

# Fax Cover Sheet

**To:** 3018165151 **From:** Valcor

**Pages:** 6 **Date:** Mon Sep 12 2:34:02 PM EDT 2022

**Re:** Part 21 Notification for Valcor PN V52653-6040-7

## Comments:

Regards,

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# VALCOR ENGINEERING CORPORATION

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## FACSIMILE MESSAGE

DATE: 9/12/22 TOTAL NUMBER OF PAGES 5

**TO:**

**FROM:**

NAME \_\_\_\_\_ NAME \_\_\_\_\_

COMPANY NRC Operation Center DEPT Quality Assurance

CITY/STATE \_\_\_\_\_

FACSIMILE 301-816-5151

**MESSAGE:**

Attached please find Part 21 notification report for Valcor Coil Shell Assemblies PN V52653-6040-7

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*Nuclear Business Group*

September 12, 2022  
Valcor/NRC 2110-2022-QA1 Rev. 1

U.S. Nuclear Regulatory Commission  
ATTENTION: Document Control Desk  
Washington, D.C. 20555-0001

**Subject: 10CFR Part 21 Final Notification for premature failures of Valcor Coil Shell Assemblies V52653-6040-7**

**Reference: Duke Energy Notification dated 5/19/2022 (RA-22-0167)**

This letter provides Valcor Engineering Corporation (VEC) formal notification of the identification of a defect in Valcor Coil Shell assemblies Part Number V52653-6040-7.

The information required for this VEC Notification per §21.21(d)(4) is attached.

Please contact me if you have any questions or require any additional information.

Sincerely,

Mike Swirad  
Quality Assurance Director  
[mikeswirad@valcor.com](mailto:mikeswirad@valcor.com)

Enclosures:  
Enclosure 1 (3 pages)

**10 CFR Part 21 Notification per §21.21(d)(4)**

**(i) Name and Address of the individual or individuals informing the Commission.**

Mike Swirad  
QA Director  
Valcor Engineering Corporation  
2 Lawrence Road  
Springfield, NJ 07081

**(ii) Identification of the facility, the activity, or the basic component supplied for such facility or such activity within the United States which fails to comply or contains a defect.**

Coil Shell Assembly, Valcor PN V52653-6040-7 (supplied as "spare part" or as part of Valcor Solenoid Valve)

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

Valcor Engineering Corporation  
2 Lawrence Road  
Springfield, NJ 07081

**(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.**

On May 19, 2022, Duke Energy reported two (2) Coil Shell Assembly failures of Valcor Engineering Dwg. No. V52653-6040-7, on two different, recently installed 3-Way Solenoid Valves, Dwg. No. V70900-39-3-1, located at their Catawba Nuclear Power Station. The customer indicated that both coils caused "blown fuses in their system", exhibited "loss of resistance", and were in service for less than six (6) months "after initial installation and functional testing". These units were categorized as being Safety Related.

Duke cited violations of the requirements of CNS-1210.04-00-0022 Rev.003, MR70900-39-3-1 (40-Year Life Expectancy) and requested a 10 CFR Part 21 Reporting Evaluation (Ref. NFR 39, RMA 2400, E.O. 9018, RA-22-0167, and NCR 2426351).

Valcor solenoid valve V70900-39-3-1 is a balanced, direct acting, three-way solenoid operated valve. Electrical power (105 to 140 VDC) to operate the valve is applied to the coil of the solenoid through a terminal block located in the top of the solenoid housing. Energizing the coil causes the plunger to pull in, transferring the piston-seal assembly from the upper seat to the lower seat, causing port 1 to be sealed off and opening port 2, allowing 115 psig facility air to flow from port 2 to port 3.

To create the required magnetic force, this solenoid coil is made up of 7400 turns (minimum) of 25 gauge insulated magnet wire, wrapped around a NEMA grade G7 bobbin, and covered with Kapton Tape outer wrap insulation. The magnet wire is connected to the 18-gauge leadwire through a brazed solder joint which is additionally insulated with 3M #27 glass tape and Kapton tape. This solenoid coil assembly design has been in existence at Valcor since 1978.

This solenoid coil assembly is then inserted into a metallic coil shell and is then potted to allow coil heat to dissipate as well as to maintain the coil assembly fixed. This assembly is identified by VEC as V52653-6040-7. The coil shell assembly is then assembled onto the valve sub-assembly to finish the process of manufacturing a solenoid valve.

Internal short in Coil Shell Assembly will prevent Solenoid Valve to perform its Safety Function.

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

May 19, 2022 (60 day Interim Report issued on July 15, 2022)

(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.

QTY:	VEC LOT #	End Customer	Sales Order	Part #	Customer PO	Location of Installation	Approx. Ship Date
1	A129620	Duke	E181385	V70900-39-3-1	3118384	Catawba	3/9/2021
2	A2	Duke	E181385	V70900-39-3-1	3118384	Catawba	3/9/2021
3	293551	Duke	E181385	V70900-39-3-1	3118384	Catawba	3/9/2021
5	A3	Duke	E181385	V70900-39-3-1	3118384	Catawba	3/9/2021
1	A2	Duke	E161269	143170003 V526-5891-39	3075236	Brunswick	8/23/2019
2	A2	Union Electric	N179481	218140101 V526-6040-7	855003 SR Rev 3	Callaway Energy Center	12/28/2020
6	A2	Duke	E179908	V70900-39-3-1	3107229	Catawba	10/13/2020 10/27/2020
1	A2	Duke	E179029	103170009 V526-5295-65	3104608	Oconee	11/28/2020
1	A2	Exelon	N180619	218135101 V526-6043-5-1	00795079 Rev 2	Braidwood	9/29/2021
1	A2	Duke	E179181	V105-200	3105656	Catawba	8/13/2020
1	A2	Exelon	E177893	V52653-6040-7	685770	Fitzpatrick	2/28/2020
2	A2	Exelon	N161878	218135101 V526-6043-5-1	668648	Braidwood	4/30/2020
5	A2	Duke	E178326	V70900-39-3-1	3100560	Catawba	2/28/2020

(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.

The root cause of the failed component is due to inconsistency in Coil Assembly manufacturing process. More specifically, one of the two coil terminal wires was shorted to coil windings directly below the location where the coil wire is brazed to the terminal wire (hereafter referred to as the external termination point ETP). The ETP is insulated with a layer of Kapton tape and fiberglass tape and then secured to the outside of the coil winding with more Kapton tape and fiberglass tape. Dimension checks found the location of the ETP is lower (1.0") than specified on the Valcor engineering drawing (0.75" per V52605-501) which places it on the larger diameter of the coil winding rather than the area with a smaller diameter.

There is evidence of a significant amount of heat at the ETP. The evidence includes:

- 1) a hole in the ETP insulation with charred fiberglass tape
- 2) two coil wires broken from the coil and melted to the ETP
- 3) charring of the coil wires beneath the ETP
- 4) melted copper
- 5) melted and re-solidified brazing oozing from the ETP insulation

This fault broke at least six of the coil windings, shorted two coil wires to the ETP and effectively shortened the coil length accounting for the drop in resistance. The heat which destroyed the insulation of the ETP and melted the coil wires to the ETP was caused by one of the following or a combination of them:

1) The insulation around the ETP was crushed by the error in locating the ETP more than 0.75" below the top of the coil. The diameter of the coil winding is larger where the ETP was incorrectly located. This applied more force to the ETP when it was inserted into the cast housing and applied more pressure to this area than intended. This pressure would pierce the insulation creating a catastrophic weak spot if there was a sharp spot on the brazed connection.

2) A process issue may have created a poor connection of the lead wire to the coil wire. A poor connection will create more resistance and create localized heating. There were less wraps of the coil wire (3 wraps) around the terminal wire on the bad termination versus the good termination (5 wraps). There was also melted and re-solidified brazing material. The brazing was either squeezed out when wrapping the joint with tape or forced out when overheating of the coil took place.

3) Damage to the coil wire insulation during manufacture. If the insulation of the coil wire was compromised during assembly, this would create an inter-winding short leading to a hot spot. This spot is directly beneath the ETP. Such damage could come from a tool touching the coil wire accidentally (e.g. to compress the coil 0.0. to meet the print) or from a protrusion from the brazed area.

Valcor initiated internal and supplier Corrective Actions. All Coil Shell Assemblies (including sub-component Coil Assembly PN V52605-501) have been quarantined and Valcor supplier was notified. Valcor will rework all existing Coil Assemblies in stock to conform to VEC Engineering Drawing. Valcor is responsible for above corrective action. It shall take 30 to 60 days to complete.

**(viii) Any advice related to the 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.**

Valcor is in a process of notifying all affected customers. Defect in Coil Shell Assembly cannot be visually and/or electrically identified and all Coil Shell Assemblies that perform Safety Related function must be send to Valcor for evaluation/replacement.

**(ix) In the case of an early site permit, the entities to whom an early site permit was transferred.**

Not applicable