |
| | | 8000114 | CENTRAL NUCLEAR DE ALMARAZ | EM04IN04170MA REV 0 | 2 | 14-Sep-06 |
| | | 8001775 | NUCLEAR POWER PLANT KRSKO+ | NEK-10766/436 | 32 | 22-Feb-12 |
| 5229250-RR | Fuel Injector Repair and Return | 92266 | POOLED EQUIPMENT INVENTORY COMPANY | PG00-1 | 20 | 26-Feb-02 |
| | | 93870 | POOLED EQUIPMENT INVENTORY COMPANY | PG00-1 | 20 | 26-Feb-02 |
| | | 98325 | ENTERGY NUCLEAR OPERATIONS | 4500511844 | 20 | 11-Jun-02 |
| | | 101638 | EXELON GENERATION COMPANY | 47230 | 1 | 09-Oct-02 |
| | | 102856 | TENNESSEE VALLEY AUTHORITY | 00001690/00115 | 20 | 06-Oct-02 |
| | | 104986 | EXELON GENERATION COMPANY | 00047230 | 1 | 21-Feb-03 |
| | | 107217 | EXELON GENERATION COMPANY | 703, REL 10892/001 | 1 | 30-Apr-03 |
| | | 107218 | EXELON GENERATION COMPANY | 703, REL 10893 | 20 | 29-Apr-03 |
| | | 107562 | ENTERGY NUCLEAR OPERATIONS | 4500521401 | 1 | 05-Jun-03 |
| | | 115115 | ENERGY NORTHWEST | 00316012 | 61 | 22-Mar-04 |
| | | 8000092 | NUCLEAR MANAGEMENT - MONTICELLO | P500308 | 20 | 22-Mar-04 |
| | | 8000119 | FIRST ENERGY/PERRY NUCLEAR POW | 55100803 | 20 | 19-Mar-04 |
| | | 8000162 | FIRST ENERGY CORP - PERRY NUCLEAR POWER | 55100803 | 1 | 27-May-04 |
| | | 8000171 | EXELON - LASALLE | 703, REL 11118 | 21 | 16-Jul-04 |
| | | 8000177 | FIRST ENERGY CORP - PERRY NUCLEAR POWER | 55101795 | 20 | 20-Jul-04 |
| | | 8000361 | ENTERGY NUCLEAR-JAMES FITZPATRICK | 4500540253 | 1 | 15-Nov-05 |
| | | 8000385 | SOUTHERN CALIFORNIA EDISON CO | 6F235901 | 40 | 23-May-05 |
| | | 8000422 | SOUTHERN CALIFORNIA EDISON CO | 6F235901 Rev 01 Rel A002 | 36 | 29-Jun-05 |
| | | 8000438 | SOUTHERN CALIFORNIA EDISON CO | 6F235901 Rel A003 | 36 | 12-Aug-05 |
| | | 8000474 | SOUTHERN CALIFORNIA EDISON CO | 6F235901 Rel A004 | 36 | 30-Sep-05 |
| | | 8000489 | DUKE ENERGY-OCONEE NUCLEAR | ON 66500 | 2 | 13-Dec-05 |
| | | 8000655 | NUCLEAR MANAGEMENT - MONTICELLO | 00005865 | 22 | 03-Aug-06 |
| | | 8000661 | ENERGY NORTHWEST | 00921218/REV 001 | 3 | 08-Aug-06 |
| | | 8000710 | EXELON - QUAD CITIES | 703, Rel 11399 | 20 | 03-Aug-06 |
| | | 8000728 | OMAHA PUBLIC POWER DISTRICT | 00095792/Rev B001 | 5 | 25-Aug-06 |
| | | 8000733 | EXELON - LASALLE | 703, Rel 11408 | 19 | 03-Aug-06 |
| | | 8000848 | EXELON - QUAD CITIES | 703, Rel 11451 | 20 | 01-Feb-07 |
| | | 8000965 | DOMINION VIRGINIA POWER - SURRY POWER STATION | 70168743 | 11 | 01-Jun-07 |
| | | 8000970 | EXELON - QUAD CITIES | 703, Rel 11534 | 1 | 14-Aug-07 |
| | | 8001229 | EXELON AMERGEN - OYSTER CREEK NUCLEAR | 80 026255 | 4 | 02-Dec-08 |
| | | 8001641 | TENNESSEE VALLEY AUTHORITY - BROWNS FERRY | 00001690/121128 | 10 | 25-Jan-11 |
| | | 8001742 | EXELON - QUAD CITIES | 703, Rel 12113 | 8 | 20-Jan-12 |
| | | 8001754 | ENTERGY NUCLEAR FITZPATRICK LLC | 10304700 | 20 | 16-Feb-12 |
| | | 8002131 | NORTHERN STATES POWER COMPANY - MONTICELLO | 00046290 | 22 | 14-May-13 |
| | | 8002162 | DOMINION VIRGINIA POWER - SURRY POWER STATION | 70265507 | 40 | 31-Oct-13 |
| | | 8002175 | ENTERGY OPERATIONS INC RIVER BEND | 10387954 | 2 | 25-Sep-13 |
| | | 8002325 | DUKE ENERGY CAROLINAS LLC - OCONEE NUCLEAR | 00188232 | 28 | 31-Mar-15 |
| | | 8002333 | OMAHA PUBLIC POWER DISTRICT | 00205507 | 6 | 17-Jul-15 |
| | | 8002356 | EXELON - LASALLE | 00530360 | 1 | 04-Nov-14 |
| | | 8002519 | EXELON - LASALLE | 00555614 | 2 | 10-Sep-15 |
| | | 8002572 | EXELON - LASALLE | 00567642 | 20 | 26-Feb-16 |
| | | 8002695 | NORTHERN STATES POWER COMPANY - MONTICELLO | CNT 64134 | 42 | 03-Mar-17 |
| | | 8002747 | OMAHA PUBLIC POWER DISTRICT | 00227568 | 14 | 05-Jul-17 |

| Part Number | Description | ESI Order | Customer | Customer PO | Qty Shipped | C of C Date |
|-------------|---------------------------------|-----------|-----------------------------------------------|----------------------------|-------------|-------------|
| 5229315-RR | Fuel Injector Repair and Return | 111544 | NUCLEONOR, S A | S103782 | 4 | 22-Mar-04 |
| | | 8001013 | PGS ENRIQUE MARIA HIERRO SL - NUCLENOR | 2007/065/QS/18277/07/01/01 | 7 | 01-Feb-08 |
| | | 8001848 | PGS ENRIQUE MARIA HIERRO SL - NUCLENOR | N2011/083 | 5 | 15-May-12 |
| | | 8002476 | PGS ENRIQUE MARIA HIERRO SL - NUCLENOR | N2015/072 | 20 | 06-Jan-16 |
| | | 8002645 | PGS ENRIQUE MARIA HIERRO SL - NUCLENOR | N2016/024 | 5 | 05-Aug-16 |
| | | 93912 | ERGYTECH INC | 62432-0 | 40 | 04-Apr-02 |
| | | 107759 | ERGYTECH INC | 3700001129 | 20 | 17-Jun-03 |
| | | 114256 | ERGYTECH INC | 3700005746 | 20 | 23-Mar-04 |
| | | 8000418 | PGS ENRIQUE MARIA HIERRO SL | N2005/042 | 20 | 12-Aug-05 |
| | | 8000811 | PGS ENRIQUE MARIA HIERRO SL - ALMARAZ | N2006/067 | 20 | 15-Jan-07 |
| | | 8001056 | PGS ENRIQUE MARIA HIERRO SL - ALMARAZ | N2007/080 Rev 1 | 39 | 15-Feb-08 |
| | | 8001652 | PGS ENRIQUE MARIA HIERRO SL - ALMARAZ | N2010/041 | 40 | 02-Feb-11 |
| 40084714-RR | Fuel Injector Repair and Return | 8000308 | PROGRESS ENERGY FLORIDA INC - CRYSTAL RIVER | 00210347 Rev 002 | 1 | 10-Mar-05 |
| | | 8000309 | PROGRESS ENERGY FLORIDA INC - CRYSTAL RIVER | 00210345 Rev 002 | 1 | 10-Mar-05 |
| | | 8000310 | PROGRESS ENERGY FLORIDA INC - CRYSTAL RIVER | 00210342 Rev 002 | 1 | 10-Mar-05 |
| | | 8000311 | PROGRESS ENERGY FLORIDA INC - CRYSTAL RIVER | 00210340 Rev 002 | 1 | 10-Mar-05 |
| | | 8000312 | PROGRESS ENERGY FLORIDA INC - CRYSTAL RIVER | 00210339 Rev 002 | 1 | 10-Mar-05 |
| | | 8000313 | PROGRESS ENERGY FLORIDA INC - CRYSTAL RIVER | 00210338 Rev 003 | 1 | 05-Oct-05 |
| | | 8000314 | PROGRESS ENERGY FLORIDA INC - CRYSTAL RIVER | 00210330 Rev 004 | 1 | 10-Mar-05 |
| | | 8000315 | PROGRESS ENERGY FLORIDA INC - CRYSTAL RIVER | 00210349 Rev 002 | 1 | 10-Mar-05 |
| 40084720-RR | Fuel Injector Repair and Return | 8000499 | TENNESSEE VALLEY AUTHORITY - BROWNS FERRY | 00001690/00449 | 3 | 06-Apr-06 |
| | | 8000883 | TENNESSEE VALLEY AUTHORITY - BROWNS FERRY | 00001690/00520/Rev 002 | 3 | 13-Mar-07 |
| | | 8001203 | DOMINION VIRGINIA POWER - SURRY POWER STATION | 70182355 | 20 | 18-Aug-08 |
| | | 8001313 | DOMINION ENERGY KEWAUNEE INC | 70189102 | 10 | 27-Jan-09 |
| | | 8001402 | TENNESSEE VALLEY AUTHORITY - BROWNS FERRY | 00001690/00777 | 15 | 03-Jun-09 |
| | | 8001568 | DOMINION ENERGY KEWAUNEE INC | 70208606 | 10 | 24-Jun-10 |
| | | 8002016 | OMAHA PUBLIC POWER DISTRICT | 00176216 | 3 | 11-Jun-13 |
| | | 8002067 | FLORIDA POWER & LIGHT - TURKEY POINT | 02310378, Rev 003 | 2 | 30-Nov-12 |
| | | 8002857 | NEXTERA ENERGY POINT BEACH LLC | 02367024 | 20 | 07-May-18 |
| 40084724-RR | Fuel Injector Repair and Return | 8003057 | FLORIDA POWER & LIGHT - ST LUCIE | 02381644 | 4 | 20-Jun-18 |
| | | 8002618 | PGS ENRIQUE MARIA HIERRO SL - ALMARAZ | N2016/012 | 67 | 26-Jul-16 |