Distribution Interconnection Policy

Technical Requirements

aes Ohio

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1 Introduction

The AES Ohio distribution interconnection technical requirements are intended to facilitate distributed energy resource (DER) installations while ensuring the delivery of safe and reliable power to all customers. This document contains information on the application process, technical requirements, and testing and commissioning requirements for distributed energy resources. The target audience for this public facing document are customers, DER developers, owners, and installers. The following information is in alignment with and supplements the Interconnection Tariff on file with the Public Utility Commission of Ohio.

Please note that this document is a guide, and the Company reserves the right to change its policies, procedures and standards when deemed necessary to maintain the reliability of the AES Ohio Electric Power System (EPS) and the safety of the Company's customers, workforce and the general public.

In Ohio, the interconnection of DER to the distribution system is governed by Ohio Administrative Code Chapter 4901:1-22. Interconnection Services and Net Metering is governed by Ohio Administrative Code Rule 4901:1-10-28 | Net metering.

2 Scope

This policy applies to distributed energy resources that are designed to operate in parallel with the AES Ohio distribution system and export electric power for more than 100 milliseconds. The policy does not apply to customer owned emergency or standby generators that do not operate in parallel with or create momentary parallel operation with the AES Ohio distribution system for no more than 100 milliseconds. This document also does not apply to DERs connected directly to an AES Ohio distribution substation, the AES Ohio transmission system at 69kV, 138kV, or 345kV, or any resource under the jurisdiction and requirements of FERC due to their wholesale market sales of electricity. The AES Ohio Transmission Interconnection Requirements can be found here

3 Definitions

Abnormal Operating Condition – A situation in which the Company is operating the Distribution System in other than normal configuration, or under conditions that do not normally exist.
Application – *See* Interconnection Request Application below.
Basic Impulse Level (BIL) – A measure of the ability of a piece of equipment to withstand abnormal voltage and surge voltages.
Company – AES Ohio
Customer – An entity that receives electric service from Company.
Distributed Energy Resource (DER) – A source of electric power that is directly connected to Company's Distribution System. DER sources include energy storage systems, fuel cells, solar photovoltaic (PV), biomass, natural gas, wind, etc. DER conversion technology includes inverters, induction generators, and synchronous generators, including reciprocating or turbine-driven generators.
DER Owner – The entity that is the counterparty to the Company in the DER Interconnection Agreement. **Direct Transfer Trip (DTT) –** High speed relaying function and communication channel between two or more devices that provides for a remote operation of a circuit breaker or recloser.
Distribution System – Company's wires, equipment, and facilities that operate at a nominal operating alternating current (AC) voltage of 34.5 kV or below.
Effectively Grounded – A system in which a low impedance path to ground exists to limit overvoltage during fault conditions.
Energy Storage System – A system that captures energy produced at one time, stores that energy for a period of time, and delivers that energy as electricity at a future time.
FERC – Federal Energy Regulatory Commission

Interconnection – The physical connection of a DER to Company's Distribution System.
Interconnection Agreement – The contract between Company and DER Owner that stipulates terms and conditions for DER Interconnection and Parallel Operation.
Interconnection Equipment – Company-owned facilities that are required for DER interconnection service.

Interconnection Request Application ("Application") – Formal application to connect a DER to Company's Distribution System and for DER interconnection service, using Company's standard form.
Interconnection Study – A technical analysis to determine whether adverse effects to the operation or reliability of the Distribution system would be created as a result of the DER under study operating in parallel with the system at the proposed POI.
Island – According to IEEE 1547-2018, a condition in which a portion of Company's Distribution System is energized solely by a DER while that portion is electrically separated from the rest of Company's electric system on all phases to which the DER is connected. IEEE defines both intentional and unintentional islands. Intentional islands may be desirable in some cases, such as in a microgrid that is planned to operate independently during a weather event or unforeseen outage. An unintentional island is not planned and is considered undesirable because line worker practices, protective equipment, and grid control systems are not designed for those conditions.
Letter of Credit – A standby letter of credit that is: (i) substantially in Company's standard form; (ii) issued by a U.S. commercial bank or a U.S. branch of a foreign bank with total assets of at least $10 billion, having a general long-term senior unsecured debt rating of A minus or higher as rated by S&P, or A3 or higher as rated by Moody's, or A minus or higher as rated by Fitch; and (iii) otherwise acceptable to Company in Company's sole discretion.
Meter – A device or sensor that measures the amount of electricity consumed or generated by a DER. It may also be used to monitor the voltage, current, or other electrical characteristics of the electricity generated by a DER.
Parallel Operation – Operation of a DER connected to Company's Distribution System.
Point of Interconnection (POI) – The point of connection of the DER to Company's Distribution System; this term is synonymous with point of common coupling (PCC) as used in IEEE 1547-2018.
Power Delivered – Electricity supplied by Company to the DER .
Power Received – Electricity supplied by the DER to Company's Distribution System.
Ramp Rate – The linear rate at which a DER increases its real power output over time upon entering service or operating in parallel with the utility source.
Secondary Network – A Distribution System in which the secondary of multiple distribution transformers are connected to a common network for supplying electric power to customers.
Spot Network – Type of electric distribution system that uses two or more inter-tied transformers to supply an electric network circuit.
Telemetering – Communications equipment used to obtain information from the DER or to control the DER, including a transmitter, antenna, pole for the antenna, telephone, etc.
Term – Time period during which terms and conditions of an Interconnection Agreement are binding.
Witness Testing – Live testing of the DER while operating in parallel with Company's Distribution System.

4 Application Requirements

For an application to be deemed complete it must include payment for all applicable fees, be factually correct in information, contain all required documentation, and meet all applicable standards listed within this document and set forth in the Ohio Administrative code. AES Ohio reserves the right to review, approve, and request modifications to all interconnection applications to ensure the safety and reliability of the distribution system. If at any stage the application is deemed to require corrections or clarification the review time will revert to the applicable stage of review upon receipt of those documents.

4.1 Ohio Interconnection Incentives

All current and active AES Ohio interconnection incentives can be found here. The Ohio Rule 4901:1 which provides current guidelines for net metering can be found here. There is no guarantee of acceptance or availability of such incentives.

4.2 Applying for Interconnection

All interconnection application forms can be found here at the AES Ohio Interconnection website. Additionally, all applications can be submitted electronically via PowerClerk, AES Ohio's application portal. Interconnection in Ohio is broken into different levels depending on the size of the proposed DER system. There is also a preapplication process that can be used to gather information about the existing facilities at a given proposed POI.
While the pre-application process is valid for all levels of interconnection, it is not required, and is often bypassed for smaller behind the meter (BTM) facilities that do not have flexibility of choosing their POI. A pre-application is most used for Level 3 applications. The application levels and fees are defined in Ohio Rule 4901:1 and are summarized in Table 1 for reference. There will be an additional fee of $95 for meter replacement for net metering customers.

Application Level	System Requirements	Fees
Pre-Application	No system requirements but is typically designed for Level 3 projects.	$300
Level 1	DER nominal nameplate capacity of 25 kW or less (likely connected behind the meter at a residence or small business)	$50
Level 2	DER nominal nameplate capacity greater than 25kW and less than 2 MW*	$50 + $1 per kW of nominal nameplate capacity
Level 3	DER nominal nameplate capacity greater than 2 MW* and less than 20 MW.	$100 + $2 per kW of nominal nameplate capacity

Table 1. Application Level Criteria and Fees
* 3 MW if the DER is primary connected, located on a 600 amp capable line, and withing 2.5 miles of the substation.

4.3 Interconnection Process Overview

The interconnection process begins when a customer or developer submits an interconnection application. The application must include information about the DER facility including the fuel source, nominal nameplate capacity, equipment being used, site plan, and electrical diagram (one-line). Further clarification on the site plan and oneline diagrams is summarized below. Applications are reviewed based on the processes and procedures defined in Ohio Rule 4901:1 to ensure the delivery of safe and reliable power to all customers and AES Ohio's workers. If an interconnection study identifies system modifications to the AES Ohio electrical power supply are required for interconnection to proceed, the applicant will be provided with the estimated cost of the system modifications. AES Ohio will then generate an Interconnection Agreement (IA) that includes any necessary system modifications and DER customer charges. When any charges are paid and both parties sign the IA, the project moves forward, and the interconnection queue progresses accordingly. After the DER customer and AES Ohio construct any required facilities, permission to operate (PTO) is granted to the DER customer.

Site Plan

Customer's site plan must clearly indicate where all equipment will be installed on property. The site plan must show, all PV information, all batteries or inverters, AC disconnect, utility meter, any reclosers or step-up transformers.

One Line

Interconnection Service Customer must provide the Company with a one-line diagram showing the configuration of the proposed DER system, including the protection and controls, disconnection devices, nameplate rating of each device, power factor rating, transformer connections, and all grounding information. One Line diagrams for all applications >50kW must be stamped by a Licensed PE in the state where the installation will occur.

Proof of Insurance

Any DER to be interconnected with the AES Ohio Distribution system must show proof of insurance or other suitable financial instrument sufficient to meet its construction, operating, and liability responsibilities.

Inspection

Proof of inspection is required from local county, city, or an otherwise licensed inspector.

4.4 Interconnection Queue Process

DER interconnection applications are studied following a queue process to ensure fairness and consistency when considering system impacts, balancing a holistic view of the electric distribution system with expedience. All applications are queued based on the time the application is submitted and the circuit that will serve the proposed interconnection. Larger projects requiring engineering studies will be studied on a first-come, first-served basis based upon their proposed POI. Queue position is not guaranteed if an applicant fails to complete any milestone/requirement without prior notice.

5 General Requirements

Any DER Owner seeking a new or modified interconnection of a DER with the AES Ohio distribution system must meet the requirements and specifications provided in this document, the interconnection agreement, and any other requirements set forth by the Company.

5.1 Equipment Standards

The DER Owner is responsible for ensuring that the DER design and installation meet the technical requirements described in this document. The DER Owner must also be in compliance with, as it applies, the most current version of standards in the National Electric Code (NEC), the National Electrical Safety Code (NESC), Institute of Electrical and Electronic Engineers (IEEE), National Electrical Manufacturers Association (NEMA), American National Standards Institute (ANSI), National Fire Protection Association (NFPA), Underwriters Laboratories (UL), Federal Communications Commission (FCC), local codes, and any jurisdictional requirements pertaining to electrical facility design, construction, and safety.

AES Ohio reserves the right to field verify the DER owned and operated equipment against the equipment specified in the interconnection application.

5.2 Safe Operation and Maintenance

The DER Owner shall operate and maintain the DER in accordance with the applicable manufacturer's recommended maintenance schedule, and in compliance with all aspects of the Company's interconnection tariff and agreements, as applicable. The DER Owner must keep maintenance records that the Company may request for review. The DER Owner shall continue to comply with all applicable laws and requirements after an interconnection has occurred. In the event the Company has reason to believe that the DER installation may be the source of problems on the Company EPS, the Company has the right to install monitoring equipment at a mutually agreed upon location to determine the source of the problems. If the DER is determined to be the source of the problems, the Company may require disconnection as applicable.

5.3 Facility Isolation and Curtailment

AES Ohio reserves the right to temporarily disconnect the DER from the Company's distribution system on a nondiscriminatory basis. AES Ohio may disconnect the DER for the following reasons:

- → During an emergency with the potential to endanger life or property.
- → The DER is adversely affecting the Company's distribution system equipment or its safe and reliable operation.
- → During planned or emergency maintenance, repair, modification, or replacement of AES owned system assets impacting the normal circuit hosting the DER. To include manual or automatic system reconfiguration of the distribution system which results in the DER being connected in parallel with the AES Ohio distribution system under conditions that were not studied for parallel operation with the DER.
- → Under normal operation of protection and control devices.
- → Failure of Company owned equipment which is necessary for parallel operation of the DER.
- → Noncompliant DER operation or output.
- → Modification of the DER operating characteristics, output, or interconnection point without the approval of the Company.
- → DER Owner's failure to comply with the conditions of the interconnection agreement.

AES Ohio will reconnect the DER to the Company owned distribution system as soon as practicable once the event or condition which caused the temporary disconnection is resolved. The Company will communicate and coordinate with the DER Owner to the extent possible. For planned work or maintenance, the Company will provide at minimum a seven-day notice.

The Company may require curtailment if it is determined that the continued operation of the DER at the current output level will impact the Company's ability to operate the Company's distribution system safely and reliably.

5.4 Utility Access

The DER Owner and/or operator on which the Company's facilities reside shall allow duly authorized agents of the Company the right and privilege to enter the Customer's premises at all reasonable times for the purpose of reading meters, installing, testing, inspecting, repairing and removing any or all of the Company's equipment used in connection with the supply of electric service.

5.5 Utility Accessible Disconnect Switch

AES Ohio requires a utility accessible disconnecting device that provides for a visible break at the point of interconnection, or another mutually agreed upon location. The disconnecting device must be accessible to the Company at all times. The Company reserves the right to operate the disconnecting device in accordance with the Company's interconnection agreement. The disconnecting device must provide a visible break and be capable of being locked open by the Company.

5.6 Connection types

AES Ohio permits line and load side taps given such connection is made past any AES Ohio owned metering assemblies or equipment. AES Ohio does not allow direct connections into the meter socket.

5.7 Future System Changes and Responsibilities

The EPS is dynamic and must be able to accommodate future load growth and system changes. Therefore, the Company may, at its discretion and cost, make upgrades to the EPS. Such upgrades may have an impact on existing DER facilities. In order to ensure continued safe operations in compliance with any Interconnection Agreements, the DER facilities, including any DER interconnection facilities, may need to be upgraded in accordance with the upgraded EPS. The DER Owner and the Company will work together cooperatively to implement the appropriate changes, upgrades, etc. to attain the common goal of continued safe and reliable operation of the interconnection of the DER to the EPS.

AES Ohio must be contacted prior to any operating or design modifications made to existing DER facilities. The Company must approve of any proposed changes to an existing interconnected DER. Failure to notify AES Ohio and seek approval of operating or design changes prior to implementation may result in the disconnection of the DER.

6. DER Design and Operating Requirements

The information and requirements provided in this section are intended to ensure interconnection to the AES Ohio distribution system will be made in a safe and reliable manner for both the Company and the DER Owner. The interconnection of a DER onto the Company's distribution system must not negatively affect the safety or the service reliability of other customers.

6.1 Thermal Loading Limits

DER interconnections must not cause AES Ohio's conductors or devices to exceed 90% of their thermal ratings. Specific to Company owned transformation this 90% limit is in relation to the transformer's top nameplate rating.

6.2 Transformer Reverse Power Capability

Any proposed DER facility that has the potential to cause reverse power flow through an AES Ohio substation transformer will require additional analysis during the interconnection study. The interconnection study will specifically address the ability of the transformer to accommodate reverse power flow. Based upon the transformer specifications and the insulation aging impact in accordance with IEEE Std. C57.91 it will be determined if reverse power will significantly add to a loss of life for the substation transformer. If it is found that loss of transformer life is not a concern a maximum of reverse power flow up to 90% of the substation transformer's top nameplate rating will be permitted.

The DER Owner will be responsible for the cost to upgrade or replace any load tap changer (LTC) control or voltage regulator control that is found to be incompatible with a reverse flow of real power. The LTC and/or regulator controls must be capable of properly regulating the voltage when the real power is observed to be in either the forward or reverse direction to ensure adequate voltage is being supplied to all customers on the EPS.

6.3 Interconnection Transformer Winding and Grounding Requirements

The DER Owner shall own, maintain, and operate the step-up transformation for any DER that will be connected at primary voltage to the AES Ohio distribution system. The interconnection transformer(s) shall be groundedwye on the Company side and grounded-wye on the DER side. The rated voltage, kVA, and impedance of the interconnection transformer must be included in the system single line provided to AES Ohio by the DER Owner.

During its active operation, a customer-owned DER System must serve as an effectively-grounded source within the AES Ohio system. This measure is vital to safeguard against over-voltages stemming from neutral shifts during ground faults. Conversely, when the Interconnection Customer's DER System is not in operation, it must not act as a grounding source within the AES Ohio system. This is required to avoid the desensitization of AES Ohio's ground fault protection. During a phase to ground fault on the AES Ohio distribution system, the Interconnection Customer's equipment shall not cause over voltages greater than 135% of nominal phase to ground voltage on the unfaulted phases. During an open phase condition on the AES Ohio distribution system, the Interconnection Customer's equipment shall not energize (i.e., backfeed) the open phase.

A DER System may meet effective grounding requirements through its transformer configuration or by use of a grounding transformer, each with or without a neutral reactor.

A grounded wye - grounded wye interconnection transformer with a grounded wye generator may satisfy the requirement of being an effectively grounded source, as it will pass zero-sequence current from the Interconnection Customer source only when the DER is generating. A three-legged core type grounded wye – grounded wye transformer should not be used; a four-legged or five-legged core type transformer or three singlephase transformers are required to prevent overheating due to zero sequence current circulating through the transformer tank.

For DER technologies that do not supply zero-sequence current (for example, inverter-based DERs), a grounded wye - grounded wye interconnection transformer alone may not satisfy the effective grounding requirement. Per IEEE 142 a system is considered effectively grounded when the ratio of zero-sequence reactance to positive-sequence reactance is less than or equal to three and the zero-sequence resistance to positive-sequence reactance is not greater than one. AES Ohio will review the proposed DER System and, depending on the results, an additional grounding transformer may be required in parallel with the DER equipment to provide zero sequence current during a ground fault on the AES Ohio system. This grounding transformer shall be appropriately sized to maintain IEEE 142 effective grounding criteria while producing ground current no greater than 10% of the existing ground fault current at the PCC. If the grounding transformer cannot be sized in such a way, the Interconnection Customer shall include provisions to disconnect the grounding transformer at either the high side or the neutral when the DER is not generating. Additional protection, such as open-phase detection settings, may be required with the inclusion of a grounding transformer. Upon request, AES Ohio will supply the Interconnection Customer with source impedance and fault current levels at the PCC and might assist in the development of open-phase detection settings.

Conventional generators (i.e., rotating machinery) are classified as constant voltage sources. By contrast, inverters are considered voltage-controlled current sources. Because of this distinction, an inverter-based DER will respond differently to fault conditions than a non-inverter-based DER. Therefore, it is necessary to adjust certain effective grounding criteria for inverter-based DER Systems only. Many inverters are constructed with a neutral wire that is meant for sensing only and is not rated to carry fault current. This prevents the inverter from being an effectively grounded source to the AES Ohio system. An interconnection transformer that is a zerosequence current source or an additional grounding transformer may be required for these inverters to meet the effective grounding requirement. For inverter-based DER Systems with nameplate ratings greater than 50 kW, AES Ohio will evaluate each proposal on a case-by-case basis to determine if a ground source is needed on the Interconnection Customer's system. The Interconnection Customer shall provide AES Ohio with the inverter's positive, negative, and zero sequence impedances if they are available from the manufacturer. If AES Ohio determines that a grounding transformer is required, the Interconnection Customer shall revise their design to include a grounding transformer and resubmit it to AES Ohio for review.

6.4 Fault Current Contribution

AES Ohio will simulate the fault current with the DER interconnection to ensure that the distribution equipment, which includes but is not limited to feeder breakers, reclosers, regulators, switches, and fuses, does not exceed their specified withstand ratings. This analysis is conducted to ensure that all DERs, both currently installed and proposed, within the feeders originating from the same substation, as well as any DERs connected to affected systems of other utilities, can be seamlessly integrated into and disconnected from the system in a synchronized manner. AES Ohio will evaluate fault currents at various equipment locations, extending up to and including the corresponding feeder breaker, as well as at the Point of Interconnection (POI) or Point of Common Coupling (PCC). The available fault current at the PCC must not increase by more than 10% due to the addition of a DER.

6.5 Interconnection Requirements for Secondary Networks

Any proposed DER to be interconnected on an AES Ohio secondary network must be inverter based. To prevent unwanted operation of network protectors due to reverse power flow under no circumstances should the DER export power onto the secondary network. Any DER interconnecting on a secondary network shall install minimum import protection (37P) that will trip the DER Owner's dedicated DER breaker when the power being imported by the DER Owner drops below 5% of the DERs nameplate rating. The maximum aggregated generation on a spot network must not exceed the smaller of five percent of the spot network's maximum load or 50kW.

6.6 Insulation and Insulation Coordination

It is the responsibility of the DER Owner to ensure equipment owned and operated by the DER Owner is able to withstand normal and abnormal transient voltages that can be experienced in grid parallel mode. Abnormal voltages can be experienced during switching activities, lightning strikes, system faults, etc.

6.7 Power Quality Requirements

The requirements below are intended to ensure AES Ohio continues to deliver safe and reliable service to all customers while allowing for the interconnection of DERs. The criteria below are used to determine if system modifications to the AES Ohio system and/or the proposed DER will be necessary during the interconnection study process.

6.7.1 Steady State Voltage Requirements

The steady state voltage of the AES Ohio distribution system must remain within ANSI C84.1 range A. DERs interconnecting with AES Ohio shall not cause voltage at any point along the EPS to deviate from +5% / -2.5% of the nominal service voltage.

6.7.2 Rapid Voltage Change Limits

Rapid voltage change as defined by IEC 61000-4-30:2015 is a quick transition in rms voltage accruing between two steady-state conditions. In accordance with IEEE1547 the maximum voltage change at any point on the EPS due to a DER tripping offline or coming online must be less than 3% of the nominal voltage. Additionally, AES Ohio requires the maximum voltage change due to a DER tripping offline or coming online be at or below 2% of the nominal voltage at any regulating device to prevent excessive operations of the device.

6.7.3 Voltage Variation Limits

Section 6.7.2 addresses the worst-case voltage fluctuation. However, it does not address the frequent voltage fluctuations that may occur due to the intermittency of solar and wind based DERs. The voltage change related to the DER output dropping from 100% to 50% should not exceed 1.5% at any AES Ohio voltage regulating device.

6.7.4 Ramp Rate

When a DER enters service or reconnects to operate in parallel with the grid source a defined ramp rate may be necessary to assist in being compliant with the rapid voltage change limits and voltage variation limits in the above sections. AES Ohio may specify a maximum ramp rate for the generation not to exceed a linear ramp of 300 seconds (20% per minute). The Company will communicate the need for a specific ramp rate with the DER Owner if applicable.

6.7.5 Harmonic Limits

The maximum harmonic limits for electrical equipment shall be in accordance with the most current version of IEEE 519. The objective of IEEE 519 is to limit the maximum individual frequency voltage harmonic to 3% of the fundamental frequency and the voltage Total Harmonic Distortion (THD) to 5% on the AES Ohio side of the PCC. In addition, DER Systems shall also meet harmonic current distortion limits as described in the most recent version of IEEE 1547-2018.

6.7.6 DC Current Injection

AES Ohio limits the level of DC current injection into the grid as it may lead to transformer saturation and other equipment failure. The Interconnection Customer's DER System including all interconnection equipment shall not inject DC current greater than 0.5% of the full rated output current at the point of connection of the DER System.

6.8 Voltage Regulation

AES Ohio regulates the voltage of the EPS through load tap changes (LTCs), voltage regulators, capacitor banks, and other devices. DERs interconnected with AES Ohio must not interfere with the capability to regulate voltage of the EPS. DERs should not actively regulate the voltage of the EPS unless agreed upon or required by the Company.

6.8.1 Reactive Power Control Capability

DERs that are interconnected with the AES Ohio distribution system must have the following reactive power control capabilities. The control mode required by the Company will be identified during the interconnection study. The Company will specify set points for the control mode or control modes that are agreed upon to operate under. The DER must not operate in a control mode not approved by the Company.

Constant Power Factor – In this control mode the DER will operate with a constant leading or lagging power factor to limit the voltage fluctuation scene on the EPS. The power factor will be determined by the Company following an interconnection study.

Volt – VAr control mode – In this control mode the DER controls its reactive power output as a function of the voltage at the point of interconnection. Figure 1 below shows an example of the volt-var curve for a DER. The specific set points will be determined during the interconnection study.

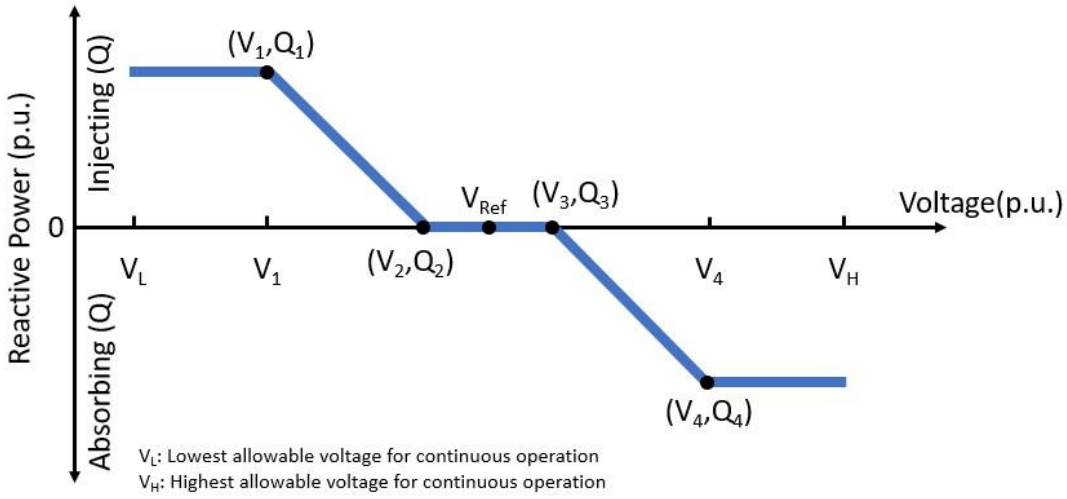

Figure 1

6.8.2 Power Factor Requirements

The DER must be capable of operating with a leading or lagging power factor up to 90%. Should a constant power factor other than unity be required it will be identified and agreed upon following an interconnection study. The DER shall only operate in a control mode or at a power factor agreed upon by the Company.

6.9 Ride-Through Capability

All DERs seeking interconnection with the AES Ohio distribution grid shall be capable of riding through momentary system abnormalities as specified in IEEE 1547-2018. The clearing times of inverter-based DER will generally follow those of a category II DER as specified in IEEE 1547-2018 and rotating machine-based DER will follow that of a category I DER as specified in IEEE 1547-2018. The Company will make final determination of the ride through settings as part of the interconnection study.

DERs that will not operate in parallel with the AES Ohio distribution system and operate only as back-up or emergency generation and do not to energize the area EPS are exempt from the ride-through requirements.

6.9.1 Voltage Ride-Through

Inverter based DER shall follow the default Category II abnormal operating performance settings as specified in IEEE 1547-2018 section 6.4.1. Machine based generation shall follow the default Category I abnormal operating performance settings as specified in IEEE 1547-2018 section 6.4.1. The Company reserves the right to request custom voltage ride-through settings within the range of allowable settings to ensure safe and reliable operation of the distribution grid.

6.9.2 Frequency Ride-Through

Inverter based and machine based generation shall follow the default abnormal operating performance settings for frequency as specified in IEEE 1547-2018 section 6.5.1. The Company reserves the right to request custom frequency ride-through settings within the range of allowable settings to ensure safe and reliable operation of the distribution grid.

6.10 Transient Overvoltage

Transient overvoltage is a concern with inverter-based DER when a large step change in load occurs. This is known as load rejection overvoltage and can cause damage to both the DER Owner's and Company's equipment if not limited. All inverter-based DER installations greater than or equal to 500kW must incorporate inverters that are compliant with IEEE 1547-2018 clause 7.4.2 to limit the potential for transient overvoltage. The DER shall not cause overvoltage on any part of the EPS that exceeds the magnitude and duration specified in IEEE 1547-2018 section 7.4.2.

6.11 Inverter Design Requirements

All inverter based DERs shall incorporate inverters with the following features and capabilities:

- → UL listed and meet UL Standard 1741
- → Operate in grid following mode when operating in parallel with the AES Ohio distribution grid.
- → Grid forming mode is allowable when isolated from the AES Ohio distribution grid upon written approval and agreement by the Company.
- → Meet the ride through requirements in section 6.9
- → Be capable of operating in the reactive power modes listed in section 6.8.1
- → Meet the transient overvoltage requirements in section 6.10
- → Be capable of detecting and tripping for faults on the Company owned equipment on the Company side of the point of interconnection

6.12 Single-Phase DER Connection Limits

AES Ohio limits imbalance on a single phase 120/240 V service. These limits are designed to maintain system phase balancing while allowing smaller applications, which often do not have three-phase equipment available, to proceed with interconnection. Installations behind a three-phase meter should be balanced three-phase generators whenever possible to preserve phase balancing. In all cases, single phase DER interconnections are limited to 100kW to prevent phase imbalance. Additional limits around single phase DER interconnections may apply depending on the existing service voltage for behind the meter DER installations.

7. Protection and Control Requirements

The protection and control requirements below contain requirements for AES Ohio owned and operated equipment as well as the requirements for the DER owned equipment. These requirements are intended to ensure the distribution system can continue to operate in a safe and reliable manner.

The requirements below are intended to protect the AES Ohio transmission and distribution system only. AES Ohio nor the DER Owner should rely on the other party for detection of abnormal conditions, such as faults, or protection of their respective equipment. The DER Owner is required to detect faults and isolate the DER equipment with DER owned and maintained equipment and protective devices.

As a part of the interconnection study process, projects will be reviewed on a case-by-case basis to determine if additional relays or other protective devices will be required. The DER Owner is responsible for the costs of any AES Ohio owned protective equipment that is deemed necessary to allow for the DER to interconnect with the AES Ohio distribution system. The need for protective equipment will vary with the type of generation, DER output (kW), and location of the facility on a Company's distribution system.

7.1 Interconnection Classification

The sections below will specify the protection requirements for DERs interconnecting with the AES Ohio distribution system. The DERs will fall into three classifications: Primary Connected, Behind the Meter

(Exporting), and Behind the Meter (Non-Exporting). This classification in addition to the size of the proposed DER and the generation type will determine the required protection.

7.1.1 Primary Connected

A DER that is stepped up to primary voltage through DER owned transformation and whose point of interconnection / change in ownership is at primary voltage is considered a primary connected DER. These DERs will normally be a stand-alone DER whose primary purpose is to provide power to the area EPS with little to no customer load onsite. Depending on the size of the installation a Company owned protective device, such as an electronic recloser may be required along with a DER owned disconnecting device as described in section 5.5.

The Company owned disconnecting device may be operated when conditions listed in section 5.3 are present due to the absence of customer load behind the point of interconnection.

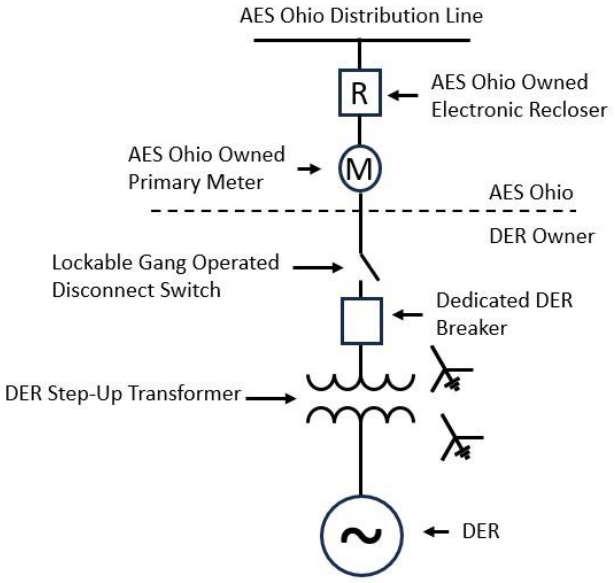

Figure 2 – Simplified Primary Connected DER Single Line Diagram

7.1.2 Behind the Meter (Exporting)

This classification may be connected to the area EPS through a company owned transformation with metering on secondary equipment or customer owned transformation with metering on primary equipment. A DER of this classification will provide power to the Company EPS, but also contains customer load behind the meter.

A DER owned disconnecting device as described in section 5.5 will be required. For behind the meter three phase installations the Company may require an additional DER owned protective device and the ability to control the protective device in order to isolate the DER from the EPS in accordance with section 5.3. Large three phase installations behind the meter installations equal to or greater than 1000 kW may require a Company owned electronic recloser. See section 7.2.3.

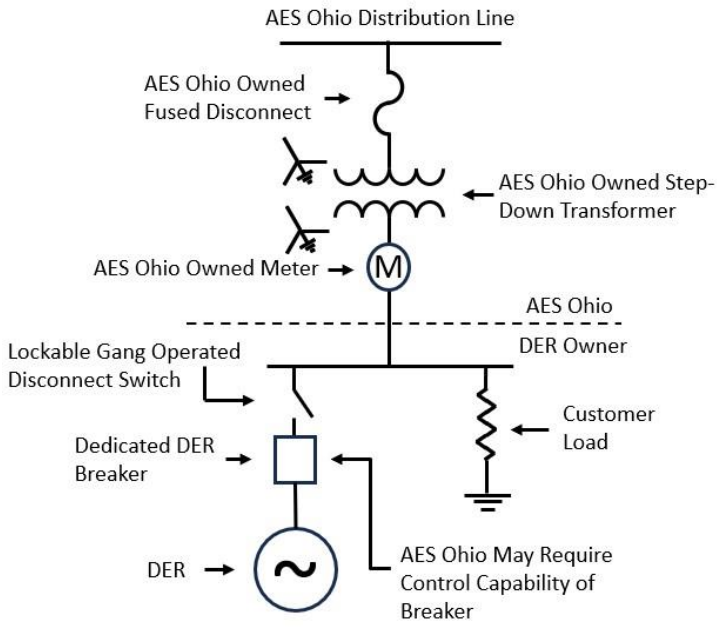

Figure 3 – Simplified Behind the Meter (Exporting) DER Single Line Diagram for Three Phase Industrial and Commercial Customer

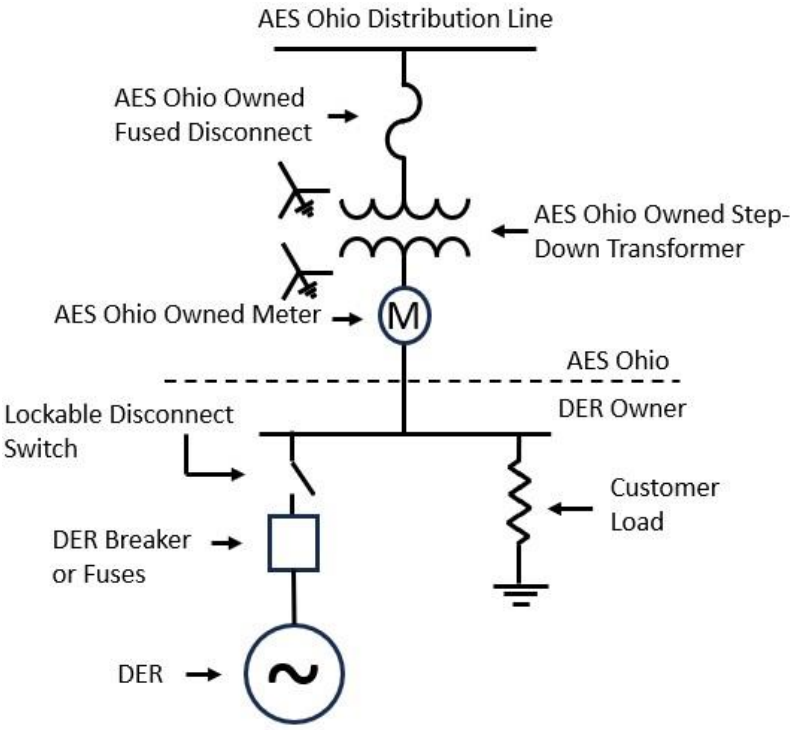

Figure 4 – Simplified Behind the Meter (Exporting) DER Single Line Diagram for Residential or Single Phase Commercial Customer

7.1.3 Behind the Meter (Non-Exporting)

A DER that is only intended to supplement customer load, operate in parallel with the area EPS, and not to export power back to the area EPS will require standard anti-islanding protection unless installed on a secondary network. Interconnection onto a secondary network will additionally require a minimum power relay and dedicated breaker to ensure that the DER cannot back feed onto the secondary network and risk the tripping of network protectors.

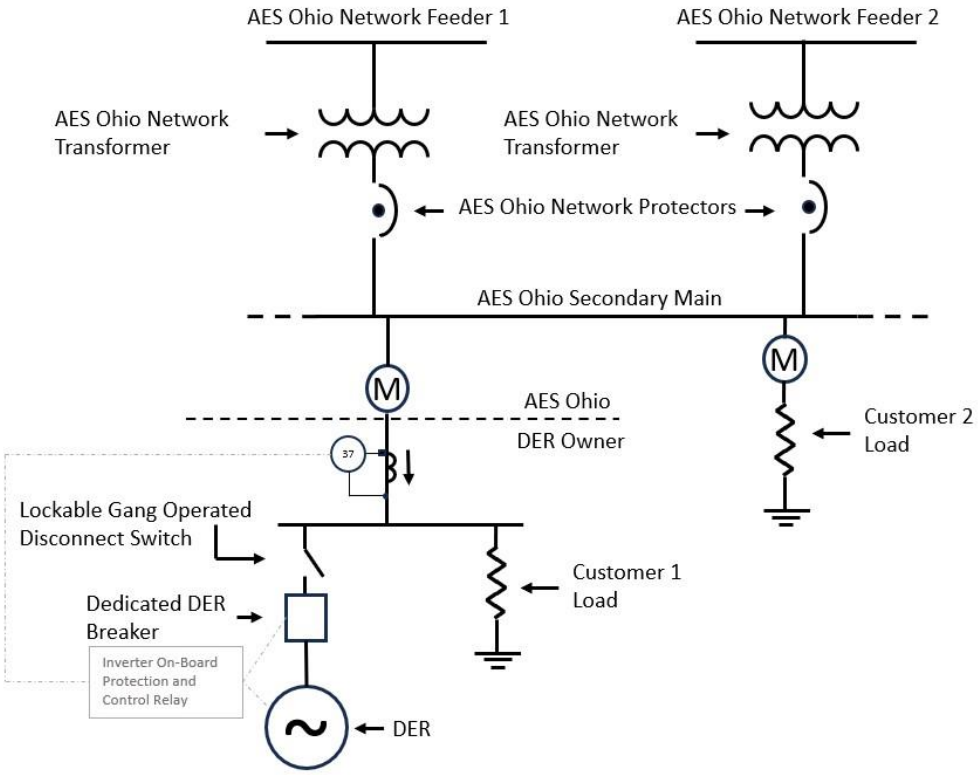

Figure 5 – Simplified Behind the Meter (Non-Exporting) DER Single Line Diagram on Secondary Network

7.2 Protection and Relay Requirements

The minimum protection the DER Owner shall incorporate for all DER to detect and clear faults on the EPS is as follows.

- Under and over voltage (27/59) and under and over frequency (81U / 81O) – see section 6.8 for the default AES Ohio settings. The Company will determine if special settings need to be applied on a caseby-case basis.
- Directional time and instantaneous phase overcurrent protection (67)
- Directional time and instantaneous ground overcurrent protection (67N)

This relaying will be owned, operated, and maintained by the DER Owner and at the DER Owner's expense. The protective functions above will trip the DER owned and operated interconnection breaker or inverter directly. If it is found the DER is unable to detect faults on the EPS with the functions above the Company will require direct transfer trip to a Company owned device at the point of interconnection (see section 7.3) at the customer's expense.

7.2.1 Detection of DER System Faults

Detection and clearing of DER system faults beyond the point of interconnection is the responsibility of the DER Owner. The DER Owner will determine the protection necessary to detect and clear DER system faults. The DER Owner and the Company will mutually agree upon the overcurrent protection settings so that coordination can be achieved to the maximum extent possible between the Company's protective equipment and the DER owned, operated, and maintained protection equipment.

7.2.2 Tie Line Protection for Inverter Based DER Less than 1000 kW

For primary connected inverter-based DER with an aggregate nameplate capacity less than 1000 kW a Company owned fused disconnect at minimum is required. The interconnection study may identify the need for additional protection depending on the aggregate amount of DER present, location on the circuit, and other specific design details of the proposed DER.

7.2.3 Tie Line Protection for Inverter Based DER 1000kW and Greater

For primary connected inverter-based DER with an aggregate nameplate capacity of 1000 kW or greater a Company owned electronic recloser is required on the Company's side of the point of interconnection. The recloser will be owned, operated, and maintained by the Company. The DER Owner will be responsible for the cost of the electronic recloser.

Direct transfer trip may also be required and will be determined during the interconnection study. See section 7.3 for details on direct transfer trip.

7.2.4 Tie Line Protection for Synchronous / Asynchronous Generation

For primary connected DER which utilize synchronous or asynchronous generation a Company owned electronic recloser is required on the Company side of the point of interconnection regardless of the aggregate nameplate capacity. The recloser will be owned, operated, and maintained by the Company. The DER Owner will be responsible for the cost of the recloser.

Direct transfer trip is required and at the expense of the DER Owner. See section 7.3 for details on direct transfer trip.

7.3 Direct Transfer Trip

Direct Transfer Trip (DTT) may be required and the need for DTT will be determined on a case-by-case basis. At AES Ohio Direct Transfer Trip (DTT) is used to send a high-speed signal between protective devices upstream from the DER location to the AES owned DER recloser at the point of interconnection. The Company requires a fiber optic connection between devices as the communication medium.

A DTT scheme will be required if any of the criteria below are met.

- → The DER is capable of back feeding onto the transmission system.
- → The nameplate output of the DER, regardless of generation type, exceeds 10 MW.
- → It is determined the DER is unable to detect and trip for faults on the Company's EPS.

→ The DER is any one of the following types:
- Synchronous or asynchronous machine
- Non-certified inverter
- Self-excited induction generator

A DTT scheme may be required if any of the criteria below are met pending the outcome of the interconnection study.

→ The nameplate output of the DER is equal to or greater than 1000 kW.
→ The minimum load on the line segment following the operation of any Company owned sectionalizing device is not greater than three times the aggregate DER capacity.

If the Company determines DTT is required the company shall install, own, and maintain the fiber optic communications line and the associated equipment enabling a DTT scheme. The cost associated with the installation of the DTT scheme, including the fiber optic communications line, will be the responsibility of the DER Owner.

7.4 Intentional and Unintentional Islanding

Intentional Islanding

An intentional island, such as a microgrid, is planned to operate independent of the utility source upon an unforeseen utility outage and energize some portion of the area EPS. AES Ohio will work collaboratively with the DER Owner when intentional islanding is desired. Permission to operate in grid forming mode must be granted in writing by the company before intentional islanding is permitted.

A DER Owner may wish to use a DER as backup or emergency generation following a loss of the utility source to energize the DER Owners equipment and load. This is supported by the Company with the requirement that the DER ceases to energize Company owned facilities and the area EPS within 2 seconds following a loss of the utility source.

Unintentional Islanding

An unintentional island is an unplanned island that has energized or re-energized a portion of the area EPS following the loss of the utility source. Unintentional islands may result in unsafe conditions for the public, customers, and Company employees and can result in equipment damage. In the absence of a written agreement with the Company to form an intentional island or microgrid the DER must cease to energize the area EPS within 2 seconds following the loss of the utility source. Inverter based generation must be configured to operate in grid following mode. Inverter based generation shall not operate in grid forming mode or with antiislanding function disabled without consultation with and written permission by the Company.

7.5 Automatic Reclosing of Company Equipment

AES Ohio normally uses automatic reclosing to re-energize the downstream EPS following a fault clearing trip. If the fault is momentary this action will automatically restore the impacted customers. The automatic reclosing scheme does not normally check for the absence of voltage or synchronization prior to operating. It is the DER

Owner's responsibility to ensure the DER has disconnected from the EPS prior to the automatic reclose. The Company is not responsible for damage to the DER owned and operated equipment due to out-of-phase reclosing.

7.6 DER Synchronization

The synchronization device shall be owned and operated by the DER Owner. Company facilities will not be used to provide synchronization between the DER owned equipment and the company owned EPS. The synchronization device must not be used to energize any portion of the EPS. The DER owned synchronization device must be capable of interrupting the current associated with an out of phase condition.

All machine-based generation must be operating at the proper speed prior to paralleling with the area EPS to reduce the voltage drop associated with the current needed to accelerate the device during the synchronization process.

7.7 DER Reconnection to the Area EPS

The DER must not re-energize the area EPS in any circumstance unless approved by and agreed upon with the Company. Following an outage on the EPS or a trip of the DER due to a fault or other abnormal condition on the area EPS the DER may synchronize and reconnect to the energized EPS after stable voltage and frequency is observed for a minimum of five minutes.

Should the area EPS be re-energized under abnormal conditions the Company may require the DER to remain disconnected from the area EPS until the system is returned to normal. This will be achieved by a Company owned electronic recloser operating to an open state such that the point of interconnection with the DER remains de-energized or by the Company sending a block signal to the DER to prevent it from reconnecting to the area EPS.

8 Telemetry Requirements

AES Ohio will require a Company owned electronic recloser with SCADA communications for monitoring and control of primary connected DER with an aggregated nameplate capacity at or above 1000 kW. Additional communication and control capability may be required and will be determined as part of the interconnection study.

The Company may require SCADA communication to behind the meter installations of 1000 kW and above where the installation of an electronic recloser is not desired due to the impact to the customer load behind the meter should the DER need to be disconnected from the EPS. The need for SCADA communication and control capability will be determined during the interconnection study.

The DER should be capable of supporting the information exchange requirements specified in IEEE 1547-2018 section 10. The local DER communications interface must support IEEE Std 1815 (DNP3), IEEE Std 2030.5 (SEP2), and SunSpec Modbus.

Backup and emergency generation that does not run in parallel with the EPS is exempt from this requirement.

9 Metering Requirements

AES Ohio will install and provide the appropriate metering equipment at the DER Owner's expense. This equipment includes a meter, meter socket, instrument transformers, conduit, and secondary wiring. The metering location will be outside on an AES owned pole or padmount housing depending on the feed type. Metering equipment will not be installed in customer switchgear or equipment.

The DER meter will record real and reactive interconnection power flows between the DER and the EPS. The meter will display real power, reactive power will only be recorded. Meter will be a two-way communicating AMI meter that records intervals. The customer can request to monitor their usage with their own equipment using KYZ. If necessary, a separate metering of station power may be required to meter facility load when the DER is offline.

10 Testing and Commissioning

The DER Owner is responsible for conducting commissioning and verification testing to confirm that the DER as designed, installed, and operating meets the interconnection and interoperability requirements of this document and IEEE Std 1547-2018.

10.1 Witness Testing

AES Ohio requires DER inspection of completed installations and witness testing prior to granting permission to operate for any DER with an aggregate nameplate capacity of 1000 kW or greater. The DER Owner and the Company will jointly determine a date and time of the inspection and witness testing once the DER has successfully completed initial synchronization and the control parameters are in their final configuration.

Witness testing at minimum will require confirmation and testing of the following:

- → Confirmation of reactive power mode and/or constant power factor as agreed upon by the Company.
- → Confirmation of aggregate nameplate capacity.
- → Confirmation of interconnection transformer winding configuration (if applicable).
- → Confirmation of utility accessible disconnect switch.
- → Witness test that the DER disconnects following a loss of a single phase.
- → Witness test that the DER disconnects following a three-phase loss of utility source.
- → Witness test DER reconnection delay upon the return of the utility source.
- → Witness test the DER ramp rate upon reconnection and parallel operation with the utility source.

The Company reserves the right to require witness testing of additional commissioning activities if deemed necessary by the Company.

10.2 Permission to Operate

For DERs that require witness testing a Permission to Operate (PTO) will be issued following a successful witness test within 48 hours. If the DER fails any portion of the inspection and witness test another witness test will be scheduled within 30 days to allow the DER Owner to resolve any problems. The DER Owner may seek an extension of this 30 days upon mutual agreement between the Company and the DER Owner.

11 Appendix

11.1 Pre-Application Report

Interconnection Pre-application Report

Pre-Application Request Type: _____ Pre-Application ID: _____

Requesting name: Email:

Project Name or other identifier:

Address:

City: State: Zip:

Latitude (N): Longitude (W):

DER Type: _____

Prime Mover:

DER Aggregate nameplate power (Generation + Storage)

1. What is the Total capacity (in MW) of substation/area bus, bank or circuit based on normal or operating ratings likely to serve the proposed Point of Interconnection?

Total substation Bank Capacity (MW)	Total distribution circuit capacity (MW)

2. What is the existing aggregate generation capacity (in MW) interconnected to a substation/area bus, bank or circuit (i.e., amount of generation online) likely to serve the proposed Point of Interconnection?

In service DER substation capacity (MW)	In service DER capacity on distribution circuit (MW)

Interconnection Contact
800-253-5801 • aesohiointerconnection@aes.com

aes Ohio

Interconnection Pre-application Report

3. What is the Aggregate queued generation capacity (in MW) for a substation/area bus, bank or circuit (i.e., amount of generation in the queue) likely to serve the proposed Point of Interconnection?

Queued DER substation capacity (MW)	Queued DER capacity on distribution circuit (MW)

4. What is the Available capacity (in MW) of substation/area bus or bank and circuit likely to serve the proposed Point of Interconnection (i.e., total capacity less the sum of existing aggregate generation capacity and aggregate queued generation capacity).

Available bank capacity (MW)	Available circuit capacity (MW)

5. What is the substation nominal distribution voltage and/or transmission nominal voltage if applicable?

Transmission (Substation) Nominal Voltage (kV): _____

Distribution (Circuit) Nominal Voltage (kV): _____

6. What is the nominal distribution circuit voltage at the proposed Point of Interconnection?

   Nominal Distribution (Circuit) Voltage at POI (kV): _____

7. What is the approximate circuit distance between the proposed Point of Interconnection and the substation?

   Line Distance from POI to Substation: _____Miles

8. What is the relevant line section(s) peak load estimate, and minimum load data, when available.

   Estimated Peak Load on Circuit: _____MVA

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800-253-5801 • aesohiointerconnection@aes.com

aes Ohio

Interconnection Pre-application Report

9. Identify whether the substation has a load tap changer. _____

10. What is the number of phases available at the proposed Point of Interconnection. If a single phase, distance from the three-phase circuit

    Number of Phases Available: _____If single-phase, distance to nearest three-phase circuit.

11. What is the limiting conductor ratings from the proposed Point of Interconnection to the distribution substation.

    Limiting Conductor Ratings: _____MW

12. Based on the proposed Point of Interconnection, existing or known constraints such as, but not limited to, electrical dependencies at that location, short circuit interrupting capacity issues, power quality or stability issues on the circuit, capacity constraints, or secondary networks

Data Provided by AES Ohio Distribution Engineering	
Engineer Name	
Date	

Notes

- → The information provided represents the AES Ohio electrical system characteristics at the date and time of completion of this form. This information is calculated based upon certain engineering assumptions. This information should be treated accordingly. Further information can only be determined by additional Engineering Studies and Analyses.
- → Changes to the utility electrical system may occur which may alter the values contained in this study. It is the responsibility of the customer to request updates on a periodic basis.

Interconnection Contact
800-253-5801 • aesohiointerconnection@aes.com

aes Ohio

11.2 Level 1 Application

AES OHIO SIMPLIFIED APPLICATION FOR
INTERCONNECTION UNDER THE SIMPLIFIED
LEVEL 1 REVIEW PATH

12/1/2022

SHORT APPLICATION FORM
FOR INTERCONNECTION OF CERTIFIED INVERTER BASED GENERATION EQUIPMENT
TWENTYFIVE KILOWATTS OR SMALLER TO THE ELECTRIC DISTRIBUTION SYSTEM

Electric Distribution Company: AES Ohio

Electric Distribution Company's Designated Contact Person:

AES OHIO
Attn: AES Ohio Interconnection
1065 Woodman Drive
Dayton, OH 45432
Phone: (800) 253-5801
Email: aesohiointerconnection@aes.com

Please complete all sections of the application and include all attachments. Depending upon the information you provide, more information may be required. If so, AES OHIO will contact you at that time.

Processing Fee:

The application fee is based on actual costs on time spent on the simplified review. The following fee has been filed with the Public Utilities Commission of Ohio:

Application Fee: $50

SECTION 1 – Applicant Information

1.1 Application Type

( ) Existing Customer with Generation
( ) Existing Customer without Generation
( ) New Customer (No AES Ohio Account)

1.2 Legal Name of the Applicant:

Name: _____
Address: _____
Phone: (_____) _____
E-mail Address: _____

1.3 Applicant's Electric Service Customer Account Number: _____

1.4 Name and Address of the Applicant as it appears on the Applicant's electric bill

Name: _____
Address: _____
Phone: (_____) _____

1.5 Proposed Generation Ownership (Please check one):

( ) Customer owned
( ) Third Party owned
Explanation of ownership agreement: _____
_____

1.6 Do you seek to install an Energy Storage System (ESS), or batteries as part of this interconnection application to the AES Ohio distribution system?

( ) Yes
( ) No

1.7 Please select the ESS setup that suites this application

( ) Stand-alone ESS with no Renewable Energy System
( ) Installing ESS and Renewable Energy System in the same application
( ) Add-on ESS to a previously installed/operating customer-generating facility
( ) N/A

1.8 Will you be installing an EV

( ) Yes
If yes, please specify which type: _____
Will it have the capability to power your home? ( ) Yes ( ) No
( ) No

1.9 Net Metering
( ) Check if you are applying to be a net metering customer
- If so, please attach the completed Net Metering Service Information Request form

SECTION 2 – Contractor/Installer Information

2.1 Consulting Engineer or Contractor if applicable

Name: _____
Address: _____
Phone: (_____) _____
E-mail address: _____

SECTION 3 – Generation Equipment and Customer Location Information

3.1 Energy Source (Please check one):

Solar	____
Wind	____
Hydro	____
Diesel	____
Natural Gas	____
Fuel Oil	____

Other (please specify) _____

3.2 Energy Converter Type:

Photovoltaic ____
Reciprocating Engine ____
Fuel Cell ____
Turbine ____
Other ____

3.3 Energy Production Equipment

Inverter ____
Synchronous ____
Induction ____
Other ____

3.4 Is this proposed generation to be connected on the line or load side of the main service disconnect?

Line Side (incoming) ____
Load Side (outgoing) ____
Line and Load Side ____

3.5 Estimated In-Service Date: _____

3.6 Existing Electric Service at the Customer's Location:
Please specify the size of the facility address' breaker panel: (A) _____
Service Capacitance: (Amps) _____
Service Voltage: (Volts) _____
Type of Service: ( ) Single Phase ( ) Three Phase
AES OHIO Rate #:_____

3.7 Direction on Property of Protective Interface Equipment (e.g. "southwest corner of lot"):
_____

3.8 Energy Producing Equipment Information:

Manufacturer: _____
Model No. _____
Version No. _____
Number of Devices: _____
Total DC kW of Proposed Facility: _____ kW DC
kVA Rating: _____ kVA Voltage Rating: _____V

Total Generator Nameplate Rating kW (include all inverters if inverter-based system):
Expected kWh output of generation: _____

3.9 Inverter Information:

Manufacturer: _____
Model No. _____
Version No. _____
AC kW Rating of each Inverter: _____ kW AC
Number of Inverters (if more than one): _____
Total AC kW of Proposed Facility: _____ kW AC
Total kVA Rating: _____ kVA Voltage Rating: _____V
Power Factor Settings Range: _____

Generator Nameplate Rating: _____ kW DC Rating: _____
Generator Nameplate KVAR: _____ AC Rating: _____

Is the inverter IEEE 1547 certified/listed? ( ) Yes ( ) No
Is the inverter UL 1741 certified/listed? ( ) Yes ( ) No

SECTION 4 – Energy Storage System Information

4.1 Will the ESS/battery system share an inverter with the Renewable Energy System?

( ) Yes
( ) NO

Manufacturer: _____
Model:_____
Storage Type (i.e. NaS, Li-ion, Vanadium Flow, PB-Acid, etc.): _____
_____
Battery Charge/Discharge Rating (kW AC): _____
Maximum Battery Charge/Discharge Rate (kW AC per second): _____
Battery Energy Capacity (kWh): _____
Power Factor Settings Range: _____

4.2 ESS Inverter Manufacturer: _____
ESS Inverter Model: _____
ESS Inverter Type:
_____ Forced Commutated (Grid Forming) ____ Line Commutated (Grid Following)
ESS Inverter Rated Output (kW): _____
ESS Inverter Rated Output Voltage (V): _____
ESS Inverter Efficiency (%): _____
ESS Inverter Power Factor (%): _____
What is the DC Rated Voltage of the Inverter? (V) _____
What is the DC Rated Current of the Inverter? (A) _____
What is the DC Rated Power of the Inverter? (kW) _____
How many inverters will be used for connection with the ESS? _____
Power Factor Settings Range: _____

SECTION 5 – Attachments

5.1 Please provide the following attachments:

- Testing results documenting conformance with the Company's technical requirements
- Documentation confirming that a nationally recognized testing and certification lab has listed the equipment
- One Line Diagram (specific to Customer's installation)
- Installation Test Plan
- Equipment Manufacturer's Recommended Maintenance Schedule
- Site diagram showing disconnect switch location

I hereby certify that, to the best of my knowledge, all the information provided in the Interconnection Application is true and correct.

CUSTOMER NAME: _____ TITLE: _____

CUSTOMER SIGNATURE: _____ DATE: _____

** If all sections of the application are not complete and/or attachments are missing, it will delay the processing of your application.

12/1/2022

AES Ohio Net Metering Service Information Request

Customer's Name: _____

Account Number: _____ Rate Number: _____

Service Address: _____

City: _____ State: OH Zip Code: _____

Contact Person (if different than Customer): _____

Telephone Number: _____

Address: _____

City: _____ State: OH Zip Code: _____

Email Address: _____

Generation equipment ownership (check one):
Will the Customer: Own: _____ Rent: _____ Lease: _____ Other: _____

If other, please describe:

_____

A. Total generating capacity: _____ kW
B. Expected annual output: _____ kWh
C. Expected capacity factor = B / (A*8760)

Expected capacity factor: _____ %

Capacity factor is the ratio of what the facility should produce compared to what it would produce if 100% efficient, 100% of the time.

Customer qualifies for net metering if the generating facility uses as its fuel either solar, wind, biomass, landfill gas or hydropower or uses a micro-turbine or fuel cell which is located on the Customer's premises (located at the same address as Customer's account). The Customer's generating equipment must operate in parallel with the Company's transmission and distribution systems. The Customer's generation equipment must be intended to offset part or all of the Customer's requirements for electricity. Generating equipment which is significantly oversized, as compared to the Customer's maximum demand, may not qualify for net metering and may incur additional interconnection costs. The Customer

or its Developer must complete an interconnection application and receive approval to interconnect in order to qualify for net metering service. The Customer's equipment must be

inspected before net metering service may begin. If Customer is served by a competitive retail electric service (CRES) provider, Customer should make arrangements with its CRES provider to receive net metering credits in accordance with OAC 4901:1-21-13.

The Customer acknowledges that it has read the Company's Net Metering rules found in Tariff Sheet No. D5 and agrees to all terms and conditions contained therein, including without limitation those specified in the Company's Distribution Interconnection Tariff, Tariff Sheet No. D35. Specifically, the Customer understands and agrees that a meter, which is capable of registering the flow of electricity in each direction, must be in service at the facility. If a meter is not in service with this capability, the Customer must submit a written request for the Company at the Customer's cost to acquire, install, maintain, and read an approved meter. All costs related to this meter shall be borne by the Customer. Customer acknowledges and agrees that operation of Customer's generation facility is intended primarily to offset part or all of Customer's electricity requirements in accordance with the Company's Net Metering rules.

Meter Exchange Fee:

The purpose of this fee is the installation and/or reprogramming of a bidirectional meter that is capable of measuring the flow of electricity in two directions.

Charge: $95.00

Requested By:	Approved By:
_____	_____
Customer Name	Name
_____	_____
Authorized Signature	Company Signature
Date: _____	Date: _____

12/1/2022

RELEASE OF PERSONAL INFORMATION

By signing this form, I acknowledge that I am giving

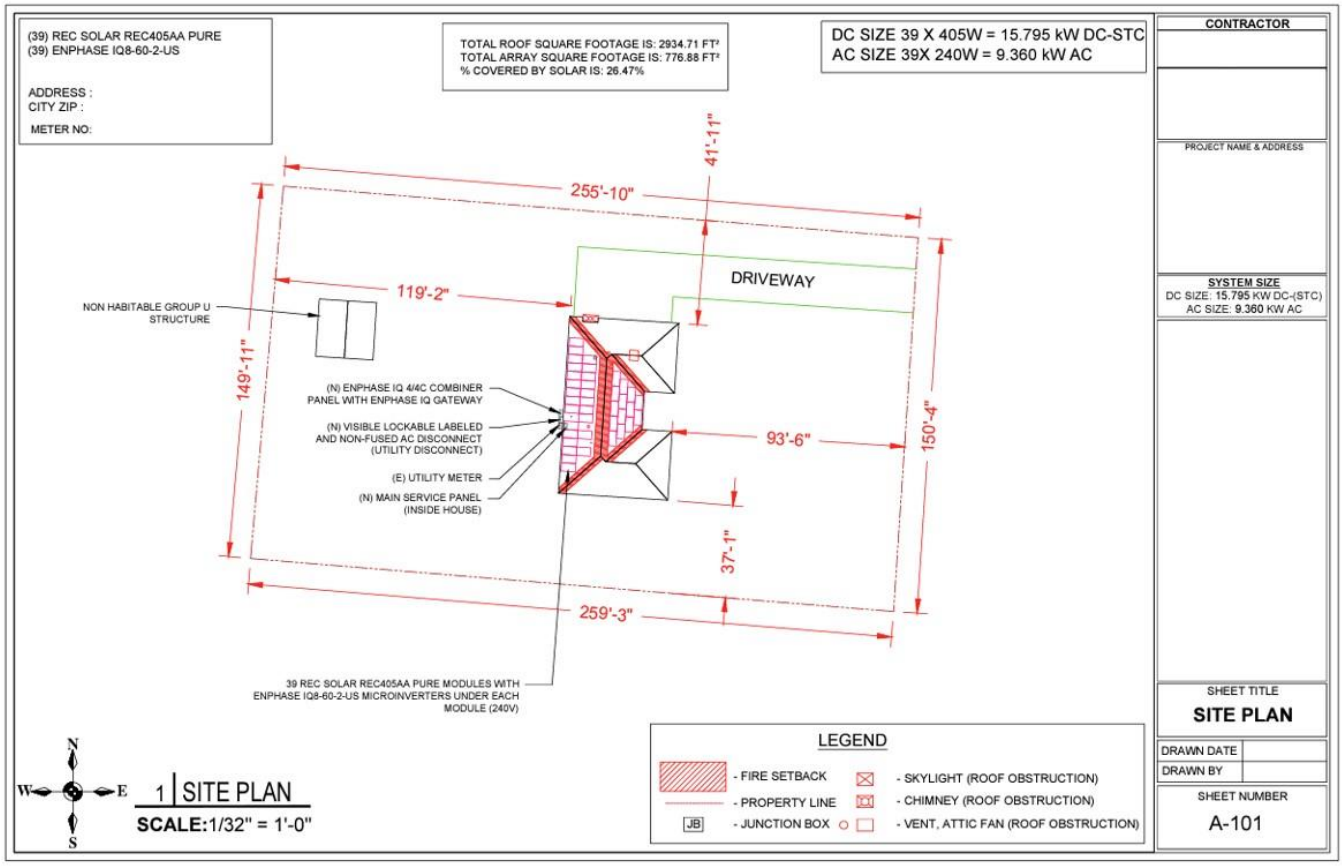
_____(Consulting Engineer/Contractor) access to my AES Ohio account information. Account information can include account number, rate, service address, phone number, and usage history. **I realize that under the rules and regulations of the public utilities commission of Ohio, I may refuse to allow AES Ohio to release the information set forth above. By my signature I freely give AES Ohio permission to release the information designated above.**

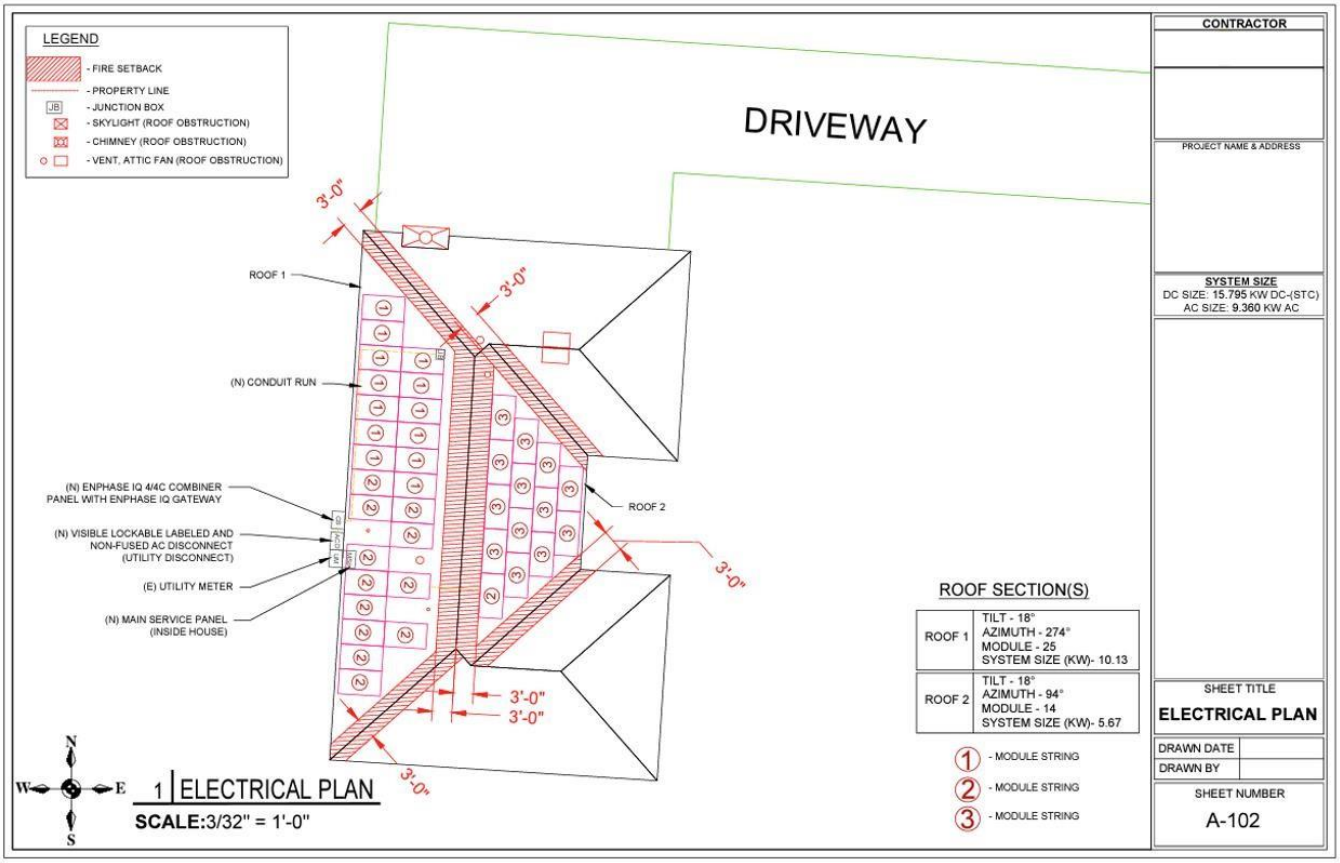
_____
Customer Name:

_____
Customer Signature

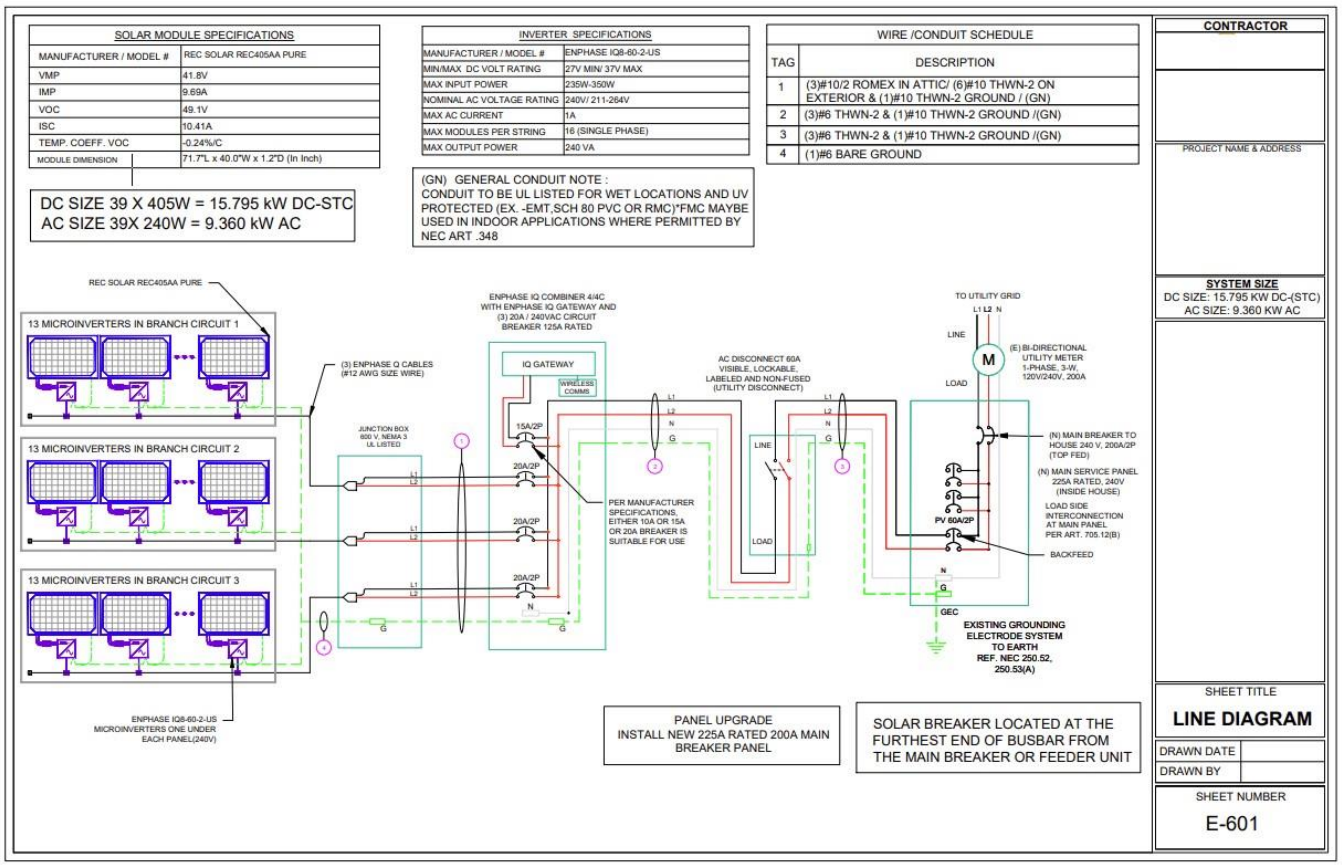
_____
Date

11.3 Example Site Plan





11.4 Example Single Line



11.5 Sample Interconnection Agreement 50kW or Smaller

INTERCONNECTION AGREEMENT
FOR INTERCONNECTION AND PARALLEL OPERATION
OF CERTIFIED INVERTER-BASED EQUIPMENT 50 kW OR SMALLER

THIS INTERCONNECTION AGREEMENT ("Agreement") is made and entered into this day of , 2023, by and between AES Ohio ("Company"), and (Full Name) ("Customer").

The Customer is installing, or has installed, inverter-based Customer-generator facilities and associated equipment ("Generation Facilities") to interconnect and operate in parallel with the Company's electric distribution system, which Generation Facilities are more fully described as follows:

Location:

Type of facility: □ Solar □ Wind □ Other

Inverter Power Rating: _____

Inverter Manufacturer and Model Number: _____

Description of electrical installation of the Generation Facilities, including any field adjustable voltage and frequency settings:

As shown on the single line diagram included with the Interconnection Application received by the Company on (date) and incorporated herein by this reference; or

Described as follows:

The Customer represents and agrees that the Generation Facilities are, or will be prior to operation, certified as complying with:

(i) The requirements of the Institute of Electrical and Electronics Engineers ("IEEE") Standard 1547-2003, "Standard for Interconnecting Distributed Resources with Electric Power Systems", as amended and supplemented as of the date of this Agreement, which standard is incorporated herein by this reference ("IEEE Standard 1547-2003"); or

(ii) The requirements of the Underwriters Laboratories ("UL") Standard 1741 concerning Inverters, Converters and Controllers for Use in Independent Power Systems, as amended and supplemented as of the date of this Agreement, which standard is incorporated herein by this reference.

Customer further represents and agrees that:

(i) The Generation Facilities are, or will be prior to operation, designed and installed to meet all applicable requirements of IEEE Standard 1547-2003, the National Electrical Code and local building codes, all as in effect on the date of this Agreement; and

(ii) The voltage and frequency settings for the Generation Facilities are fixed or, if field adjustable, are as stated above.

The Customer agrees to maintain reasonable amounts of insurance sufficient to meet its construction, operating and liability responsibilities associated with the generator installation. The Customer agrees to provide the Company from time to time with proof of such insurance upon the Company's request.

With respect to the Generation Facilities and their interconnection to the Company's electric system, the Company and the Customer, whichever is applicable, (the "Indemnifying Party") to the extent permitted by law shall indemnify and hold the other harmless from and against all claims, liability, damages and expenses, including attorney's fees, based on any injury to any person, including the loss of life, or damage to any property, including the loss of use thereof, arising out of, resulting from, or connected with, or that may be alleged to have arisen out of, resulted from, or connected with, an act or omission by the Indemnifying Party, its employees, agents, representatives, successors or assigns in the construction, ownership, operation or maintenance of the Indemnifying Party's facilities.

The Company agrees to allow the Customer to interconnect and operate the Generation Facilities in parallel with the Company's electric system in accordance with the provisions of the Company's Tariff D35 – Interconnection Service, which provisions are incorporated herein by this reference.

For purposes of this Agreement, the term "certify" (including variations of that term) has the meaning set forth in Chapter 4901:1-22-05(B), Ohio Administrative Code Uniform Electric Interconnection Standards, as the same may be revised from time to time by the Public Utilities Commission of Ohio ("Commission"), which provision is incorporated herein by this reference.

The Customer's use of the Generation Facilities is subject to the rules and regulations of the Company, including the Company's Service Regulations and the Company's Tariff D35 – Interconnection Service, as contained in the Company's Retail Electric Tariff, as the same may be revised from time to time with the approval of the Commission. Both the Company and this Agreement are subject to the jurisdiction of the Commission. To the extent that Commission approval of this Agreement may be required now or in the future, this Agreement and the Company's commitments hereunder are subject to such approval.

IN WITNESS WHEREOF, the Customer and the Company have executed this Agreement, effective as of the date first above written.

AES OHIO	**CUSTOMER**
By:	By: