Ohio | Public Utilities Commission

Application to Commit Energy Efficiency/Peak Demand Reduction Programs (Mercantile Customers Only)

Case No.: 18-1058-EL-EEC

Mercantile Customer: **GE Aircraft Engines**

Electric Utility: **Duke Energy**

Program Title or Description: **VFD HVAC Fan**

Rule 4901:1-39-05(F), Ohio Administrative Code (O.A.C.), permits a mercantile customer to file, either individually or jointly with an electric utility, an application to commit the customer's existing demand reduction, demand response, and energy efficiency programs for integration with the electric utility's programs. The following application form is to be used by mercantile customers, either individually or jointly with their electric utility, to apply for commitment of such programs in accordance with the Commission's pilot program established in Case No. 10-834-EL-POR

Completed applications requesting the cash rebate reasonable arrangement option (Option 1) in lieu of an exemption from the electric utility's energy efficiency and demand reduction (EEDR) rider will be automatically approved on the sixty-first calendar day after filing, unless the Commission, or an attorney examiner, suspends or denies the application prior to that time. Completed applications requesting the exemption from the EEDR rider (Option 2) will also qualify for the 60-day automatic approval so long as the exemption period does not exceed 24 months. Rider exemptions for periods of more than 24 months will be reviewed by the Commission Staff and are only approved up the issuance of a Commission order.

Complete a separate application for each customer program. Projects undertaken by a customer as a single program at a single location or at various locations within the same service territory should be submitted together as a single program filing, when possible. Check all boxes that are applicable to your program. For each box checked, be sure to complete all subparts of the question, and provide all requested additional information. Submittal of incomplete applications may result in a suspension of the automatic approval process or denial of the application.

Any confidential or trade secret information may be submitted to Staff on disc or via email at ee-pdr@puc.state.oh.us.

Section 1: Mercantile Customer Information

Name: **General Electric Company**
GE Aircraft Engines

Principal address: **1 Neumann Way, Cincinnati, Ohio 45215**

Address of facility for which this energy efficiency program applies:

Same as above

Name and telephone number for responses to questions:

Robin Avant, (513)287-5948

Electricity use by the customer (check the box(es) that apply):

□ The customer uses more than seven hundred thousand kilowatt hours per year at the above facility. (Please attach documentation.)

□ The customer is part of a national account involving multiple facilities in one or more states. (Please attach documentation.)

Section 2: Application Information

A) The customer is filing this application (choose which applies):

□ Individually, without electric utility participation.

✓ **Jointly with the electric utility.**

B) The electric utility is: **Duke Energy**

C) The customer is offering to commit (check any that apply):

□ Energy savings from the customer's energy efficiency program. (Complete Sections 3, 5, 6, and 7.)

□ Capacity savings from the customer's demand response/demand reduction program. (Complete Sections 4, 5, 6, and 7.)

✓ **Both the energy savings and the capacity savings from the customer's energy efficiency program. (Complete all sections of the Application.)**

Section 3: Energy Efficiency Programs

A) The customer's energy efficiency program involves (check those that apply):

□ Early replacement of fully functioning equipment with new equipment. (Provide the date on which the customer replaced fully functioning equipment, and the date on which the customer would have replaced such equipment if it had not been replaced early. Please include a brief explanation for how the customer determined this future replacement date (or, if not known, please explain why this is not known)).

□ Installation of new equipment to replace equipment that needed to be replaced The customer installed new equipment on the following date(s): **Month and Year**

□ Installation of new equipment for new construction or facility expansion. The customer installed new equipment on the following date(s): _____.

✓ Behavioral or operational improvement.

B) Energy savings achieved/to be achieved by the energy efficiency program:

1) If you checked the box indicating that the project involves the early replacement of fully functioning equipment replaced with new equipment, then calculate the annual savings [(kWh used by the original equipment) – (kWh used by new equipment) = (kWh per year saved)]. Please attach your calculations and record the results below:

Annual savings: _____kWh

2) If you checked the box indicating that the customer installed new equipment to replace equipment that needed to be replaced, then calculate the annual savings [(kWh used by less efficient new equipment) – (kWh used by the higher efficiency new equipment) = (kWh per year saved)]. Please attach your calculations and record the results below:

Annual savings: _____kWh

Please describe any less efficient new equipment that was rejected in favor of the more efficient new equipment.

3) If you checked the box indicating that the project involves equipment for new construction or facility expansion, then calculate the annual savings [(kWh used by less efficient new equipment) – (kWh used by higher efficiency new equipment) = (kWh per year saved)]. Please attach your calculations and record the results below:

Annual savings: **XXXXX kWh (See Attachment 1 - Appendix 2)**

Please describe the less efficient new equipment that was rejected in favor of the more efficient new equipment.

4) If you checked the box indicating that the project involves behavioral or operational improvements, provide a description of how the annual savings were determined.

Annual savings: **238,883 kWh (See Attachment 1 - Appendix 2)**

Section 4: Demand Reduction/Demand Response Programs

A) The customer's program involves (check the one that applies):

- ✓ **Coincident peak-demand savings from the customer's energy efficiency program.**
- □ Actual peak-demand reduction. (Attach a description and documentation of the peak-demand reduction.)
- □ Potential peak-demand reduction (check the one that applies):
  - □ The customer's peak-demand reduction program meets the requirements to be counted as a capacity resource under a tariff of a regional transmission organization (RTO) approved by the Federal Energy Regulatory Commission.
  - □ The customer's peak-demand reduction program meets the requirements to be counted as a capacity resource under a program that is equivalent to an RTO program, which has been approved by the Public Utilities Commission of Ohio.

B) On what date did the customer initiate its demand reduction program?

Month(s) and Year(s)

C) What is the peak demand reduction achieved or capable of being achieved (show calculations through which this was determined):

16.53 KW (See Attachment 1 - Appendix 2)

Section 5: Request for Cash Rebate Reasonable Arrangement (Option 1) or Exemption from Rider (Option 2)

Under this section, check the box that applies and fill in all blanks relating to that choice.

Note: If Option 2 is selected, the application will not qualify for the 60-day automatic approval. All applications, however, will be considered on a timely basis by the Commission.

A) The customer is applying for:

✓ **Option 1: A cash rebate reasonable arrangement.**

OR

□ Option 2: An exemption from the energy efficiency cost recovery mechanism implemented by the electric utility.

OR

□ Commitment payment

B) The value of the option that the customer is seeking is:

Option 1: A cash rebate reasonable arrangement, which is the lesser of (show both amounts):

✓ A cash rebate of **$11,050 (See Attachment 1 - Appendix 3).**

Option 2: An exemption from payment of the electric utility's energy efficiency/peak demand reduction rider.

□ An exemption from payment of the electric utility's energy efficiency/peak demand reduction rider for ____ months (not to exceed 24 months). (Attach calculations showing how this time period was determined.)

OR

□ A commitment payment valued at no more than $_____. (Attach documentation and calculations showing how this payment amount was determined.)

OR

□ Ongoing exemption from payment of the electric utility's energy efficiency/peak demand reduction rider for an initial period of 24 months because this program is part of the customer's ongoing efficiency program. (Attach documentation that establishes the ongoing nature of the program.) In order to continue the exemption beyond the initial 24 month period, the customer will need to provide a future application establishing additional energy savings and the continuance of the organization's energy efficiency program.)

Section 6: Cost Effectiveness

The program is cost effective because it has a benefit/cost ratio greater than 1 using the (choose which applies):

□ Total Resource Cost (TRC) Test. The calculated TRC value is: _____ (Continue to Subsection 1, then skip Subsection 2)

✓ Utility Cost Test (UCT). The calculated UCT value is 9.61 **(See Attachment 1 - Appendix 4)**

Subsection 1: TRC Test Used (please fill in all blanks).

The TRC value of the program is calculated by dividing the value of our avoided supply costs (generation capacity, energy, and any transmission or distribution) by the sum of our program overhead and installation costs and any incremental measure costs paid by either the customer or the electric utility.

The electric utility's avoided supply costs were _____.

Our program costs were _____.

The incremental measure costs were _____.

Subsection 2: UCT Used (please fill in all blanks).

We calculated the UCT value of our program by dividing the value of our avoided supply costs (capacity and energy) by the costs to our electric utility (including administrative costs and incentives paid or rider exemption costs) to obtain our commitment.

Our avoided supply costs were **$222,956 (See Attachment 1 - Appendix 5).**

The utility's program costs were **$12,139 (See Attachment 1 - Appendix 6).**

The utility's incentive costs/rebate costs were **$11,050 (See Attachment 1 - Appendix 3)**.

Section 7: Additional Information

Please attach the following supporting documentation to this application:

Narrative description of the program including, but not limited to, make, model, and year of any installed and replaced equipment.

A copy of the formal declaration or agreement that commits the program or measure to the electric utility, including:

1) any confidentiality requirements associated with the agreement;
2) a description of any consequences of noncompliance with the terms of the commitment;
3) a description of coordination requirements between the customer and the electric utility with regard to peak demand reduction;
4) permission by the customer to the electric utility and Commission staff and consultants to measure and verify energy savings and/or peak-demand reductions resulting from your program; and,
5) a commitment by the customer to provide an annual report on your energy savings and electric utility peak-demand reductions achieved.

Refer to Offer Letter following this application

A description of all methodologies, protocols, and practices used or proposed to be used in measuring and verifying program results. Additionally, identify and explain all deviations from any program measurement and verification guidelines that may be published by the Commission.

Mercantile Self Direct Prescriptive - Pumps and VFD Rebate Application

Application Guide & Cover Sheet

Questions? Call 1-866-380-9580 or visit www.duke-energy.com/MSD.

Email this form along with completed Mercantile Self Direct Prescriptive or Custom applications, proof of payment, energy savings calculations and spec sheets to SelfDirect@Duke-Energy.com. You may also fax to 1-513-629-5572.

Mercantile customers, defined as using at least 700,000 kWh annually or having an account in multiple locations are eligible for the Mercantile Self Direct program. Indicate which applies:

☒ a single Duke Energy Ohio account with 700,000 kWh annual usage
☐ an account with multiple locations

Please list Duke Energy account numbers below (attach listing of multiple accounts and/or billing history for other utilities as required):

Account Number	Annual Usage	Account Number	Annual Usage
84500860013	148,246,985		

Self Direct rebates are applicable to Prescriptive measures that were installed more than 90 days prior to submission to Duke Energy and have not previously received a Duke Energy Prescriptive rebate. Self Direct rebates are available for completed Custom projects that have not previously received a Duke Energy Smart $aver® Custom Incentive.

Self Direct Program rules allow for, though do not require, certain projects that are Prescriptive in nature under the Mercantile Self Direct program to be evaluated using the Custom process in the Self Direct program. Use the list on page two as a guide to determine which Self Direct program best fits your project(s). Apply for Self Direct projects using the appropriate application forms in conjunction with this cover sheet.

Self Direct Program rules also allow for behaviorally based and/or no cost and low cost projects to receive rebates.

Please check each box to indicate completion/inclusion of the following program requirements:

☒ All sections of appropriate application(s) are completed	☒ Proof of payment.*	☒ Manufacturer's Spec sheets	☐ Energy model/calculations and detailed inputs for Custom applications

*If a single payment record is intended to demonstrate the costs of both Self Direct Prescriptive & Custom projects, please include an additional document with an estimated breakout of costs for each Self Direct Prescriptive and Custom energy conservation measure.

**Behavioral energy efficiency and demand reduction projects must be both measurable and verifiable. Provide justification with your application. Rebates for such projects may be small in magnitude.

Mercantile Self Direct Prescriptive - Pumps and VFD Rebate Application

Questions? Call 1-866-380-9580 or visit www.duke-energy.com/MSD .
Email the complete, signed application with all required documents to SelfDirect@duke-energy.com or fax to 513-629-5572.

Is this application: ☒ **NEW** (original) or ☐ **REVISED** (changes made to original application)

Building Type – Required (check one)		
☐ Data Centers	☐ Full Service Restaurant	☐ Office
☐ Education/K-12	☐ Healthcare	☐ Public Assembly
☐ Education Other	☒ Industrial	☐ Public Order/Safety
☐ Elder Care/Nursing Home	☐ Lodging	☐ Religious Worship/Church
☐ Food Sales/Grocery	☐ Retail (Small Box)	☐ Service
☐ Fast Food Restaurant	☐ Retail (Big Box)	☐ Warehouse
☐ Other:		
How did you hear about the program? (check one)		
☐ Duke Energy Representative	☐ Web Site	☐ Radio
☒ Contractor / Vendor	☐ Other _____	

Please check each box to indicate completion of the following program requirements:

☒ All sections of application	☒ Invoice with make, model number, quantity and equipment manufacturer	☒ Tax ID number for payee ☒ W-9 for payee	☒ Customer/vendor agree to Terms and Conditions

Customer Information					
Customer/Business	**GE Aviation**	Contact		**Chris Kearns**	
Phone	**513-222-8843**	**Account Number**		**84500860013**	
Street Address (Where rebate should be mailed)		**1 Neumann Way**			
City	**Cincinnati**	State	**Ohioi**	Zip Code	**45215**
Installation Street Address	**1Neumann Way**				
City	**Cincinnati**	State	**Ohio**	Zip Code	**45215**
E-mail Address	**chris.kearns@ge.com**				

Failure to provide the account number associated with the location where the installation took place will result in rejection of the application.

Vendor Information					
Vendor	**Energy Management Solutions**	Contact		**Kelly Rogers**	
Phone	**952-767-7450**	Fax		**952-556-9171**	
Street Address	**684 Excelsior Blvd**				
City	**Excelsior**	State	**MN**	Zip Code	**55331**
E-mail Address	**krogers@emsenergy.com**				

If Duke Energy has questions about this application, who should we contact? ☐ **Customer** ☒ **Vendor**

Payment Information		
Who should receive rebate payment?	☒ Customer	☐ Vendor (Customer must sign below)
I hereby authorize payment of rebate directly to the vendor:	Customer Signature (written signature)	
	Date	
Provide Tax ID Number for Payee	Customer Tax ID #	**14-0689340**
	Vendor Tax ID #	

Terms and Conditions			
I have read and hereby agree to the Terms & Conditions and Program Requirements.			
Customer Signature (written signature)		Vendor Signature (written signature)	
Date	3/26/2018	Date	3/27/18
Title	Project Manager	Title	Kelly Rogers, VP of Operations

Rebates are subject to change and may be discontinued at the sole discretion of Duke Energy. Equipment must be installed and operable to be eligible for rebates. As Federal Energy Policy Law changes, equipment efficiency requirements are subject to change.

Variable Frequency Drives (VFDs) – Applied to HVAC Fans for Comfort Cooling Only (retrofit application only)

Process pumping does not include HVAC or swimming pool fluid pumping systems.

VFD HVAC Applications (please check one):

☐ Supply Fan ☐ Cooling Tower Fan ☐ Return Fan

☐ Exhaust Fan

Make/Model or Catalog Number	HP	Quantity (number of VFDs)	Total HP (HP x quantity)	Rebate	Annual Operating Hrs. (minimum of 2,000)	Project Cost	Date Installed and Operable (mm/dd/yy)	Total Rebate (total HP x rebate)
See attached VFD document	221 HP	13	221	$50.00/HP	8760Hrs.	$44,200.00	10/1/17	$11,050.00

- Installed equipment must be new. Used, rebuilt or rewound equipment is not eligible.
- Rebates are only available for new VFDs installed on existing HVAC fans.
- VFDs applied to new replacement motors that power existing HVAC fans are eligible for prescriptive rebates.
- VFDs over 100 HP and VFDs installed on new HVAC fans are not eligible for Mercantile Self Direct Prescriptive rebates, but may qualify through the Mercantile Self Direct Custom Rebate Program. Please visit www.duke-energy.com/MSD for program requirements.
- Variable Frequency Drive Fans and Pumps qualifying equipment must have 2,000 annual run hours or more.
- A 3 percent impedance reactor on the AC input to the VSD is recommended to prevent damage to the VSD due to overvoltage from power factor correction and should be properly sized by your supplier. A 5 percent reactor may be recommended if there is additional harmonic distortion on the AC input lines due to other plant-specific causes.
- Replacement of existing VFDs does not qualify for rebates.
- VFDs installed on redundant fans do not qualify.
- VFD speed must be automatically controlled by differential pressure, flow, temperature, or other variable signal.
- Existing throttling devices including inlet vanes, bypass dampers, and throttling valves must be removed or permanently disabled.
- Rebate capped at 50 percent of the customer's equipment cost.

General Electric International Inc
4200 Wildwood Pkwy
Atlanta, GA 30339 USA

BRANCH ADDRESS: 4200 Wildwood Pkwy, Atlanta,GA 30339 US

SHIP TO: GE AIRCRAFT ENGINE
*GEN ELEC CO
CINCINNATI OH 45215

BILL TO: IBS ADMINISTRATOR IBS ADMINISTRATOR
GE AIRCRAFT ENGINE
*GEN ELEC CO
CINCINNATI OH 45215

ORIGINAL INVOICE

INVOICE NUMBER	*INVOICE DATE*	*PAGE*
1078959	26-JUL-16	1 of 1

DUE DATE	*PAYMENT TERMS*
26-JUL-16	DUE ON RECEIPT

SEND PAYMENT SHOWING INVOICE NO. & INVOICE DATE TO

BY MAIL: GE INTERNATIONAL INC
P.O. BOX # 281997
ATLANTA GA 30384-1997

BY WIRE: DEUTSCHE BANK TRUST COMP
ACC# 50280397
ABA# 021001033
NEWYORK, NY
Swift Code: BKTRUS33

Seller VAT ID

GE Tax ID# 13-1962940

Customer VAT ID:

We now accept: Master Card, Visa and American Express. Call Phone# listed below for processing

CURRENCY : USD

CUSTOMER ORDER NUMBER	*GE REFERENCE NUMBER*	*GE CUSTOMER NUMBER*	*BILLING PERIOD*
2931890HZCAW	30039120	F00000	26-JUL-16

LINE	SVC.DATE	PRODUCT/SERVICE PROVIDED	TAX/VAT%	QUANTITY	UOM	UNIT PRICE	EXTENDED AMOUNT
1		NUP Plant VFDs, JUN 2016		1		65,465.00	65,465.00

Signature and Stamp

TAX SUMMARY BY RATE

TAX NAME/RATE	NET AMOUNT	TAX/VAT%	TAX/VAT AMOUNT	TOT AMOUNT
TOTAL				

State tax statutes require that a copy of tax-exempt certificate be maintained in our records,otherwise we must collect tax on sales invoiced. If applicable, please return a copy of your valid tax-exempt certificates to the following address, to ensure accurate invoicing:
General Electric, PO Box 2639, LILBURN, GA 30048. Fax (949) 252-7340

UNIT TOTAL	TAX TOTAL	SHIP HNDL TOTAL	INVOICE TOTAL
65,465.00	0.00	0.00	65,465.00

General Electric International Inc
4200 Wildwood Pkwy
Atlanta, GA 30339 USA

BRANCH ADDRESS: 4200 Wildwood Pkwy, Atlanta,GA 30339 US

SHIP TO: GE AIRCRAFT ENGINE
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*GEN ELEC CO
CINCINNATI OH 45215

ORIGINAL INVOICE

INVOICE NUMBER	*INVOICE DATE*	*PAGE*
1079425	24-AUG-16	1 of 1

DUE DATE	*PAYMENT TERMS*
24-AUG-16	DUE ON RECEIPT

SEND PAYMENT SHOWING INVOICE NO. & INVOICE DATE TO

BY MAIL: GE INTERNATIONAL INC
P.O. BOX # 281997
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CURRENCY : USD

CUSTOMER ORDER NUMBER	*GE REFERENCE NUMBER*	*GE CUSTOMER NUMBER*	*BILLING PERIOD*
2931906HZCDW	30039121	F00000	24-AUG-16

LINE	SVC.DATE	PRODUCT/SERVICE PROVIDED	TAX/VAT%	QUANTITY	UOM	UNIT PRICE	EXTENDED AMOUNT
1		Defer NUP Plant VFDs, AUG 2016		1		3,371.40	3,371.40

Signature and Stamp

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3,371.40	0.00	0.00	3,371.40

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Atlanta, GA 30339 USA

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ORIGINAL INVOICE

INVOICE NUMBER	*INVOICE DATE*	*PAGE*
1079424	24-AUG-16	1 of 1

DUE DATE	*PAYMENT TERMS*
24-AUG-16	DUE ON RECEIPT

SEND PAYMENT SHOWING INVOICE NO. & INVOICE DATE TO

BY MAIL: GE INTERNATIONAL INC
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ABA# 021001033
NEWYORK, NY
Swift Code: BKTRUS33

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GE Tax ID# 13-1962940

Customer VAT ID:

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CURRENCY : USD

CUSTOMER ORDER NUMBER	*GE REFERENCE NUMBER*	*GE CUSTOMER NUMBER*	*BILLING PERIOD*
2931890HZCAW	30039120	F00000	24-AUG-16

LINE	SVC.DATE	PRODUCT/SERVICE PROVIDED	TAX/VAT%	QUANTITY	UOM	UNIT PRICE	EXTENDED AMOUNT
1		NUP Plant VFDs, AUG 2016		1		19,104.60	19,104.60

Signature and Stamp

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19,104.60	0.00	0.00	19,104.60

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ORIGINAL INVOICE

INVOICE NUMBER	*INVOICE DATE*	*PAGE*
1079897	20-SEP-16	1 of 1

DUE DATE	*PAYMENT TERMS*
20-SEP-16	DUE ON RECEIPT

SEND PAYMENT SHOWING INVOICE NO. & INVOICE DATE TO

BY MAIL: GE INTERNATIONAL INC
P.O. BOX # 281997
ATLANTA GA 30384-1997

BY WIRE: DEUTSCHE BANK TRUST COMP
ACC# 50280397
ABA# 021001033
NEWYORK, NY
Swift Code: BKTRUS33

Seller VAT ID

GE Tax ID# 13-1962940

Customer VAT ID:

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CURRENCY : USD

CUSTOMER ORDER NUMBER	*GE REFERENCE NUMBER*	*GE CUSTOMER NUMBER*	*BILLING PERIOD*
2931906HZCDW	30039121	F00000	20-SEP-16

LINE	SVC.DATE	PRODUCT/SERVICE PROVIDED	TAX/VAT%	QUANTITY	UOM	UNIT PRICE	EXTENDED AMOUNT
1		Defer NUP Plant VFDs, SEP 2016		1		17,830.20	17,830.20

Signature and Stamp

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17,830.20	0.00	0.00	17,830.20

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ORIGINAL INVOICE

INVOICE NUMBER	*INVOICE DATE*	*PAGE*
1078972	26-JUL-16	1 of 1

DUE DATE	*PAYMENT TERMS*
26-JUL-16	DUE ON RECEIPT

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2931906HZCDW	30039121	F00000	26-JUL-16

LINE	SVC.DATE	PRODUCT/SERVICE PROVIDED	TAX/VAT%	QUANTITY	UOM	UNIT PRICE	EXTENDED AMOUNT
1		Defer NUP Plant VFDs, JUN 2016		1		9,819.75	9,819.75

Signature and Stamp

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9,819.75	0.00	0.00	9,819.75

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1079896	20-SEP-16	1 of 1

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Customer VAT ID:

We now accept: Master Card, Visa and American Express. Call Phone# listed below for processing

CURRENCY : USD

CUSTOMER ORDER NUMBER	*GE REFERENCE NUMBER*	*GE CUSTOMER NUMBER*	*BILLING PERIOD*
2931890HZCAW	30039120	F00000	20-SEP-16

LINE	SVC.DATE	PRODUCT/SERVICE PROVIDED	TAX/VAT%	QUANTITY	UOM	UNIT PRICE	EXTENDED AMOUNT
1		NUP Plant VFDs, SEP 2016		1		101,037.80	101,037.80

Signature and Stamp

TAX SUMMARY BY RATE

TAX NAME/RATE	NET AMOUNT	TAX/VAT%	TAX/VAT AMOUNT	TOT AMOUNT
TOTAL				

State tax statutes require that a copy of tax-exempt certificate be maintained in our records,otherwise we must collect tax on sales invoiced. If applicable, please return a copy of your valid tax-exempt certificates to the following address, to ensure accurate invoicing: General Electric, PO Box 2639, LILBURN, GA 30048. Fax (949) 252-7340

UNIT TOTAL	TAX TOTAL	SHIP HNDL TOTAL	INVOICE TOTAL
101,037.80	0.00	0.00	101,037.80

GE Aviation NUP - VFDs

Pictures of GE VFDs included for reference

Designation	Serves		VFD Type	Model	Drive HP	Qty VFD's	Total HP	Rebate	Annual Op. Hours	Project Cost	Date Installed and Operable	Total Rebate
VFD-451-1-AHU-1-1	AHU-451-1 SF		Supply Fan	GE CORE DRIVE 6KFP43015X9XXXA1	15	1	15	$50/HP	8,760	$ 3,000	10/1/2017	$ 750
VFD-451-1-AHU-1-2	AHU-451-1 SF		Supply Fan	GE CORE DRIVE 6KFP43015X9XXXA1	15	1	15	$50/HP	8,760	$ 3,000	10/1/2017	$ 750
VFD-451-1-AHU-1-3	AHU-451-1 RF		Return Fan	GE CORE DRIVE 6KFP43005X9XXXA1	5	1	5	$50/HP	8,760	$ 1,000	10/1/2017	$ 250
VFD-451-1-AHU-1-4	AHU-451-1 RF		Return Fan	GE CORE DRIVE 6KFP43005X9XXXA1	5	1	5	$50/HP	8,760	$ 1,000	10/1/2017	$ 250
VFD-451-1-AHU-2-1	AHU-451-2 SF		Supply Fan	ABB ACH550-UH-045A-4+B055	25	1	25	$50/HP	8,760	$ 5,000	10/1/2017	$ 1,250
VFD-451-1-AHU-2-2	AHU-451-2 SF		Supply Fan	ABB ACH550-UH-045A-4+B055	25	1	25	$50/HP	8,760	$ 5,000	10/1/2017	$ 1,250
VFD-451-1-AHU-2-3	AHU-451-2 RF		Return Fan	ABB ACH550-UH-023A-4+B055	15	1	15	$50/HP	8,760	$ 3,000	10/1/2017	$ 750
VFD-451-1-AHU-2-4	AHU-451-2 RF		Return Fan	ABB ACH550-UH-023A-4+B055	15	1	15	$50/HP	8,760	$ 3,000	10/1/2017	$ 750
VFD-451-1-AHU-3-1	AHU-451-3 SF		Supply Fan	GE CORE DRIVE 6KFP43007X9XXXA1	7.5	1	7.5	$50/HP	8,760	$ 1,500	10/1/2017	$ 375
VFD-451-1-AHU-3-2	AHU-451-3 SF		Supply Fan	GE CORE DRIVE 6KFP43007X9XXXA1	7.5	1	7.5	$50/HP	8,760	$ 1,500	10/1/2017	$ 375
VFD-451-1-AHU-3-3	AHU-451-3 RF		Return Fan	GE CORE DRIVE 6KFP43003X9XXXA1	3	1	3	$50/HP	8,760	$ 600	10/1/2017	$ 150
VFD-451-1-AHU-3-4	AHU-451-3 RF		Return Fan	GE CORE DRIVE 6KFP43003X9XXXA1	3	1	3	$50/HP	8,760	$ 600	10/1/2017	$ 150
VFD-451-EF-1-1	EF-451-1		Exhaust Fan	GE CORE DRIVE 6KFP43020X9XXXA1	20	1	20	$50/HP	8,760	$ 4,000	10/1/2017	$ 1,000
VFD-451-EF-1-2	EF-451-2		Exhaust Fan	GE CORE DRIVE 6KFP43020X9XXXA1	20	1	20	$50/HP	8,760	$ 4,000	10/1/2017	$ 1,000
VFD-451-EF-1-3	EF-451-3		Exhaust Fan	GE CORE DRIVE 6KFP43020X9XXXA1	20	1	20	$50/HP	8,760	$ 4,000	10/1/2017	$ 1,000
VFD-451-EF-1-4	EF-451-4		Exhaust Fan	GE CORE DRIVE 6KFP43020X9XXXA1	20	1	20	$50/HP	8,760	$ 4,000	10/1/2017	$ 1,000
TOTAL:					**221**	**16**	**221**			**$ 44,200**		**$ 11,050**

OSHPD Special Seismic Certification
Pre-Approval: OSP-0093-10
Product Name: ACH550
Product Type: VFD
Anchorage: Rigid
Seismic Performance Characteristics
SDS (g) = 2.0, z/h = 1.0 , Ip = 1.5,

Made in USA
of foreign
parts

ABB INC. ACH550-UH-045A-4+B055 S/N 2152201342
Seismic certification per applicable building codes
Tested and analyzed in accordance with:
IBC 2000,2003,2006,2009,2012 ASCE 7-02, 7-05, ICC-ES,AC-156
Approved to Seismic Design Spectral Response Acceleration Sds of 2.0 g.
CERTIFYING AGENCY: The VMC Group REPORT #: VMA-44407-02

ABB INC.

IP54,UL TYPE
MTR OL INCL

Input Voltage(U1)	3PH 48...63 Hz 380...480 Vac
Current(I1n)	44 A
Short Circuit	100 kA RMS Symetrical, 600V max
Output Voltage(U2)	3PH 0...500 Hz 0...U1 Vac
Current(I2n)	44 A
Power(Pn)	30 Hp 22 kW

Suitable for installation in a compartment handling conditioned air

ACH550-UH-045A-4+B055

LISTED 45Y1
E124534

Mfg. Date:27-May-2015

Orig. Firm

S/N 2152201342

OSHPD Special Seismic Certification
Pre-Approval: OSP-0083-10
Product Name: ACH550
Product Type:VFD
Anchorage: Rigid
Seismic Performance Characteristics
SDS (g) = 2.0, z/h = 1.0 , Ip = 1.5,

Made in USA
of foreign
parts

ABB INC. ACH550-UH-023A-4+B055 S/N 2170702316
Seismic certification per applicable building codes
Tested and analyzed in accordance with:
IBC 2000,2003,2006,2009,2012 ASCE 7-02, 7-05, ICC-ES,AC-156
Approved to Seismic Design Spectral Response Acceleration Sds of 2.0 g.
CERTIFYING AGENCY: The VMC Group REPORT #: VMA-44407-02

Input	3PH 48...63 Hz
Voltage(U1)	380...480 Vac
Current(I1n)	23 A
Short Circuit	100 kA RMS Symmetrical, 600V max
Output	3PH 0...500 Hz
Voltage(U2)	0...U1 Vac
Current(I2n)	23 A
Power(Pn)	15 Hp 11 kW

Suitable for installation in a compartment handling conditioned air

ABB INC.

IP54,UL TYPE 12
MTR OL INCL: SEE MANUAL

ABB Oy
Hiomotie 13
00380,Helsinki
Finland

LISTED 45Y1
E124534

Mfg. Date: 15-February-2017

Orig. Firmware: V.3.16A

ACH550-UH-023A-4+B055

S/N* 2170702316 *

GE Panel Model Number
6KFPHD003202627

Source Ratings

Voltage: 460Vac
Amps: 4.8
Phase: 3
Hz: 60

Drawings

Elementary: 55 – 538736
Layout: 55 – 686664
Outline: 55 – 217706

DATE CODE: MM627i

Output

Voltage:
Amps:
Phase:
Hz:

Inst

Book: 0

Drive

Model: 6KFP43003X9XXXA1

The Maximum Short Curcuit Rating of Panel:
100 kA RMS Symmetrical Amperes at 460 volts AC

MADE IN MEXICO
55 – 217731

FUSE TABLE

GE Panel Model No. 6KFPHD003202627

Fuse Nomenclature	Voltage Rating	Current Rating	Class or Type
PFUS1	600	1	CC Time Delay
PFUS2	600	1	CC Time Delay
SFUS	250	1	Time Delay 1/4" x 1 – 1/4"
MFUS1	600	7	J Time delay
MFUS2	600	7	J Time Delay
MFUS3	600	7	J Time Delay

55 – 217732

COVER PILOT LAYOUT

VIEW

LT3	LT1
LT6	LT2

AF-600

GE Panel Model Numbe
6KFPHD005202624

Source Ratings

Voltage: 460Vac
Amps: 8.4
Phase: 3
Hz: 60

Output Ratings

Voltage: 460Vac
Amps: 7.4
Phase: 3
Hz: 0 – 1000

Drawings

Elementary 55 – 538736
Layout 55 – 686664
Outline 55 – 217706

Instructions

Book: DEH40600

Drive

Model: 6KFP43005X9XXXA1

DATE COD: MM627!

MADE IN MEXICO

The Maximum Short Curcuit Rating of Panel:
100kA RMS Symmetrical Amperes at 460volts AC

55 – 217731

FUSE TABLE

GE Panel Model No. 6KFPHD005202624

Fuse Nomenclature	Voltage Rating	Current Rating	Class or Type
PFUS1	600	1	CC Time Delay
PFUS2	600	1	CC Time Delay
SFUS	250	1	Time Delay 1/4" x 1 – 1/4"
MFUS1	600	12	J Time delay
MFUS2	600	12	J Time Delay
MFUS3	600	12	J Time Delay

55 – 217732

COVER PILOT LAYOUT

GE Panel Model Number
6KFPHD007202626

Source Ratings

Voltage: 460Vac
Amps: 11
Phase: 3
Hz: 60

Output Rat

Voltage: 46
Amps: 9.9
Phase: 3
Hz: 0 -

Drawings

Elementary: 55 – 538736
Layout: 55 – 686664
Outline: 55 – 217706

DATE CODE: MM628

Instructi

Book: DEH40600

Drive

Model: 6KFP43007X9XXXA1

The Maximum Short Curcuit Rating of Panel:
100 kA RMS Symmetrical Amperes at 460 volts AC

MADE IN MEXICO
55 – 217731

FUSE TABLE

GE Panel Model No. 6KFPHD007202626

Fuse Nomenclature	Voltage Rating	Current Rating	Class or Type
PFUS1	600	1	CC Time Delay
PFUS2	600	1	CC Time Delay
SFUS	250	1	Time Delay 1/4" x 1 – 1/4"
MFUS1	600	15	J Time delay
MFUS2	600	15	J Time Delay
MFUS3	600	15	J Time Delay

55 – 217732

COVER PILOT LAYOUT

VIEW

LT3	LT1

AF-600 FP

~~GE Panel Model Number~~
6KFPHD015202623

Source Ratings

Voltage: 460Vac
Amps: 21
Phase: 3
Hz: 60

Drawings

Elementary: 55-538735
Layout: 55-686664
Outline: 55-217707

DATE CODE: MM6281

Output Ratings

Voltage: 460Vac
Amps: 19
Phase: 3
Hz: 0-1000

Instructions

Book: DEH40600

Drive

Model: 6KFP43015X9XXXA1

The Maximum Short Curcuit Rating of Panel:
100 kA RMS Symmetrical Amperes at 460 volts AC

MADE IN MEXICO
55-217731

FUSE TABLE

GE Panel Model No. 6KFPHD015202623

Fuse Nomenclature	Voltage Rating	Current Rating	Class or Type
PFUS1	600	2	CC Time Delay
PFUS2	600	2	CC Time Delay
SFUS	250	2	Time Delay 1/4" x 1-1/4"
MFUS1	600	25	J Time delay
MFUS2	600	25	J Time Delay
MFUS3	600	25	J Time Delay

55-217732

COVER PILOT LAYOUT

REAR VIEW

LT7 LT1

AF-600 FP

GE Panel Model Number
6KFPHD020202625

Source Ratings

Voltage: 460Vac
Amps: 27
Phase: 3
Hz: 60

Output Ratings

Voltage: 460Vac
Amps: 25
Phase: 3
Hz: 0 - 1000

Drawings

Elementary 55 - 538741
Layout 55 - 686664
Outline 55 - 217707

Instructions

Book: DEH40600

Drive

Model: 6KFP43020X9XXXA1

DATE CODE: MM628|

The Maximum Short Circuit Rating of Panel:
100 kA RMS Symmetrical Amperes at 460 volts AC

MADE IN MEXICO
55-217731

FUSE TABLE

GE Panel Model No. 6KFPHD020202625

Fuse Nomenclature	Voltage Rating	Current Rating	Class or Type
PFUS1	600	2	CC Time Delay
PFUS2	600	2	CC Time Delay
SFUS	250	2	Time Delay 1/4" x 1-1/4"
MFUS1	600	40	J Time delay
MFUS2	600	40	J Time Delay
MFUS3	600	40	J Time Delay

55-217732

COVER PILOT LAYOUT

LT3	LT1	
LT4	LT2	
SSW	START	SPDPOT
STOP	STOP	

SIDE VIEW

002

EQUIPMENT SPECIFICATION

PROJECT NAME	**North Utility Plant**
LOCATION	**Building 451**
CLIENT	**GE Aviation - Evendale**
EQUIPMENT	**Variable Frequency Drives**
EQUIPMENT NO.	**See Performance Schedule Within**
TOTAL NO. REQ'D.	**32**

DATE 10/12/15

* THESE ARE THE BID SPECIFICATIONS PREPARED BY GE AVIATION

SCOPE:

This specification covers the basic requirements for total of thirty-two (32) solid-state, PWM, VFDs for speed control of three-phase squirrel-cage induction motors utilized including, pumps, air handling unit fans, and exhaust fans.

SUMMARY:

This section includes wall or base mounted Variable Frequency Drives.

See the MECHANICAL and ELECTRICAL drawings provided for reference with this bid package

☐ REVIEWED ☒ REVIEWED/CORRECTIONS NOTED
☐ REJECTED ☐ REVISE AND RESUBMIT
Corrections or comments made on the submittals during this review do not relieve Contractor from compliance with requirements of the Contract Documents. This review is for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Document. The Contractor remains responsible for determining the accuracy and completeness of other details such as dimensions and quantities; for substantiating instructions for installations; verifying materials, field measurements and related construction criteria; checking, coordinating, and performing Work in compliance with the Contract Documents.
KZF DESIGN Inc. PN Date 4/21/16

SUBMITTALS:

General: Submit the following:

Product data for the Variable Frequency Drives, including the following:

1. Matching load ratings to device of use including pumps or fans.
2. Output ratings for phase throughout voltage range.
3. Unit operating requirements including tolerances, efficiencies, overload capability, starting torque and speed regulation.
4. Other interface abilities including internal adjustability capabilities, self-protection and reliability, automatic reset/restart, torque boost, motor temperature compensation, manual bypass (where applicable) and indicating devices.
5. Shop drawings from manufacturer detailing dimensions, required clearances, components and location and size of each field connection meeting the maximum length, width and height requirements as described herein.
6. Wiring diagrams detailing wiring for power and controls and differentiating between manufacturers installed wiring and field installed wiring.
7. Delivery and shipping information including delivery within seven (7) days of purchase order.

QUALITY ASSURANCE:

NFPA 70: Listed and laveled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

UL and NEMA Compliance: Provide electrical components required as part of variable frequency drives, which have been listed and labeled by UL and comply with NEMA Standards.

DELIVERY:

Deliver variable frequency drives as a factory assembled unit to the extent allowable by shipping limitations, with protective crating and covering. Variable frequency drives shall be protected from exposure to dirt, fumes, water, corrosive substances and physical damage.

SEQUENCING AND SCHEDULING:

Coordinate the delivery of variable frequency drives with written notification to the Owner's Representative 48 hours prior to deliver.

GENERAL DESCRIPTION:

General: Variable Frequency Drive shall include all items as listed herein for each size range:

WALL MOUNTED VARIABLE FREQUENCY DRIVES:

1. Variable Frequency Drives for use on fan motors smaller than 75 HP shall be wall mounted types.
2. Drives shall be NEMA ICS 2, IGBT, PWM: listed and labeled as a complete unit and arranged to provide variable speed of a NEMA MG 1, Design B, 3-phase induction motor by adjusting output voltage and frequency.
3. Drives design and rating shall match load type such as fans or blowers and type of connection used between motor and load such as direct or through a power-transmission connection.
4. Drive enclosure shall come as a single unit of NEMA 12 construction and shall include a panel mounted operator station with start-stop and auto-manual selector switches with manual speed control potentiometer and elapsed time meter.

BASE MOUNTED VARIABLE FREQUENCY DRIVES:

1. Variable Frequency Drives for use on pump motors larger than 100 HP shall be base mounted, cabinet enclosure types.
2. Drives shall be NEMA ICS 2, IGBT, PWM: listed and labeled as a complete unit and arranged to provide variable speed of a NEMA MG 1, Design B, 3-phase induction motor by adjusting output voltage and frequency.
3. Drives design and rating shall match load type of pumps and type of connection used between motor and load such as direct or through a power-transmission connection.

4. Drive enclosure shall come as a single unit of NEMA 12 construction and shall include a panel mounted operator station with start-stop and auto-manual selector switches with manual speed control potentiometer and elapsed time meter.
5. Drives shall include a manual bypass consisting of a magnetic contactor arranged to safely transfer motor between controller output and bypass controller circuit when motor is at zero speed. Controller-off-bypass selector switch sets mode, and indicator lights give indication of mode selected. Unit shall be capable of stable operation (starting, stopping and running), with motor completely disconnected from controller (no load).

FEATURES COMMON TO ALL VARIABLE FREQUENCY DRIVES:

1. Output Rating: 3-phase; 6 to 60 Hz, with voltage proportional to frequency throughout voltage range.
2. Drive Operating Requirements:

   A. Input AC voltage tolerance of 208V, plus or minus 5 percent or 380 to 500 V, plus or minus 10 percent as needed for voltage application as indicated on the Drawings.
   B. Input frequency tolerance of 50/60 Hz, plus or minus 6 percent.
   C. Minimum Efficiency: 96 percent at 60 Hz, full load.
   D. Minimum Displacement Primary-Side Power Factor: 96 percent.
   E. Overload Capability: 1.1 times the base load current for 1 minute every 10 minutes, 130% overload for 2 seconds.
   F. Starting Torque: 100 percent of rated torque or as indicated.
   G. Speed Regulation: Plus or minus 1 percent.

3. Drive to include isolated control interface to allow controller to follow control signal over an 11:1 speed range with an electrical signal of 4 to 20 mA at 24 volts.
4. Internal Adjustment Capabilities:

   A. Minimum Speed: 5 to 25 percent of maximum RPM.
   B. Maximum Speed: 80 to 100 percent of maximum RPM.
   C. Acceleration: 1 to 1800 seconds.
   D. Deceleration: 1 to 1800 seconds.
   E. Seven (7) programmable preset speeds.
   F. Current Limit: 50 to a minimum of 110 percent of maximum rating.

5. Self-Protection and Reliability Features:

   A. Input transient protection by means of surge suppressors.
   B. Under-and-overvoltage trips; inverter over-temperature, overload, and overcurrent trips.

C. Motor Overload Relay: Adjustable and capable of NEMA ICSS 2, Class 20 performance.
D. Notch filter to prevent operation of the controller-motor-load combination at a natural frequency of the combination.
E. Instantaneous line-to-line and line-to-ground overcurrent trips.
F. Loss-of-phase protection.
G. Reverse-phase protection.
H. Short-circuit protection.
I. Motor overcurrent fault.

6. Automatic Reset/Restart: Attempts three restarts after controller fault or on return of power after an interruption and before shutting down for manual reset or fault correction. Bidirectional auto-speed search shall be capable of starting into rotating loads spinning in either direction and returning motor to set speed in proper direction, without damage to controller, motor, or load.
7. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.
8. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.
9. Indicating Devices: Meters or digital readout devices and selector switch, mounted flush in controller door and connected to indicate the following controller parameters:

A. Output Frequency (Hz).
B. Motor Speed (rpm).
C. Motor Current (amperes).
D. Motor Torque (percent).
E. Motor Power (kw).
F. DC-Link Voltage (VDC).
G. Motor Output Voltage (V).

10. Control Signal Interface:

A. Electric Input Signal Interface: A minimum of 2 analog inputs (0 to 10 V or 0/4-20 mA) and 6 programmable digital inputs.
B. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the BMS or other control systems:

I. 0 to 10 V dc.
II. 0-20 or 4-20 mA.
III. Potentiometer using up/down digital inputs.
IV. Fixed frequencies using digital inputs.

V. RS485.
VI. Keypad display for local hand operation.

C. Output Signal Interface: A minimum of 1 analog output signal (0/4-20 mA), which can be programmed to any of the following:

I. Output Frequency (Hz).
II. Output Current (load).
III. DC-Link Voltage (VDC).
IV. Motor Torque (percent).
V. Motor Speed (rpm).
VI. Set-Point Frequency (Hz).

D. Remote Indication Interface: A minimum of 3 programmable digital form relay outputs (120 VAC, 1 A) with the following settings:

I. Motor Running
II. Not faulted (fail safe).
III. Run permissive.

11. Communications: Provide an RS485 interface allowing drive to be used with an external system within a multi-drop LAN configuration. Interface shall allow all parameter settings of drive to be programmed via BMS control. Provide capability for drive to retain these settings within the nonvolatile memory.
12. Integral Disconnecting Means: Provide a NEMA KS 1, fusible switch with lockable handle.

ACCESSORIES:

1. Devices shall be factory installed in controller enclosure, unless otherwise indicated.
2. Push-Button Stations, Pilot Lights and Selector Switches: NEMA ICS 2, heavy-duty type.
3. Control Relays: Auxiliary and adjustable time-delay relays.
4. Standard Displays:

A. Output Frequency (Hz).
B. Motor Current (amperes).
C. Motor Torque (percent).
D. Motor Speed (rpm).
E. Motor Output Voltage (V).
F. DC Bus Voltage (V).
G. Motor Power (kw).

5. Historical Logging Information and Displays:

   A. Real-time clock with current time and date.
   B. Running log of total power versus time.
   C. Total run time.
   D. Fault log, maintaining last four faults with time and date stamp for each.

VARIABLE FREQUENCY DRIVE PERFORMANCE:

DESIGNATION	SERVES	DRIVE HP	DRIVE VOLAGE (V/PH/HZ)	BYPASS (Y/N)
VFD-451-AHU-1-1	AHU-451-1 SF	15	480/3/60	No
VFD-451-AHU-1-2	AHU-451-1 SF	15	480/3/60	No
VFD-451-AHU-1-3	AHU-451-1 RF	5	480/3/60	No
VFD-451-AHU-1-4	AHU-451-1 RF	5	480/3/60	No
VFD-451-AHU-2-1	AHU-451-2 SF	20	480/3/60	No
VFD-451-AHU-2-2	AHU-451-2 SF	20	480/3/60	No
VFD-451-AHU-2-3	AHU-451-2 RF	15	480/3/60	No
VFD-451-AHU-2-4	AHU-451-2 RF	15	480/3/60	No
VFD-451-AHU-3-1	AHU-451-3 SF	7.5	480/3/60	No
VFD-451-AHU-3-2	AHU-451-3 SF	7.5	480/3/60	No
VFD-451-AHU-3-3	AHU-451-3 RF	3	480/3/60	No
VFD-451-AHU-3-4	AHU-451-3 RF	3	480/3/60	No
VFD-451-AHU-4-1	AHU-451-4 SF	15	480/3/60	No
VFD-451-AHU-4-2	AHU-451-4 RF	5	480/3/60	No
VFD-451-AHU-5-1	AHU-451-5 SF	7.5	480/3/60	No
VFD-451-AHU-5-2	AHU-451-5 RF	2	480/3/60	No
VFD-451-EF-1-1	EF-451-1	20	480/3/60	No
VFD-451-EF-2-1	EF-451-2	20	480/3/60	No
VFD-451-EF-3-1	EF-451-3	20	480/3/60	No
VFD-451-EF-4-1	EF-451-4	20	480/3/60	No
~~VFD-451-CT-1-1~~	~~CT-451-1~~	~~60~~	~~480/3/60~~	~~Yes~~
~~VFD-451-CT-2-1~~	~~CT-451-2~~	~~60~~	~~480/3/60~~	~~Yes~~
~~VFD-451-CT-3-1~~	~~CT-451-3~~	~~60~~	~~480/3/60~~	~~Yes~~
~~VFD-451-CT-4-1~~	~~CT-451-4~~	~~60~~	~~480/3/60~~	~~Yes~~
VFD-451-CHP-1-1	CHP-451-1	400	480/3/60	Yes

VFD-451-CHP-2-1	CHP-451-2	400	480/3/60	Yes
VFD-451-CHP-3-1	CHP-451-3	400	480/3/60	Yes
VFD-451-CWP-1-1	CWP-451-1	200	480/3/60	Yes
VFD-451-CWP-2-1	CWP-451-2	200	480/3/60	Yes
VFD-451-CWP-3-1	CWP-451-3	200	480/3/60	Yes
VFD-451-HWP-1-1	HWP-451-1	150	480/3/60	Yes
VFD-451-HWP-2-1	HWP-451-2	150	480/3/60	Yes

250

SHIPPING:

Shall be FOB JOBSITE

All components shall be adequately protected during shipment against physical and weather damage either by separate protective covering or disassembly and separate packing. Separate packages shall be clearly identified, shipped together with main equipment, and be separately itemized on the "Bill of Lading."

VARIABLE FREQUENCY DRIVE START UP AND TESTING:

Factory testing shall be provided for each variable frequency drive. Technical and Service assistance will be included until the drives are performing as expected, and is accepted by GE Facilities Engineering.

WARRANTY and MAINTENANCE:

The variable frequency drive manufacturer's warranty shall cover parts costs for the repair or replacement of defects in material or workmanship, for a period of five years from equipment acceptance or 66 months from shipment, whichever occurs first. Warranty support shall be provided by company direct or factory authorized service permanently located near the job site.

Vendor shall provide an alternate for an additional five (5) year period for a parts warranty for a total coverage of ten (10) years.

INSTRUCTIONS TO EQUIPMENT VENDORS:

Quote per the instructions provided to bidder in the bid package requested from

CH2MHill
1 Neumann way,
Cincinnati, Ohio 45241.

All shipping and handling costs are to be included as separate line items on quotes.

Provide with quote, accurate (factory-certified) shipping and delivery schedules.

The successful vendor shall submit for approval, within one week after receipt of order, seven (7) sets of factory-certified shop drawings containing the following data:

1. "Certified correct" equipment dimensional drawings, including minimum clearances for servicing, general mounting requirements, including loads and support frame size plus hold-down bolt size and location.
2. Equipment installation, operating, and maintenance instruction manuals.
3. Vendor suggested spare parts lists with model (part) numbers and pricing information.
4. Starter and motor data sheet.
5. Equipment weight data.
6. Pressure ratings and pressure drops.

Deviations from this specification are permitted to accommodate Manufacturer standard construction. Deviations will be evaluated and compared to this specification by GE Aviation Facilities Engineering. Any such deviations must be clearly indicated on the quotation, with the associated cost add to meet the specifications.

Attachment "A" **GE Aviation**

GE INDUSTRIAL SOLUTIONS BLANKET RELEASE FORM

GE AVIATION PURCHASE ORDER NO.

REQUESTER NAME: Dave Swigart **MAIL DROP** _____ **PHONE NO.** 604-4675

DATE: 2/11/16 **GE AVIATION ACCOUNT NO:** - - -

Deferred account no: - - -

(ADN #)

SELECT TYPE:

☐ **TIME & MATERIAL:** ***Requester*** -- Please identify the amount of man-days needed in work scope section.
GE IS -- Please fill out GE IS section.

☒ **FIRM PRICE:** ***Requester*** -- Check this box if you wish to have GE IS provide you with a firm price for a specific work scope. Fill out work scope section.
GE IS -- Please fill out GE IS section.

WORK SCOPE: **Requester** -- Provide job description, number of man-days required, completion date, comments and location.

Provide twenty-eight (28) enclosed variable frequency drives according to the equipment specification for the North Utility Plant Building 451 Variable Frequency Drives dated 10/12/15.

After completing the above information, submit this form to GE IS for processing.

TO BE COMPLETED BY GE IS:

FIELD SERVICE REPORT NO.: G801134-1215WLH Rev. 2 **CASE NO.:** _____

DOLLAR AMOUNT: _____ **NOT TO EXCEED (NTE) / FIRM PRICE**
CIRCLE ONE OF THE ABOVE ITEMS

GE IS APPROVAL SIGNATURE: _____ **DATE:** 2/11/16

PHONE NUMBER: 513-530-7177

COMMENTS: GEIS will provide twenty-eight (28) enclosed variable frequency drives according to the equipment specification for the North Utility Plant Building 451 Variable Frequency Drives dated 10/12/15 with exceptions as noted.

GE TEAM - PLEASE NOTE

This firm price proposal is in response to C2HM RFQ # 111915/EBF1945-04 and Addendum 1&2 Inclusive Contract Number EBF1945-40559 dated November 19, 2015.

After completing the above information, submit this form to Requester for his/her approval and signature. Note: The Requester must sign in the following area before GE IS can proceed.

Requester signature: _____ **Date:** _____

GEA Indirect Sourcing signature: _____ **Date:** _____

**General Electric Aviation Indirect Sourcing Facilities Buyer Signature required when material purchases exceed $100,000*

Requester: shall mail a copy of the completed form to GE IS and GE Aviation Blanket Administrator.

GE Aviation Blanket Administrator
Evendale Plant: Dave Swigart, Mail Drop B-67, Fax # 786-1996

Workscope:
The Industrial Solutions business (GEIS) of General Electric International, Inc. is pleased to provide this proposal for twenty-eight (28) variable frequency digital drives for use at the GE Aviation (GEA) North Utility Plant Bldg. 451 in Evendale, Ohio.

This is a "Parts Only" proposal. No field engineering services are included. The equipment offered by GEIS in this proposal is based solely on the information contained in GEA specification "NUP VFD Pre Purchase Spec 10 12 15" (Addendum 1 & 2 inclusive), information gathered during recent site visits, and GEIS's understanding of the existing power distribution system at the GEA Evendale facility. The product offering and price are subject to change as more information is obtained and/or clarification of the existing data is provided.

For the North Utility Plant variable frequency drive Project, GE IS will provide the following equipment:

QTY	CURRENT	MOTOR HP	DRIVE HP	BYPASS (Y/N)	NEMA 12 Enclosure Type
5	21	15	15	No	Wall mount
3	8.2	5	5	No	Wall mount
6	27	20	20	No	Wall mount
3	11	7.5	7.5	No	Wall mount
2	4.8	3	3	No	Wall mount
1	3.4	2	2	No	Wall mount
3	540	400	450	Yes	Free standing
3	240	200	200	Yes	Free standing
2	190	150	150	Yes	Free standing

250

The digital drives will have the following features:

- AF600 Drive
- 480 V three phase 60hz input
- Standard AC disconnect
- Door mounted manual speed pot
- NEMA 12 Ventilated Construction
- 2 Contactor manual bypass (if specified)
- Door mounted keypad
- Elapsed time meter
- Start/stop PB
- EStop PB (for UL508A compliance)
- Drive/Off/Bypass switch
- Auto/manual switch
- Modbus RTU/Metasys N2/Apgen FLN P1 serial communications interface
- BacNet Communications Module (OPTION 1)
- Equivalent of 5% line reactor

AF-600 FP Fan and Pump Drive
Standard Specifications

Operation

Operation Method	Keypad operation: Hand, Off, Auto Digital Input: Programmable for Start/Stop, Forward/Reverse, Jog Timer operation: Stop after predetermined time frame Communications: RS-485 Modbus RTU, Metasys N2, and Apogee FLN P1 USB Port for programming drive with optional PC Software
Frequency Reference Signal	Left or Right Arrow buttons on keypad in Manual Mode Speed Potentiometer: 0 to +10 Vdc, 10 to 0 Vdc 0-10Vdc analog input 0/4-20ma analog input
References	Up to 3 Input References can be selected from Analog Input #1 or #2, Frequency Input #1 or #2, Network, or Potentiometer
Digital Input Signal	No Operation Reset after drive trip or alarm Drive at stop with no holding current Quick Stop according to Quick Stop Decel Time 1 Stop on input going low Start Maintained Start after signal applied for Minimum of 2ms Reversing Start Reverse Enable Start Forward only Enable Start Reverse only Jog Multi-Step Frequency selection (1 to 8 Steps) Hold Drive Frequency Hold Reference Speed Up; activated by Hold Drive Frequency or Hold Reference Slow Down; activated by Hold Drive Frequency or Hold Reference Drive Parameter Setup Select 1-4 Precise Start or Stop; Activated when drive parameter precise start or stop function is selected Catch Up or Slow Down; Activated by signal to add to or subtract from input reference to control speed Pulse Input selectable from 100 - 110000Hz Accel / Decel Time select. Set Input to Accel / Decel Times 1 to 4 Digital Potentiometer Input Increase or Decrease Mechanical Brake Feedback

Keypad

Keypad Features	LCD Display with 6 A p Multi-Language Supp Hot Pluggable, Remote Feature, IP65 rating w LED's - Green - drive is Red - indicates an alc Menukeys and H-O-A
Keypad Keys	Status - shows status c Quick Menu - Enters Q or Trending Modes Main Menu - Used for p Alarm Log - Used to dis Back - Reverts to previc structure Cancel - Used to cance Info - Displays informat parameter, or functior Hand/Off/Auto - Used t in remote mode Reset - Used to reset W
Password	2 Level Password Prote
Alternate Motor Parameters	Up to 4 Separate compl available
Graphical Trending	Trend - Speed, Power, o

RS485 Modbus RTU Serial Communication

Physical Level:	EIA/RS485
Transmission distance:	1640 ft (500m)
Node Address:	32
Transmission Speed:	2400, 4800, 9600, 1920
Transmission Mode:	Half Duplex
Transmission Protocol:	Modbus RTU
Character Code:	Binary
Character Length:	8 Bits
Error Check:	CRC

Mounting Clearance

	All AF-650 GP drives can without spacing. For all allow 3.4 inches (100mm For all drives rated 150 (225mm) free space abo

GE

Built-in features
Built-in simplicity
Built for fans & pumps

AF-600 FP™ Fan & Pump Drives

a product of
ecomagination

imagination at work

AF-600 FP™ Fan & Pump Drives

Built for variable torque



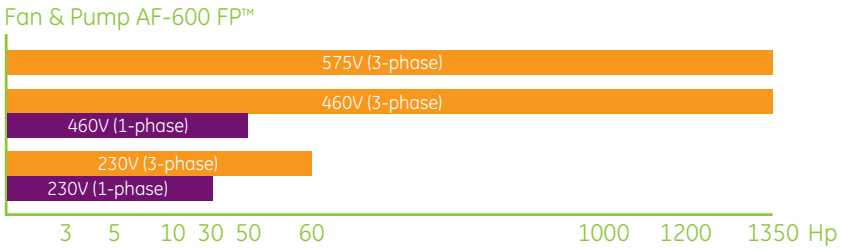


Specifically designed for fan and pump applications, the AF-600 FP drive has been optimized to make it run your applications right out of the box.

- Fans: HVAC, cooling towers, VAV, supply and return, exhaust, fume hood, make-up air, induced and forced draft, furnace temperature control
- Pumps: chilled water, pressure boosting, cooling tower, wastewater, chiller, irrigation, hydro-storage

Its compact size makes it easy to mount inside a control panel or to be used standalone, and its dedicated features include sophisticated controls that lower your overall costs. That includes an Energy Savings Optimizer that can boost energy savings by 5-15% at partial loads.

- Available up to 60Hp @ 208/230V, up to 1000Hp @ 460V and up to 1350Hp @ 575V (3-phase input) and up to 30Hp @ 208/230V and 50Hp @ 460V (1-phase input)
- Energy monitoring and analysis reports provide payback analysis for your drives
- Compliance with major international standards CE, UL, cUL, C-Tick



Built-in features lower your total cost

- Self protecting features
- 110% current overload for 1 minute
- Flying start (catch a spinning motor)
- Electronic thermal overload
- Easy to use PC software (DCT-10)
- Energy monitoring feature
- Flow compensation
- Pump cascade controller
- Sleep mode
- Automated resonance monitoring
- Fan belt monitoring
- Stairwell pressurization
- Fire override mode
- Dry pump protection
- 4 auto-tune PID controllers
- Resonance monitoring
- Belt monitoring
- Real time clock
- Plenum rated

Stand-alone drive types

For drives rated up to and including 125HP

- IP20/chassis
- IP21/NEMA 1 with field installed kit

For drives rated 150HP or more

- IP00/chassis
- IP21/NEMA 1

For all drives

- IP54 /55/NEMA 12

AF-600 FP™ Fan & Pump Drives

Built-in simplicity speeds set-up

The removable keypad, common to all AF-6 Series drives, is your window into all programming and information elements.

The keypad INFO key provides full-text, context-sensitive information to make programming easier and can eliminate the need for printed manuals. In most cases, start-up can be completed in less than 5 minutes – saving you valuable time.

You can set up one drive and then copy settings to other drives using the hot pluggable feature, eliminating the need for duplicate programming.

The Quick Menu provides easy access to all the basic settings and the controller.

- Hot pluggable
- Illuminated LCD display
- Parameters & their values
- Unit indications
- Rotation direction indication
- Set-up indication
- Custom user displays
- Trended charts display speed, torque, current
- Full alarm messages & descriptions

Actual size

AF-600 FP™ Fan & Pump Drives

Standard features

Control card

Terminal blocks	Pluggable, spring-loaded as standard or optional field-installed screw terminals
Serial ports	RS485 and USB ports
Control inputs	4/6 digital, 2 analog, 2 pulse
Control outputs	2 relay, 1 analog, 2 pulse

Networks

Built-in Modbus RTU, Metasys N2, Apogee FLN P1

Logic controller

Built-in sequencer that can eliminate the need for PLCs or timers
Easy to learn, program and debug

DCT-10 software

Familiar, intuitive interface
Option programming
On- and off-line utility
Real-time data collection
Process management interaction
USB, RS485 or Fieldbus communication
On-board help for each parameter
Logging of alarms and warnings
Easy fault history documentation

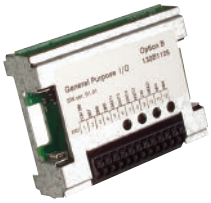
RFI filter

Reduces interference
A2 standard, A1 and B1 optional
Facilitates meeting CE EMC directives

DC link reactor

Low harmonic emission: THID < 48%
No voltage drop, full output voltage
Fulfils EN 61000-3-2/3-12
Displacement power factor (cos f ~ 1)
True power factor 0.9

Optional features



Plug-and-play option modules deliver application versatility so you can maximize performance and energy savings.

Networks
Profibus DP, DeviceNet, Modbus TCP/IP, LonWorks, EtherNet IP, BACNet
Top or bottom cable entry

General purpose I/O
3 digital and 3 analog inputs
2 digital and 1 analog outputs

Relay
Adds 3 relay outputs
AC-1 Resistive load 240VAC, 2A
AC-15 Inductive load @ cos ? 0.4, 0.2 A
DC-1 Resistive load 240V AC 1A
DC-13 Inductive load @ cos ? 0.4, 0.1 A

24 Vdc supply
Powers control card and options
Allows serial communication, control, programming and diagnostics during power outages
Input voltage range: 24 V DC ± 15% (max. 37 V in 10 sec.)
Max. input current: 2.2 A
Input capacitance load: < 10 uF
Power-up delay: < 0.6 s

Conformal coating (Factory option)
Protects electronics from aggressive atmospheres
Tested to ANSI/ISA S71.04-1985, Classes G3 and GX

Accessories

Remote keypad kit
NEMA 4 (IP65) rating for remote mounting of keypad with or without preassembled cable

NEMA 1 kits
Converts IP20 chassis drive to IP21/NEMA 1
Includes field-installable top dust cover, bottom wiring box and bonding plate
Fits all drives ≤125Hp

Pedestal kit
Allows NEMA 1 or NEMA 12 drives types to be floor mounted.
For drives rated 150Hp to 350/450Hp @ 460/575V.

Duct kits
Allows for up to 70% of the drive's generated heat to be vented out the back channel of the drive. For drives rated 150Hp to 600/650Hp @ 460/575V.

AF-600 FP™ Fan & Pump Drives

Ratings, dimensions and specifications

Voltage	HP Rating	Output Current (A)	Efficiency		Watt Loss (W)	GE Unit Size	Type	Dimensions (in)			Weight (lbs)
			kHz	%				Height	Width	Dept	
230Vac	1	6.6	5	96	63	12	IP20	14.7	3.5	8.7	10.8
	2	7.5	5	96	82	12	IP20	14.7	3.5	8.7	10.8
	3	10.6	5	96	116	12	IP20	14.7	3.5	8.7	10.8
	5	16.7	5	96	185	13	IP20	14.7	5.1	8.7	14.55
	7.5	24.2	4	96	269	23	IP20	15.71	6.5	9.13	26.5
	10	30.8	4	96	310	23	IP20	15.71	6.5	9.13	26.5
	15	46.2	4	96	447	23	IP20	15.71	6.5	9.13	26.5
	20	59.4	4	96	602	24	IP20	20.47	9.06	9.41	51.8
	25	74.8	3	96	737	33	IP20	24.8	12.13	13.15	77.2
	30	88	3	97	845	33	IP20	24.8	12.13	13.15	77.2
	40	115	3	97	1140	33	IP20	24.8	12.13	13.15	77.2
	50	143	3	97	1353	34	IP20	31.5	14.57	13.15	110.2
	60	170	3	97	1636	34	IP20	31.5	14.57	13.15	110.2
460Vac	1	2.7	5	96	58	12	IP20	14.7	3.5	8.7	10.8
	2	3.4	5	97	62	12	IP20	14.7	3.5	8.7	10.8
	3	4.8	5	97	88	12	IP20	14.7	3.5	8.7	10.8
	5	8.2	5	97	124	12	IP20	14.7	3.5	8.7	10.8
	7.5	11	5	97	187	13	IP20	14.7	5.1	8.7	14.55
	10	14.5	5	97	255	13	IP20	14.7	5.1	8.7	14.55
	15	21	4	98	278	23	IP20	15.71	6.5	9.13	26.5
	20	27	4	98	392	23	IP20	15.71	6.5	9.13	26.5
	25	34	4	98	465	23	IP20	15.71	6.5	9.13	26.5
	30	40	4	98	525	24	IP20	20.47	9.06	9.41	51.8
	40	52	4	98	698	24	IP20	20.47	9.06	9.41	51.8
	50	65	3	98	739	24	IP20	20.47	9.06	9.41	51.8
	60	80	3	98	843	33	IP20	24.8	12.13	13.15	77.2
	75	106	3	98	1083	33	IP20	24.8	12.13	13.15	77.2
	100	130	3	98	1384	34	IP20	31.5	14.57	13.15	110.2
	125	160	3	99	1474	34	IP20	31.5	14.57	13.15	110.2
	150	190	3	98	3234	43	IP00	39.3	16.1	14.7	200.6
	200	240	3	98	3782	43	IP00	39.3	16.1	14.7	200.6
	250	302	3	98	4213	44	IP00	50.3	16.1	14.7	304.2
	300	361	3	98	5119	44	IP00	50.3	16.1	14.7	304.2
	350	443	3	98	5893	44	IP00	50.3	16.1	14.7	304.2
	450	540	3	98	7630	52	IP00	59	23	19.5	611
	500	590	2	98	7701	52	IP00	59	23	19.5	611
	550	678	2	98	8879	52	IP00	59	23	19.5	611
	600	730	2	98	9428	52	IP00	59	23	19.5	611
	650	780	2	98	10647	61	IP21/NEMA 1	86.8	55.1	23.9	2214
	750	890	2	98	12388	61	IP21/NEMA 1	86.8	55.1	23.9	2214
	900	1050	2	98	13201	61	IP21/NEMA 1	86.8	55.1	23.9	2214
	1000	1160	2	98	15436	61	IP21/NEMA 1	86.8	55.1	23.9	2214
	1200	1380	2	98	18084	62	IP21/NEMA 1	86.8	71	23.9	2748
	1350	1530	2	98	20538	62	IP21/NEMA 1	86.8	71	23.9	2748

For 575Vac data, consult www.geelectrical.com/drives

GE
41 Woodford Avenue
Plainville, CT 06062

www.geelectrical.com/drives

imagination at work

ABB Drives for HVAC
ACH550, 15 to 550 HP with multi-pulse

Clean power, for your system and the grid. Harmonic distortion can wreak havoc on sensitive equipment. When there are critical applications at stake, mitigation methods are vital. From swinging chokes to filters, and multi-pulse to ultra-low harmonic, selection is key.

Power and productivity
for a better world™

Mitigation for critical HVAC systems

Disruptions due to harmonic distortion, on a commercial facility can severly dampen productivity or even put people at risk in critical scenarios. Mitigation from an integrated, HVAC-designed solution is imperative. Our 12 pulse will typically maintain harmonic current distortion below 10% at the input terminals of the drive; the 18 pulse below 5%. All the while improving true power factor, in both designs.

Saving Cost

Eliminate complexity of adding external transformers, reactors, filters or traps, and improve overall electrical system efficiency. Through an integrated redundant design, you can reduce site installation costs and minimize costly system downtime. Extend the drive's warranty when commissioned by an ABB Certified Start Up technician.

Product Offering

ABB's multi-pulse offering for harmonic mitigation is the ABB ACH550 drive in a variety of 18 pulse and 12 pulse configurations with phase shifting transformer and co-ordinated input bridge balance reactors. Each have individually fused multi-pulse input bridges and offer a wide selection of power and control options for the package including E-Clipse Bypass and Soft Start E-Clipse Bypass.

Disconnecting Means

All multi-pulse configurations safely disconnect the package from the main input power supply through a single disconnect, which is mechanically interlocked with the enclosure door, lockable in the off position for up to three padlocks.

Enclosures for your environment

These solutions come in numerous NEMA rated enclosures, all with an accesible drive control panel (keypad), even without opening the enclosure door. Our NEMA 3R enclosures include thermostatically controlled vent fans and a space heater. Finally, they are all 100 kA short circuit current rating available up to 480 V AC and UL 508A labeled.

ACH550-PHPF03U-EN REV A EN 05/10/2013

Technical data

Input power connection	
Voltage and power range	3-phase, 208 to 240 V, -10/+15%, 15 to 100 HP 3-phase, 480 V, -10/+15%, 20 to 550 HP 3-phase, 500 to 600 V, -10/+15%, 20 to 150 HP
Frequency	48 to 63 Hz
Power Factor	0.98 at nominal load
Output (motor) connection	
Frequency	0 to 500 Hz
Acceleration Time	0.1 to 1800 s
Deceleration Time	0.1 to 1800 s
Programmable control connections	
Two analog inputs	(Single speed reference signal to both drives)
Voltage signal	0 (2) to 10 V, 250kΩ, single-ended
Current signal	0 (4) to 20 mA, Rin = 100 Ω
Potentiometer reference value	10 V, 10 mA, 1 to 10 kΩ
Two analog outputs	0 (4) to 20 mA, load < 500 Ω
Auxiliary voltage	24 V DC, max. 250 mA (short circuit protected)
Six digital inputs	12 to 24 V DC with internal or external supply, PNP and NPN
Three relay outputs (Form C)	
Maximum switching voltage	250 V AC/30 V DC
Maximum switching current	8 A at 24 V DC or 250 V AC, or 0.4 at 120 V DC
Maximum continuous current	2 A RMS
Serial communication	
Embedded Building Automation Protocols	BACnet (MS/TP) Johnson Controls N2 Siemens Buildings Technologies FLN Modbus RTU
Product compliance	
240V, 480V, 600V products	UL, cUL
Environmental limits	
Protection class	NEMA 1, 12 or 3R
Ambient temperature (Operating)	NEMA 1 & 12 -15 to 40°C (5 to 104°F) -15 to 50°C (5 to 122°F) with derate NEMA 3R -18 to 40°C (0 to 104°F) -18 to 50°C (0 to 122°F) with derate
Relative humidity	5 to 95%, no condensation allowed, maximum relative humidity 60% in the presence of corrosive gas

ACH550-2BCR / 2BFR / 8BCR / 8BFR (E-Clipse Bypass)	
Available Enclosures	NEMA1, 12 & 3R
Main Input Disconnect	Circuit Breaker (BCR) Fused Disconnect (BFR)
Options	Standard ACH550 options Soft Start in Bypass Motor 1 / Motor 2 Selection
ACH550-2PCR / 2PFR / 8PCR / 8PFR	
Available Enclosures	NEMA1, 12 & 3R
Main Input Disconnect	Circuit Breaker (BCR) Fused Disconnect (BFR)
Options	Standard ACH550 options Soft Start in Bypass Motor 1 / Motor 2 Selection

For more information please contact your local ABB representative or visit:

www.abb.com/drives

Power and productivity for a better world™

Form **W-9**
(Rev. November 2017)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

▶ **Go to *www.irs.gov/FormW9* for instructions and the latest information.**

Give Form to the requester. Do not send to the IRS.

Print or type. See Specific Instructions on page 3.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.
GENERAL ELECTRIC COMPANY

2 Business name/disregarded entity name, if different from above
GE Aviation

3 Check appropriate box for federal tax classification of the person whose name is entered on line 1. Check only **one** of the following seven boxes.

☐ Individual/sole proprietor or single-member LLC ☑ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate

☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=Partnership) ▶ _____

Note: Check the appropriate box in the line above for the tax classification of the single-member owner. Do not check LLC if the LLC is classified as a single-member LLC that is disregarded from the owner unless the owner of the LLC is another LLC that is **not** disregarded from the owner for U.S. federal tax purposes. Otherwise, a single-member LLC that is disregarded from the owner should check the appropriate box for the tax classification of its owner.

☐ Other (see instructions) ▶

4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):

Exempt payee code (if any) 5

Exemption from FATCA reporting code (if any) _____

(Applies to accounts maintained outside the U.S.)

5 Address (number, street, and apt. or suite no.) See instructions.
1 Neumann Way

Requester's name and address (optional)

6 City, state, and ZIP code
Cincinnati, OH 45215

7 List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I, later. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN*, later.

Note: If the account is in more than one name, see the instructions for line 1. Also see *What Name and Number To Give the Requester* for guidelines on whose number to enter.

Social security number
[ ][ ][ ] - [ ][ ] - [ ][ ][ ][ ]

or

Employer identification number
1 4 - 0 6 8 9 3 4 0

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

Sign Here **Signature of U.S. person** ▶ _____ **Date** ▶ 2/25/2017

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to *www.irs.gov/FormW9*.

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-INT (interest earned or paid)
- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)
- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See What is backup withholding, *later.*

DUKE ENERGY
Mercantile Self Direct Program
139 East Fourth Street
Cincinnati, OH 45202

April 13, 2018

Chris Kearns
GE Aircraft Engines
1 Neumann Way
Cincinnati, Ohio, 45215-1915

Subject: Your Application for a Duke Energy Mercantile Self-Direct Rebate

Dear Chris:

Thank you for your Duke Energy Mercantile Self Direct rebate application. As noted in the Energy Conservation Measure (ECM) chart on page two, a total rebate of $11,050.00 has been proposed for your projects (listed in chart below) completed in the 2017 calendar year(s). **All Self Direct Rebates are contingent upon approval by the Public Utilities Commission of Ohio (PUCO).**

At your earliest convenience, please indicate if you accept this rebate by

- providing your signature on page two
- completing the PUCO-required affidavit on page three.

Please return the documents to my attention via fax at 513-629-5572 or e-mail to SelfDirect@Duke-Energy.com. Upon receipt, Duke Energy will submit the necessary documentation to PUCO. Following PUCO's approval, Duke Energy will remit payment.

At Duke Energy, we value your business and look forward to working with you on this and future energy efficiency projects. We hope you will consider our Smart $aver® incentives, when applicable. Please contact me if you have any questions.

Sincerely,

Robin Avant
Senior Program Manager
Mercantile Self Direct Rebates

cc: Michelle Kolb

Please indicate your response to this rebate offer within 30 days of receipt.

☒ Rebate is accepted. ☐ Rebate is declined.

By accepting this rebate, GE Aircraft affirms its intention to commit and integrate the energy efficiency projects listed on the following pages into Duke Energy's peak demand reduction, demand response and/or energy efficiency programs.

Additionally, GE Aircraft also agrees to serve as joint applicant in any future filings necessary to secure approval of this arrangement as required by PUCO and to comply with any information and reporting requirements imposed by rule or as part of that approval.

Finally, GE Aircraft affirms that all application information submitted to Duke Energy pursuant to this rebate offer is true and accurate. Information in question would include, but not be limited to, project scope, equipment specifications, equipment operational details, project costs, project completion dates, and the quantity of energy conservation measures installed.

If rebate is accepted, will you use the monies to fund future energy efficiency and/or demand reduction projects?

☒ YES ☐ NO

If rebate is declined, please indicate reason (optional):

Customer Signature	Printed Name	Date
	Chris L. Kennedy	5/7/2018

Proposed Rebate Amounts

Measure ID	Energy Conservation Measure (ECM)	Proposed Rebate Amount
ECM-1	VFD HVAC Fan – Qty. 221 (13/Q/17HP) – Yr. 2017 – EA 150163	$11,050.00
ECM-2		
ECM-3		
ECM-4		
ECM-5		
Total		$11,050.00

Ohio | Public Utilities Commission

Application to Commit Energy Efficiency/Peak Demand Reduction Programs (Mercantile Customers Only)

Case No.: ____-____-EL-EEC 18-1058-EL-EEC

State of Ohio :

CHRIS L. HEVENS, Affiant, being duly sworn according to law, deposes and says that:

1. I am the duly authorized representative of:

   GENERAL ELECTRIC ACTING THROUGH IT'S AVIATION BUSINESS

   [insert customer or EDU company name and any applicable name(s) doing business as]

2. I have personally examined all the information contained in the foregoing application, including any exhibits and attachments. Based upon my examination and inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete.

3. I am aware of fines and penalties which may be imposed under Ohio Revised Code Sections 2921.11, 2921.31, 4903.02, 4903.03, and 4903.99 for submitting false information.

Signature of Affiant & Title

Sworn and subscribed before me this 8th day of May, 2018 Month/Year

Signature of official administering oath

John Rumpf - Notary
Print Name and Title

My commission expires on Never

JOHN M. RUMPF, ATTORNEY
NOTARY PUBLIC • STATE OF OHIO
My commission has no expiration date
Section 147.03 O.R.C.

Appendix 1 – Electric History

84500860 01

GE AIRCRAFT ENGINES
1 NEUMANN WY
CINCINNATI, OH 45215

Date	Days	Actual KWH	Bill KWH	Actual Demand	Bill Demand	Net Charge	Billing Notes	KWH/Day	Load Factor	Cost Per Day
2/28/2018	29	11,133,600	11,139,357	23,762.30	24,106.20	62,144.45	UTILITY CHARGE INS*	384,115.80	67.3	2142.91
1/30/2018	32	12,437,184	12,442,199	23,424.00	24,106.20	63,984.05	*	388,818.70	69.1	1999.5
12/29/2017	30	3,732,880	11,427,313	53,766.90	24,106.20	60,444.73	*	380,910.40	9.6	2014.82
11/29/2017	33	12,517,512	12,523,423	60,570.40	24,368.90	55,371.80	*	379,497.70	26.1	1677.93
11/1/2017	29	11,396,928	11,403,878	23,749.10	24,106.20	54,109.52	*	393,237.20	68.9	1865.85
10/1/2017	30	12,829,968	12,836,048	26,407.50		75,502.36	*	427,868.30	67.5	2516.75
9/1/2017	29	13,041,360	13,047,168	28,360.20		80,166.74	*	449,902.30	66.1	2764.37
8/1/2017	32	14,184,288	14,196,470	26,136.00		76,534.92	*	443,639.70	70.7	2391.72
7/1/2017	29	12,840,192	12,847,199	28,408.20	28,177.60	79,512.56	*	443,006.90	64.9	2741.81
6/1/2017	30	12,024,384	12,031,129	26,638.20		72,407.23	*	401,037.60	62.7	2413.57
5/1/2017	32	12,226,608	12,233,397	25,286.50	24,717.30	61,827.28	*	382,293.70	63	1932.1
4/1/2017	29	11,567,328	11,576,789	23,803.40		49,977.97	*	399,199.60	69.8	1723.38

Appendix 2 – Annual kWh and kW savings

Measure	Measure Quantity	Unit of Measure	Annual kWh Gross with losses (Per Unit)	TOTAL Annual kWh Gross with losses	Saved Summer coincident kW with losses (Per Unit)	Total KW Gross with losses
VFD HVAC Fan	221	per fan hp	238883	52793239	0.07	16.53

Appendix 3 – Cash Rebate

Measure	Amount
VFD HVAC Fan	$11,050
	$11,050

Appendix 4 – Utility Cost Test

Measure	UCT
VFD HVAC Fan	9.61
	9.61

Appendix 5 – Avoided Supply Costs

Measure	T&D	Production	Capacity	Quantity	Total Avoided Costs
VFD HVAC Fan	$17,687	$190,223	$15,046	221	$222,956
					$222,956

Appendix 6 – Utility Program Costs

Measure	Qty	Total Costs
VFD HVAC Fan	221	$12,139
		$12,139

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Commission of Ohio Docketing Information System on

6/27/2018 4:51:43 PM

in

Case No(s). 18-1058-EL-EEC

Summary: Application Application to Commit Energy
Efficiency/Peak Demand
Reduction Programs
(Mercantile Customers Only)-GE Aircraft Engines,VFD HVAC Fan electronically filed by
Carys Cochern on behalf of Duke Energy