

**CUSTOMER GUIDE**  
**FOR THE**  
**INTERCONNECTION**  
**OF**  
**DISTRIBUTED RESOURCES**  
**TO THE**  
**AMERICAN ELECTRIC POWER**  
**DISTRIBUTION SYSTEM**



**October 10, 2011**



## **Table of Contents**

<b>Introduction</b>	<b>Page 1</b>
<b>Applicability</b>	<b>Page 1</b>
<b>Definitions</b>	<b>Page 3</b>
<b>Overview of the Interconnection Process</b>	<b>Page 4</b>
<b>Technical Requirements for Interconnection</b>	<b>Page 7</b>
<b>Evaluation of System Impact</b>	<b>Page 10</b>
<b>Appendix 1 – Technical Requirements</b>	<b>Page 13</b>
<b>Appendix 2 – Potential System Impacts</b>	<b>Page 14</b>
<b>Minimum Requirements for Interconnection</b>	<b>Page 18</b>
<b>Interconnection Agreement (sample)</b>	<b>Page 22</b>
<b>Application for Interconnection (Standard <math>\leq</math> 20 MW)</b>	<b>Page 27</b>

## **Introduction**

This Customer Guide to the Interconnection of Distributed Resources to the American Electric Power (AEP) Distribution System

- Explains the basic process used to interconnect Distributed Resources.
- Provides information on the technical requirements for Distributed Resources and the potential system impact a Distributed Resource may have when interconnecting to the AEP Distribution System.

Company approval of connecting a generator to its distribution system is required. The information in this document will guide a customer on the requirements and process to safely interconnect it to the AEP Distribution System. Our Minimum Requirements for Distribution System Interconnection begin on page 18 and based on Chapter 4901:1-22 Interconnection Services of the Ohio Administrative Code (OAC), which governs the requirements for the investor-owned electric utilities in Ohio. The Technical Requirements for Interconnection, which begins on page 8, provides additional details.

The electric power distribution systems operating today were not designed to accommodate the interconnection of Distributed Resources. The voltage regulation practices, overcurrent protection approaches, switching techniques and maintenance and power restoration practices used for distribution systems have been based on the fundamental assumption that there are no generation sources on the distribution system. Generation sources on the distribution system can create operating conditions that cannot be managed in conventional ways and may require special equipment, changes to the protection and control provisions, and other system modifications to operate safely and effectively without adversely affecting system performance.

The Distributed Resources Interconnection Process is intended to efficiently:

- 1) determine if the proposed Distributed Resource is compatible with the electric power system at the proposed interconnection point, and
- 2) identify and make any additions or modifications to the electric power system or modifications to the proposed Distributed Resource installation necessary for compatibility.

## **Applicability**

This document provides guidance on the interconnection of Distributed Resources to the AEP Distribution System. Distributed Resources includes both generators and energy storage technologies.

For further information on the specific rules and tariffs covering the use of Distributed Resources or other generators please contact:

AEP Ohio  
Attn: DG Coordinator  
850 Tech Center Drive  
Gahanna, Ohio 43230  
Phone: 614-883-6775  
E-mail: [dgcoordinator-ohio@aep.com](mailto:dgcoordinator-ohio@aep.com)

A generator used in an automatic or manual transfer scheme in which electrical load is transferred between the AEP Distribution System and the generator, but never paralleled with the AEP Distribution System is not considered to be a Distributed Resource. Such a generator should have an approved double-throw double-pole transfer switch installed by a qualified electrician so that the generator and AEP's service conductors cannot be paralleled.

A generator using a make-before-break transfer scheme where the generator is paralleled less than 100 milliseconds with the AEP Distribution System does not fall under the interconnection rules for Distributed Resources. However, proposed make-before-break transfer scheme generator equipment packages must be reviewed and approved by AEP. The package must meet the requirements of Underwriters Laboratories Standard 1008 and be listed by a nationally recognized testing laboratory.<sup>1</sup>

This guide covers the issues directly relating to the interconnection of a Distributed Resource. It does not cover other issues a customer will need to consider when planning to install a Distributed Resource, such as the terms and conditions relating to any purchase or sale of electric energy, environmental permitting, local ordinances, and fuel supply. Arrangements for purchase or sale of electric energy are handled separately from interconnection. The interconnection process only provides for the safe interconnection of the proposed Distributed Resource without degradation in the power quality or reliability of the AEP Distribution System. Interconnection with the AEP Distribution System does not provide an Interconnection Customer any rights to utilize AEP's Distribution System for the transmission, distribution or wheeling of electric power, nor does it limit those rights.

This guide does not cover self protection of the Distributed Resource or all operating requirements for the Distributed Resource. AEP's review and authorization for parallel operation shall not be construed as confirming or endorsing the Interconnection Customer's design or as warranting the Distributed Resource and interconnection systems' safety, durability or reliability. AEP shall not, by reason of such review or lack of review, be responsible for the strength, adequacy or capacity of such equipment.

---

<sup>1</sup> UL publications are available from Underwriters Laboratories, Inc. (<http://www.ul.com/>)

## **Definitions**

AEP Distribution System – Facilities owned, leased or controlled by AEP that deliver electric power at primary voltages ranging from 4 to 34.5 kV three phase and at secondary voltages ranging from 120/240 volts single phase to 277/480 volts three phase to retail and wholesale customers.

Distributed Resources – Sources of electric power including both generators and energy storage technologies operated in parallel with the power system and not directly connected to a bulk power transmission system.

Distributed Generation – Electric power generators operated in parallel with the power system and not directly connected to a bulk power transmission system. Distributed Generation is a subset of Distributed Resources.

Interconnection – The result of adding a Distributed Resource to the AEP Distribution or Transmission System so the Distributed Resource can operate in parallel.

Interconnection Agreement – An agreement between AEP and the owner of a Distributed Resource covering the terms and conditions under which the owner's Distributed Resource can be installed and operated in parallel with the AEP System.

Point of Common Coupling – The point at which the distributed generation facility is connected to the shared portion of the utility system or where an electrical system connects to the AEP System.

Pre-certified – A Distributed Resource equipment package, submitted by a manufacturer or an entity that assembles an equipment package, tested as per IEEE 1547 Clause 5 by a nationally recognized testing laboratory and found after testing to be in compliance with the requirements of IEEE 1547 Clause 4.

Queue – The time ordered collection of pending valid interconnection requests maintained to assure that interconnection requests are processed on a first-in first-out basis.

Screening Criteria – A set of technical criterion used to evaluate Distributed Resource interconnection requests in order to determine if a request can be approved for interconnection with no further study or if the request requires more study to determine its system impact.

System Impact – Negative effects due to technical or operational limits on conductors or equipment being exceeded that may compromise the safety, reliability or power quality of the electric system.

Technical Requirements – The specific criteria and specifications relevant to the performance, operation, testing, safety considerations, and maintenance of the interconnection of Distributed Resources with the AEP Distribution System. A Distributed Resource may comply with all of the Technical Requirements and still have significant System Impact.

## **Overview of the Interconnection Process**

AEP is committed to providing safe reliable service to our customers at the lowest practical cost. This means that AEP will perform as efficiently as practical the work necessary and appropriate to assure the continued safety of its employees and the public and continued reliable electric service to our customers.

Improper connection and operation of any source of electrical power, such as a Distributed Resource, in parallel with the AEP Distribution System could jeopardize the safety of AEP employees and the public and could degrade the reliability and quality of the electric service provided to our customers. Therefore, no source of electrical power shall be operated in parallel with the AEP Distribution System without the express written approval of AEP.

Customers may obtain AEP approval to operate a Distributed Resource in parallel with its system by applying for interconnection and following the appropriate interconnection process. The specific application form and interconnection process to be followed is dictated by Chapter 4901:1-22 Interconnection Services of the Ohio Administrative Code. Significant variations in the application forms and interconnection processes exist for interconnection to the AEP Distribution System since any one of twelve regulatory agencies may have jurisdiction (1 Federal and 11 State Commissions) and some jurisdictions have multiple tariffs relating to Distributed Resource interconnection. AEP desires to minimize the time and expense involved in each interconnection process consistent with maintenance of system safety and reliability, compliance with the applicable regulatory requirements and customer satisfaction.

An overview of the general interconnection process is outlined below.

### **Step 1: The customer contacts AEP.**

The customer contacts AEP by telephone, e-mail or U.S. mail. Based upon the customer's request and preliminary plans, AEP sends the customer the interconnection application form and provides information on the required interconnection process. The correct application form to use depends upon the location, type, size and proposed use of the planned Distributed Resource.

Customers who plan to sell electricity produced by their planned electrical generating facility at wholesale in interstate commerce may need to use an

application form approved for use as part of a Federal Energy Regulatory Commission (FERC) approved Open Access Transmission Tariff. Customers whose planned Distributed Resource does not fall under FERC jurisdiction must use the application form provided, based upon the location, type, size and proposed use of the Distributed Resource.

**Step 2: Customer submits a completed application.**

Any customer who proposes to operate any type of Distributed Resource in parallel with the AEP Distribution System must first submit a completed application to request review and approval of the proposed Distributed Resource interconnection. For the application to be considered complete, the request must be submitted on the proper application form and must include all information requested and payment of monies due at the time of application.

**Step 3: AEP reviews the application form for completeness.**

In order for AEP to process a customer request for Distributed Resource interconnection, the submitted application form must be complete. Upon receipt of an application form, AEP will review the application for completeness. If AEP determines the application form is incorrect and/or is incomplete, AEP will notify the customer and provide the correct form and/or a description of the information needed to complete the application form. The interconnection request will be placed in Queue based upon the date and time of receipt of the completed application form.

**Step 4: AEP performs a limited study to determine compliance with the Technical Requirements and the potential system impact of the Distributed Resource.**

Based upon an interconnection request's position in the Queue and the applicable time limits established by the OAC, AEP will perform a limited engineering study to determine compliance with the Technical Requirements and to evaluate the System Impact of the proposed Distributed Resource.

The study time limits and study scope vary depending upon the rules established by the OAC and may vary by the type, size and proposed use of the Distributed Resource. Specific screening criteria are utilized to minimize the time and expense involved to evaluate pre-certified Distributed Resources. Additional time is generally required to evaluate Distributed Resources that are not pre-certified to determine if they meet the Technical Requirements.

**Step 5: AEP informs the customer of the results of the limited study.**

The results of the limited study are provided to the customer within the applicable time limits established by the OAC.

AEP will first determine if the proposed Distributed Resource meets the Technical Requirements. If it is determined that the proposed Distributed Resource does not meet the Technical Requirements, AEP will notify the customer and provide a list of specific changes necessary for the proposed Distributed Resource to meet the Technical Requirements. If the customer decides to make the necessary changes to comply with the Technical Requirements, AEP will complete the limited study.

If the limited study shows that the proposed Distributed Resource meets the Technical Requirements and that interconnection of the proposed Distributed Resource will not cause System Impact, AEP will notify the customer of the study results and provide the customer with a proposed interconnection agreement.

If the limited study shows that the proposed Distributed Resource meets the Technical Requirements but that interconnection of the proposed Distributed Resource will cause System Impact and it is determined that changes in the customer's proposed generating facilities or minor AEP system modifications can be made to accommodate the proposed Distributed Resource, AEP will notify the customer of these study results. If the customer then elects to make the necessary changes and/or pay for minor AEP system modifications, AEP will provide the customer with a proposed interconnection agreement.

If the limited study shows that the proposed Distributed Resource meets the Technical Requirements and additional study is required to determine if interconnection of the proposed Distributed Resource will cause System Impact, AEP will provide the customer with the results of the limited study and provide an estimate of the cost of the additional study required to determine the System Impact of the proposed Distributed Resource. If the customer then elects to pay for the additional study and subsequently agrees to pay for any necessary changes, minor system modifications and/or system upgrades determined necessary by the additional study, AEP will provide the customer with a proposed interconnection agreement.

**Step 6: The customer signs and returns the proposed interconnection agreement and any necessary study and facility changes are completed.**

The customer signs and returns the proposed interconnection agreement. Upon receipt of the customer's payment and completion of any necessary study, minor system modifications and system upgrades by AEP and the completion of customer facility changes necessary to accommodate the customer's Distributed Resource, the customer can proceed to complete their Distributed Resource installation in preparation for final checkout and commissioning tests.

**Step 7: The customer notifies AEP of final checkout schedule, performs the final Checkout, successfully completes all commissioning tests and sets up periodic interconnection test procedures.**

The customer completes their Distributed Resource installation and notifies AEP of their schedule for final checkout and the plan for commissioning tests. AEP may inspect the customer's Distributed Resource installation and observe the customer performing the required commissioning tests. Upon successful completion of the commissioning tests, the customer will give or send AEP a copy of their final inspection checkout and the results of the commissioning tests and the written periodic interconnection test procedures proposed by the customer.

**Step 8: AEP authorizes operation of the proposed Distributed Resource in parallel with the AEP Distribution System.**

Based upon its review of the customer's proposed Distributed Resource facility, the final inspection checkout and the results of the commissioning tests, AEP notifies the customer in writing of its authorization for the customer to operate the generating facility in parallel with the AEP Distribution system under the terms of its interconnection agreement.

If AEP identifies problems with the inspection, if the commissioning test results are unsatisfactory, or if AEP does not agree with the customer's periodic test procedures, AEP will notify the customer in writing with the deficiencies clearly identified. AEP may withhold authorization for parallel operation until such deficiencies have been properly corrected.

For specific interconnection process requirements, please refer to the tariffs or rules governing interconnection within a given jurisdiction (Federal or State) based upon the location, type, size and intended use of the proposed Distributed Resource.

## **Technical Requirements for Interconnection**

IEEE Standard 1547-2003 "Standard for Interconnecting Distributed Resources with Electric Power Systems" (IEEE 1547)<sup>2</sup> is the basis for interconnection Technical Requirements for most jurisdictions. These Technical Requirements apply to all Distributed Resource technologies including synchronous machines, induction machines, or static power inverters/converters.

The interconnection system hardware and software used by a Distributed Resource to meet these Technical Requirements do not have to be located at the Point of Common Coupling. However, the Technical Requirements shall be met at the Point of Common Coupling.

---

<sup>2</sup> IEEE publications are available from the Institute of Electrical and Electronics Engineers, 443 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331 (<http://standards.ieee.org/>).

A table summarizing the Distributed Resource Technical Requirements is attached as Appendix 1. The pertinent IEEE 1547 clause number(s) are shown in this table.

Basic Technical Requirements - The Technical Requirements in IEEE 1547 cover the following areas, Voltage Regulation, Voltage Disturbances, Harmonic Current Injection, Direct Current Injection, Grounding Scheme Compatibility, Inadvertent Energization, Monitoring Operation, Isolation Device, Withstand Performance, Paralleling Device, Response to Area EPS Faults, Reclosing Coordination, Unintentional Islanding, Voltage and Frequency Detection, Abnormal Voltage or Frequency, Reconnection Following a Disturbance, Secondary Grid and Spot Network Systems, and Testing and Maintenance.

Testing – A Distributed Resource proposing to interconnect with the AEP Distribution System must be tested as per IEEE 1547 Clause 5 to demonstrate that the interconnection system meets the requirements of IEEE 1547 Clause 4. Documentation of the results of the Design Test and Production Tests shall be provided to AEP at the time of application unless such tests are to be conducted as part of the Commissioning Tests.

When the interconnection system of the Distributed Resource uses an assembly of discrete components, documentation of testing must be provided to AEP at the time of application to confirm the compatibility of the discrete components to properly function together. Otherwise AEP may require the Design Test to be conducted as part of the Commissioning Tests.

Written test procedures shall be approved by AEP for all tests to be performed as Commissioning Tests. To avoid delay, these test procedures should be submitted to AEP well in advance of the scheduled date of the Commissioning Tests.

Additional Technical Requirements:

Circuit Breaker - If a main circuit breaker (or circuit switcher) between the interconnection transformer and the Distribution System is required, the device must comply with the applicable current ANSI Standard from the C37 series of standards that specifies the requirements for circuit breakers, reclosers and interrupting switches.

Main Disconnect Switch (Voltages exceeding 480 volts) – A gang operated disconnecting device must be located at the Point of Common Coupling for all three phase interconnections. In all cases the disconnecting device must be clearly labeled, accessible to AEP personnel, must be suitable for use by AEP personnel at all times and must be suitable for use by AEP as a protective tagging location. The disconnecting device shall have a visible open gap when in the open position and be capable of being locked in the open position.

The disconnecting device must have a ground grid designed in accordance with specifications to be provided by AEP. Operation of the device must be restricted to AEP

personnel and properly trained operators designated by the interconnection customer. The disconnecting device must comply with the applicable current ANSI Standard from the C37 series of standards that specifies the requirements for circuit breakers, reclosers and interrupting switches.

**Terminating Structure** – When a new interconnection line is required, the interconnection customer shall provide a suitable structure to terminate the interconnection line. The customer is responsible for ensuring that terminating structure or substation structural material strengths are adequate for all requirements, incorporating appropriate safety factors. AEP will provide line tension information for maximum dead-end. The structure must be designed for the maximum line tension along with an adequate margin of safety.

Substation electrical clearances shall meet or exceed the requirements of the National Electrical Safety Code. Installation of disconnect switches, bus support insulators and other equipment shall comply with accepted industry practices.

Surge arresters shall be selected to coordinate with the BIL rating of major equipment components and shall comply with recommendations set forth in the applicable current ANSI Standard C62.2 that specifies the requirements for surge arresters and other surge protection devices.

**Momentary Paralleling** – For situations where the proposed Distributed Resource will only be operated in parallel with the AEP system for a short duration (less than 100 milliseconds), as in a make-before-break automatic transfer scheme, the requirements of IEEE 1547 do not apply except as noted in Clause 4.1.4. All make-before-break automatic transfer switch systems proposed by the interconnection customer must comply with UL 1008 and be listed by a nationally recognized testing laboratory.

**Voltage Unbalance** – The interconnection customer is responsible for operating the proposed Distributed Resource such that the voltage unbalance attributable to the Distributed Resource does not exceed 2.5% at the Point of Common Coupling.

**Power Factor** - Each Distributed Resource shall be capable of operating at some point within a power factor range from 0.9 leading to 0.9 lagging. Operation outside this range is acceptable provided the reactive power of the Distributed Resource is used to meet the reactive power needs of the electrical loads within the interconnection customer's facility or that reactive power is otherwise provided under tariff by AEP. The interconnection customer shall notify AEP if it is using the Distributed Resource for power factor correction.

**System Stability** – AEP may require a stability study for Distributed Resources if the aggregate generation is greater than 10 MW and in an area where there are known or posted stability limitations to generation located in the general electrical vicinity (e.g., three or four Transmission voltage level busses from the Transmission voltage bus serving the distribution circuit where the Distributed Resource proposes to interconnect.

Maintenance and Testing – The interconnection customer is responsible for the periodic scheduled maintenance on the interconnection system of the Distributed Resource (relays, interrupting devices, control schemes, and batteries that involve the protection of the AEP system). Unless the equipment manufacturer provides study results that demonstrate the need for less frequency, interconnection systems that depend upon a battery for proper function shall be checked and logged once per month for proper voltage. At least once every four years, the battery must be either replaced or a discharge test performed.

A periodic maintenance program is to be established in accordance with the requirements of IEEE 1547. AEP may examine copies of the periodic test reports or inspection logs associated with the periodic maintenance program. Upon request, AEP shall be informed of the next scheduled maintenance and be able to witness the maintenance performed and any associated testing.

Monitoring – AEP reserves the right, at AEP’s initial expense, to install special test equipment as may be required to perform a disturbance analysis and monitor the operation and control of the Distributed Resource to evaluate the quality of power produced by the Distributed Resource.

## **Evaluation of System Impact**

A Distributed Resource proposing to interconnect to the AEP Distribution System may have significant impact on the safety and reliability of one or more of the following portions of the electrical power system; the AEP Distribution System, the AEP Transmission System, the Distribution or Transmission System of a third party (called an Affected System) and the electrical system where the Distributed Resource is to be connected. AEP shall not be responsible for the evaluation of the safety and reliability impacts on the electrical system where the Distributed Resource is to be connected. AEP approval of a Distributed Resource interconnection should not be construed as an endorsement, confirmation, warranty, guarantee, or representation concerning the safety, operating characteristics, durability, or reliability of the Distributed Resource facility and the electrical system where it is connected.

### Distribution System Impact –

AEP Distribution is responsible for evaluating the system impact of a proposed Distributed Resource interconnection based upon the information provided in the interconnection application once the application is considered complete.

A study to determine system impact will be performed based upon the interconnection request’s position in the Queue and the applicable time limits established by the regulatory authority having jurisdiction. The study time limits and study scope vary depending upon the regulatory authority and the type, size and proposed use of the Distributed Resource.

AEP supports limited study and the use of a screening process to expeditiously identify and approve Distributed Resources that can be interconnected without significant system impact. AEP screening criteria is based on the OAC.

Additional study time is generally required to evaluate Distributed Resources that are not pre-certified. The exception may be for Distributed Resources that have been evaluated previously by AEP and were found to meet the Technical Requirements including the necessary testing.

The possible outcomes of the system impact study could include the following:

- 1) The proposed Distributed Resource interconnection meets the Technical Requirements and there are no system impacts that would require modification or upgrade to either AEP facilities or the Distributed Resource installation;
- 2) The proposed Distributed Resource interconnection does not meet the Technical Requirements and modifications or changes are required to either AEP facilities or the Distributed Resource installation;
- 3) The proposed Distributed Resource interconnection would result in negative system impact and modifications or changes are required to either AEP facilities or the Distributed Resource installation;
- 4) The proposed Distributed Resource interconnection requires new AEP facilities.

The potential Distribution system impacts listed in Appendix 3 may need to be examined as part of the impact study.

#### Transmission System Impact –

The AEP Transmission organization is informed of requests for interconnection to the AEP Distribution System. The Transmission organization reviews a request and determines if there may be a Transmission System impact (including any system stability impact) or an impact to a third party's system.

If the request needs to be studied to determine if there is significant Transmission System impact, the Transmission organization will notify the Distribution organization accordingly. The Distribution organization will coordinate the processing of the interconnection request to help assure that the proper process is followed and all required milestones are met.

#### Affected System Impact –

The Distribution organization will review each request for interconnection to the AEP Distribution System to determine if the potential exists for impact to a third party's

system. For example, the distribution systems of several Rural Electric Cooperatives (REC's) are interconnected to AEP Distribution feeders. The interconnection of a Distributed Resource to an AEP Distribution feeder with an REC interconnection could result in significant impact to the REC system.

If the potential exists for impact, the AEP Distribution organization will notify the third party of the proposed interconnection request and coordinate the processing of the interconnection request to help assure that the proper process is followed and all required milestones are met.

## Appendix 1

# Distributed Resource Technical Requirements

Attribute	Requirement
Voltage Regulation	IEEE 1547 - Clause 4.1.1
Voltage Disturbances	IEEE 1547 - Clause 4.3.2
Harmonic Current Injection	IEEE 1547 - Clause 4.3.3
Direct Current Injection	IEEE 1547 - Clause 4.3.1
Grounding Scheme Compatibility	IEEE 1547 - Clause 4.1.2
Inadvertent Energization	IEEE 1547 - Clause 4.1.5
Monitoring Provisions	IEEE 1547 - Clause 4.1.6
Isolation Device	IEEE 1547 - Clause 4.1.7
Withstand Performance	IEEE 1547 - Clause 4.1.8.1 and Clause 4.1.8.2
Paralleling Device	IEEE 1547 - Clause 4.1.8.3
Response to Area EPS Faults	IEEE 1547 - Clause 4.2.1
Reclosing Coordination	IEEE 1547 - Clause 4.2.2
Unintentional Islanding	IEEE 1547 - Clause 4.4.1
Abnormal Voltage	IEEE 1547 - Clause 4.2.3
Abnormal Frequency	IEEE 1547 - Clause 4.2.4
Reconnection Following a Disturbance	IEEE 1547 - Clause 4.2.6
Secondary Grid and Spot Network Systems	IEEE 1547 - Clause 4.1.4
Testing	IEEE 1547 - Clause 5
Periodic Interconnection Tests	IEEE 1547 - Clause 5.5
Circuit Breaker	Meet appropriate ANSI C37 standard
Disconnect Switch	Three phase unit gang operated at Point of Common Coupling
Terminating Structure	Adequate structural material strength suitable to terminate line
Surge Arresters	Meet applicable ANSI C62.2 standard
Momentary Paralleling	Comply with Underwriter's Laboratories Standard 1008 and IEEE 1547 – Clause 1.3
Voltage Unbalance	Unbalance attributable to Distributed Resource 2.5% or less
System Stability	Study required for units greater than 10 MW when limitations exist

## Appendix 2

### Potential Distribution System Impacts

**Voltage Regulation** - With the addition of the Distributed Resource, the voltage level on both the primary and secondary must be maintained within acceptable limits for both on peak and off peak conditions.

- 1) Reverse power flow through voltage regulators or load tap changers may cause the regulator or load tap changer to incorrectly regulate the voltage.
- 2) Improper settings of the Distributed Resource controls may result in the steady state voltage straying outside the + or - 5% limits at the point of common coupling on a 120 volt basis.
- 3) Low voltage may be experienced after a temporary fault or when restoring service after a permanent fault if the presence of the Distributed Resource is essential to the maintenance of adequate voltage.
- 4) The loss of Distributed Resource synchronous machine exciters may cause excessive reactive power losses and low voltages on a circuit.
- 5) The presence of Distributed Resources with varying output (e.g. wind turbines, photovoltaic cells, etc.) may cause excessive switching of capacitor banks and/or an excessive number of regulator or load tap changer operations.
- 6) When line drop compensators are used on a circuit, the presence of Distributed Resources may significantly alter the intended regulation scheme.
- 7) The presence of Distributed Resources on a secondary system may cause the off peak voltage level to exceed its upper limit.
- 8) The Distributed Resource owner could experience periods when his unit(s) trips off line from overvoltage due to system voltage excursions.

**Voltage Flicker** - Several Distributed Resource technologies have the potential for creating objectionable voltage flicker. In extreme cases the size of the Distributed Resource may need to be limited to prevent objectionable flicker or system improvements may be necessary to limit the voltage flicker. Possible flicker sources include:

- 1) Wind turbines may produce rapidly varying output due to changes in wind speed, wind turbulence, intensity, tower shadowing effects and blade pitching.
- 2) Photovoltaic (PV) installations may produce rapidly varying output due to intermittent cloud cover over the cells.

- 3) Reciprocating engine Distributed Resources may produce rapid output fluctuations caused by engine misfiring due to low quality fuel.
- 4) Induction machine Distributed Resources may produce voltage flicker due to current inrush when they are connected.
- 5) Synchronous machine Distributed Resources may produce voltage flicker due to poor voltage matching and phase angle synchronization at contact closure.
- 6) Power inverter based Distributed Resources may not have soft start technology to limit the rate of change of power output at starting.
- 7) Interaction of Distributed Resources with other devices such as voltage regulators, load tap changers and switched capacitor banks may produce objectionable voltage flicker.

**Overcurrent Protection and Protective Device Coordination** - With the addition of a Distributed Resource on a circuit, another source of fault current is introduced. The available fault current at any location on the feeder will depend upon the type of fault (e.g. line-to-ground, three phase, double-line-to-ground, etc.), the fault impedance, and the status of the Distributed Resource on the feeder (i.e. on or off line). Each Distributed Resource technology has its own unique fault current characteristics.

The presence of Distributed Resources may create several problems with overcurrent protection and the coordination of protective devices. Some of the problems include:

- 1) The “reach” of overcurrent protective devices may be reduced due to a reduction in the fault current contribution from the station source with Distributed Resources on a feeder. For faults located downstream from a Distributed Resource, the fault current contribution from the station source will be reduced when the Distributed Resource unit is on line.
- 2) Recloser to fuse coordination may no longer exist with the introduction of a Distributed Resource on the feeder so fuses may blow for temporary faults.
- 3) Sectionalizers may misoperate if the Distributed Resource maintains voltage when the sectionalizer should be "counting" an operation.
- 4) Nuisance tripping of a circuit recloser or station breaker may occur from a fault located on an adjacent feeder due to the fault current contribution from the Distributed Resource.
- 5) The presence of an interconnection transformer with a primary voltage wye grounded winding connection and a secondary voltage delta connection at the Distributed Resource can desensitize ground fault relays and the ground fault settings on recloser controls.

- 6) The introduction of Distributed Resource to a secondary spot or grid network system can cause nuisance trips of protectors and protector cycling and may lead to out of phase protector closing resulting in equipment damage.
- 7) The presence of a Distributed Resource may exacerbate cold load pickup problems following a feeder outage.
- 8) The addition of a Distributed Resource may increase the available fault current to the point where utility system or customer owned protective device fault interrupting ratings are exceeded.
- 9) If the Distributed Resource remains on the feeder after a protective device opens for any reason, then the protective device may reclose with the system voltage and the Distributed Resource voltage out of synchronism.
- 10) Distribution automation schemes may be adversely affected by the introduction of Distributed Resources.
- 11) System under frequency conditions may result in feeder or transformer overload conditions.

**Harmonic Current Injection** - Several Distributed Resource technologies have the potential for introducing harmonic distortion. Possible harmonic issues include:

- 1) Rotating machines produce 3rd harmonic distortion. Machines having a pitch of either  $5/6$  and  $11/16$  introduce the most distortion with  $2/3$  pitch being the preferred pitch to minimize distortion.
- 2) Inverter based Distributed Resources may inject harmonic voltages and currents into the utility grid or may serve as a system sink for harmonics.
- 3) Wye-wye transformer connected Distributed Resources and single phase Distributed Resources have the potential for being the worst harmonic sources.

**Other Issues** - Several other issues relating to the interconnection of Distributed Resources need to be considered. Potential problems to look for include:

- 1) Voltage on unfaulted phases may approach 1.73 times nominal during single line to ground faults when delta-wye or delta-delta connected transformer banks are used for the Distributed Resource transformation.
- 2) Resonant overvoltages can occur if a synchronous or induction generator Distributed Resource is isolated with capacitors during line to ground faults.
- 3) Single phase switching of a delta connected Distributed Resource transformer bank may create ferroresonant overvoltage conditions.

- 4) Distributed Resources may present utility worker and public safety concerns by inadvertently re-energizing the electric power system during abnormal system conditions.
- 5) The addition of Distributed Resource may overload conductors or equipment.
- 6) The presence of a Distributed Resource may defeat attempts to clear fault conditions by continuing to energize the feeder during fault events.
- 7) Induction and synchronous machine Distributed Resources may be over excited by the presence of a capacitor bank in an unintentional islanding situation and produce high voltages in the island.
- 8) Inverter based Distributed Resources may inject direct current onto the feeder causing transformer saturation.
- 9) When a grounded-wye high-side/delta low-side connected transformer bank is used to connect a Distributed Resource, circulating current in the delta winding may result in transformer overloading. This transformer connection allows zero sequence current to circulate in the delta winding.
- 10) When feeders are switched from their normal configuration to effect load transfers or to restore power to customers during outage situations, the presence of a Distributed Resource may create voltage regulation problems, objectionable voltage flicker, improper protective device operation and coordination or other problems.

## MINIMUM REQUIREMENTS FOR DISTRIBUTION SYSTEM INTERCONNECTION

### Applicability

This schedule is applicable to any customer with cogeneration, small power production facilities, and/or other on-site facilities producing electrical energy who wishes to operate such facilities in parallel with the Company's distribution system at voltages up to 35 kV. This schedule is not applicable to the interconnection and parallel operation of facilities which the Federal Energy Regulatory Commission has determined to be subject to its jurisdiction. A customer who has a facility that does not qualify for simplified interconnection pursuant to the PUCO's distribution interconnection rules (O.A.C. § 4901:1-22) (Commission Rules) and the Company's technical requirements for interconnection (Technical Requirements), incorporated herein by reference, may negotiate a separate interconnection agreement with the Company and the terms and conditions of this schedule shall apply to such customers to the extent that the negotiated interconnection agreement does not conflict with this schedule.

### Purpose

The purpose of this schedule is to implement Ohio Revised Code Section 4928.11, which calls for uniform interconnection standards that are not unduly burdensome or expensive and also ensure safety and reliability, to the extent governing authority is not preempted by federal law. This schedule states the terms and conditions that govern the interconnection and parallel operation of a customer's facility with the Company's distribution system.

### Customer Request for Interconnection

Any customer seeking to physically connect facilities to the Company's distribution system, which facilities may be used in parallel operation with the Company's distribution system, shall file an interconnection application and sign an interconnection agreement with the Company. For facilities for which the referenced Technical Requirements are applicable, the customer and Company shall execute a simplified interconnection agreement. For all other facilities, the customer and the Company shall execute an interconnection agreement which may be different from the simplified agreement, but which shall conform with the provisions of this schedule, to the extent applicable. Copies of all applicable forms and the Company's Technical Requirements are available upon request.

To the extent possible, interconnection to the Company's distribution system shall take place within the following time frames:

1. Where no construction is required by the Company and the facility qualifies for simplified interconnection pursuant to the review procedure contained in the Commission Rules, interconnection shall be permitted within four weeks of the Company's receipt of a completed interconnection application in compliance with the terms and conditions of this schedule. Prior to actual interconnection, the customer must execute the interconnection agreement.
2. Where construction or system upgrades of the Company's distribution system are required, the Company shall provide the customer, in a timely fashion, an estimate of the schedule and the customer's cost for the construction or upgrades. If the customer desires to proceed with the construction or upgrades, the customer and the Company shall enter into a contract. The contract shall contain a construction schedule listing target commencement and completion dates, and an estimate of the customer's costs for construction or upgrades. Assuming the customer is ready, the interconnection shall take place no later than two weeks following the completion of such construction or upgrades. The Company shall employ best reasonable efforts to complete such system construction or upgrades in the shortest time reasonably practical.

3. All interconnection applications shall be processed by the Company in a nondiscriminatory manner. The Company shall promptly provide the customer a written notice of the Company's receipt of the application. The Company will endeavor to place such notice in the U.S. Mail or respond by Email within three business days after the application has been received by the Company's personnel designated on the application form. The Company shall provide the customer with a copy of the review procedure and a target date for processing the application. If the application is viewed as incomplete, the Company must provide a written notice within 10 days of receipt of the application by the Company's personnel designated on the application form that the application is not complete together with a description of the information needed to complete the application and a statement that processing of the application cannot begin until the information is received. The Company's target date shall permit interconnection in a timely manner pursuant to the requirements of the Commission Rules. Interconnection applications will be processed in the order that they are received. It is recognized that certain interconnection applications may require minor modifications while they are being reviewed by the Company. Such minor modifications to a pending application shall not require that it be considered incomplete and treated as a new or separate application. Minor modifications would not include at least the following: changes in facility size or location; any change requiring a new impact study; or any other substantive change.
4. If the Company determines that it cannot connect the customer's facility within the time frames required by the Commission Rules, the Company will notify the customer in writing of that fact as soon as possible. The notification will identify the reason or reasons the interconnection could not be completed within the time frames stated, and provide an estimated date for completion. This section shall not limit the rights of a customer for relief under Ohio Revised Code Chapter 4905.

#### Technical Requirements

The Company shall maintain a copy of the Technical Requirements at its business office such that the Technical Requirements are readily available to the public. The Company shall provide the Commission Staff with a copy of the Technical Requirements. Standards adopted by IEEE shall supersede the applicable provisions of the Company's Technical Requirements effective the date that IEEE adopts such standards. However, any interconnection made or initiated prior to the adoption of any national standard promulgated by IEEE shall not be subject to that standard. Regarding any IEEE minimum standard, or any guideline that the IEEE may promulgate, the Company may amend the Technical Requirements to the minimum extent required to address unique local conditions, and shall provide such amendments to the Staff and make such amendments available to customers. All Technical Requirements, including superseding standards adopted by IEEE, are incorporated herein by reference.

#### Metering

Any metering installation, testing, or recalibration required by the installation of the customer's generation facilities shall be provided consistent with the Electric Service and Safety Standards pursuant to Ohio Revised Code Chapter 4928, and specifically O.A.C. § 4901:1-10-05 (Metering) and, as applicable, § 4901:1-10-28 (C) (Net Metering).

### Liability Insurance

Prior to interconnection with the Company, the customer must provide the Company with proof of insurance or other suitable financial instrument sufficient to meet its construction, operating and liability responsibilities pursuant to this schedule. At no time shall the Company require that the applicant negotiate any policy or renew any policy covering any liability through a particular insurance company, agent, solicitor, or broker. The Company's receipt of evidence of liability insurance does not imply an endorsement of the terms and conditions of the coverage.

### System Impact and Facilities Studies

For those facilities that do not qualify for simplified interconnection pursuant to the review procedures included in the Commission Rules, the Company may require a supplemental review, service study, coordination study, facilities study or Company system impact study prior to interconnection. In instances where such studies are required, the scope of such studies shall be based on the characteristics of the particular generation facility to be interconnected and the Company's system at the specific proposed location. By agreement between the Company and the customer, studies related to interconnection of the generation facility may be conducted by a qualified third party. The cost of an impact facilities study performed by the Company shall be included in the costs set forth in the Interconnection Fees section of this schedule. The Company shall provide the customer with a target date for completion of any required system impact or facilities study. Any such study conducted by the Company shall be shared with the customer.

### Interconnection Fees

The Company shall not charge any fees for interconnection other than those authorized by this schedule. Fees contained herein apply to each installation at the Company distribution voltages up to 35 kV.

The Company shall charge each customer that applies for interconnection service an application fee as set forth in the Commission Rules. Fees for customer applications for interconnection that meet the qualifications for level 1, level 1.1 or level 1.2 simplified review procedures will be based on the actual costs per one-tenth of an hour of time spent by Company personnel on the simplified review. Customer applications for interconnection that meet the qualifications for level 2 expedited review will be subject to an application fee of \$50, plus one dollar per kilowatt of the applicant's system nameplate capacity rating. Interconnection customers whose facilities qualify for level 3 standard review procedures shall pay an application fee of \$100, plus two dollars per kilowatt of the applicant's system nameplate capacity rating.

Level 2 and level 3 interconnection review processes may require that one or more interconnection studies be performed to determine the feasibility, system impact, and cost of safely connecting the customer's generation facilities to the Company's distribution system. As specified in the Commission Rules, the cost of engineering work done as part of any feasibility, system impact or facilities study shall be billed to the customer at the Company's actual cost of performing such study.

### Additional Fees

The customer is responsible for all equipment and installation costs of the customer's facility.

The customer shall pay any additional charges, as determined by the Company, for equipment, labor, metering, testing or inspections requested by the customer.

### Construction or Upgrade Fees

If the interconnection requires construction or an upgrade of the Company's system which, save for the generation facility would not be required, the Company will assess the customer the actual cost including applicable taxes of such construction or upgrade. Payment terms for such construction or upgrade will be agreed to and specified in the construction contract. The Company and the customer may negotiate for alternatives in order to reduce any costs or taxes applicable thereto.

### Resolution of Disputes

The Company or the customer who is a non-mercantile, non-residential customer may seek resolution of any disputes which may arise out of this schedule, including the interconnection and the referenced Technical Requirements in accordance with the Commission's Rules.

### Special Terms and Conditions of Service

This schedule is subject to the Company's Terms and Conditions of Service and all provisions of the standard service schedule under which the customer takes service. If applicable, the customer shall also take the appropriate service under the provisions of Schedule COGEN/SPP, Schedule SBS and/or Schedule NEMS.

## INTERCONNECTION AGREEMENT

This interconnection agreement ("Agreement") is made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between Ohio Power Company (dba AEP Ohio) ("Company"), and \_\_\_\_\_ ("Customer"). Company and Customer are hereinafter sometimes referred to individually as "Party" or collectively as "Parties".

### WITNESSETH:

WHEREAS, Customer is installing, or has installed, generation equipment, controls, and protective relays and equipment ("Generation Facilities") used to interconnect and operate in parallel with Company's electric system, which Generation Facilities are more fully described in Exhibit A, attached hereto and incorporated herein by this Agreement, and as follows:

Location: \_\_\_\_\_

Generator Size and Type: \_\_\_\_\_

NOW, THEREFORE, in consideration thereof, Customer and Company agree as follows:

- 1. Application.** It is understood and agreed that this Agreement applies only to the operation of the Generation Facilities described above and on Exhibit A.
- 2. Interconnection.** Company agrees to allow Customer to interconnect and operate the Generation Facilities in parallel with Company's electric system in accordance with any operating procedures or other conditions specified in Exhibit B. By this Agreement, or by inspection, if any, or by non-rejection, or by approval, or in any other way, Company does not give any warranty, express or implied, as to the adequacy, safety, compliance with applicable codes or requirements, or as to any other characteristics, of the Generation Facilities. The Generation Facilities installed and operated by or for Customer shall comply with, and Customer represents and warrants their compliance with: (a) the National Electrical Code and the National Electrical Safety Code, as each may be revised from time to time; (b) Company's Minimum Requirements For Distribution System Interconnection as may be revised from time to time with the approval of the Public Utilities Commission of Ohio ("Commission"); (c) the rules and regulations of the Commission, including the provisions of Chapter 4901:1-22, Ohio Administrative Code Uniform Electric Interconnection Standards, as such rules and regulations may be revised from time to time by the Commission; and (d) all other applicable local, state, and federal codes and laws, as the same may be in effect from time to time.

Customer shall install, operate, and maintain, at Customer's sole cost and expense, the Generation Facilities in accordance with *IEEE 1547-2003 "IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems."* (IEEE 1547) and the manufacturer's suggested practices for safe, efficient and reliable operation of the Generation Facilities in parallel with Company's electric system. Customer shall bear full responsibility for the installation, maintenance and safe operation of the Generation Facilities. Upon request from the Company, Customer shall supply copies of periodic test reports or inspection logs.

Customer shall be responsible for protecting, at Customer's sole cost and expense, the Generation Facilities from any condition or disturbance on Company's electric system, including, but not limited to, voltage sags or swells, system faults, outages, loss of a single phase of supply, equipment failures, and lightning or switching surges.

Customer agrees that, without the prior written permission from Company, no changes shall be made to the configuration of the Generation Facilities, as that configuration is described in Exhibit A, and no relay or other control or protection settings specified in Exhibit A shall be set, reset, adjusted or tampered with, except to the extent necessary to verify that the Generation Facilities comply with Company approved settings.

**3. Operation by Customer.** Customer shall operate the Generation Facilities in such a manner as not to cause undue fluctuations in voltage, intermittent load characteristics or otherwise interfere with the operation of Company's electric system. At all times when the Generation Facilities are being operated in parallel with Company's electric system, Customer shall so operate the Generation Facilities in such a manner that no disturbance will be produced thereby to the service rendered by Company to any of its other customers or to any electric system interconnected with Company's electric system. Customer understands and agrees that the interconnection and operation of the Generation Facilities pursuant to this Agreement is secondary to, and shall not interfere with, Company's ability to meet its primary responsibility of furnishing reasonably adequate service to its customers.

Customer's control equipment for the Generation Facilities shall immediately, completely, and automatically disconnect and isolate the Generation Facilities from Company's electric system in the event of a fault on Company's electric system, a fault on Customer's electric system, or loss of a source or sources on Company's electric system. The automatic disconnecting device included in such control equipment shall not be capable of reclosing until after service is restored on Company's electric system. Additionally, if the fault is on Customer's electric system, such automatic disconnecting device shall not be reclosed until after the fault is isolated from Customer's electric system. Upon Company's request, Customer shall promptly notify Company whenever such automatic disconnecting devices operate.

**4. Access and Inspection by Company.** Customer must provide the Company reasonable opportunity to inspect the Generation Facilities prior to operation and witness the initial testing and commissioning of the Generation Facilities. Company may witness any commissioning tests required by IEEE 1547. Following the initial testing and inspection of the Generation Facilities and upon reasonable advance notice to Customer, Company shall have access at reasonable times to the Generation Facilities to perform reasonable on-site inspections to verify that the installation, maintenance and operation of the Generation Facilities comply with the requirements of this Agreement. The Company's cost of such inspection(s) shall be at Company's expense; however, Company shall not be responsible for any other cost Customer may incur as a result of such inspection(s). Upon written request, Customer shall inform Company of the next scheduled maintenance and allow Company to witness the maintenance program and any associated testing. Company shall also have at all time's immediate access to breakers or any other equipment that will isolate the Generation Facilities from Company's electric system.

**5. Disconnection of Generation Facilities.** Company shall have the right and authority to isolate the Generation Facilities at Company's sole discretion if Company believes that: (a) continued interconnection and parallel operation of the Generation Facilities with Company's electric system creates or contributes (or will create or contribute) to a system emergency on either Company's or Customer's electric system; (b) the Generation Facilities are not in compliance with the requirements of this Agreement, and the non-compliance adversely affects the safety, reliability or power quality of Company's electric system; or (c) the Generation Facilities interfere with the operation of Company's electric system. In non-emergency situations, Company shall give Customer notice of noncompliance including a description of the specific noncompliance condition and allow Customer a reasonable time to cure the noncompliance prior to isolating the Generating Facilities.

The Customer retains the option to temporarily disconnect from the Company's system at any time. Such temporary disconnection shall not be a termination of this Agreement unless the Customer exercises its termination rights under Section 9.

Subject to Commission Rule, for routine maintenance and repairs on Company's utility system, Company shall provide Interconnection Service Customer with seven business days' notice of service interruption.

**6. Rates and Other Charges.** This Agreement does not constitute an agreement by Company to purchase power produced by the Generation Facilities, or to furnish other power or services associated with the Generation Facilities, and this Agreement does not address any

charges for facilities that may be installed by Company in connection with interconnection of the Generation Facilities. It is understood that if Customer desires an agreement whereby Company purchases energy and/or capacity, produced by the Generation Facilities, or furnishes any other power or services associated with the Generation Facilities, then Company and Customer may enter into another mutually acceptable separate agreement detailing the charges, terms and conditions of such purchase or other power or services. It is also understood that if any such facilities are required, including any additional metering equipment, as determined by Company, in order for the Generation Facilities to interconnect with and operate in parallel with Company's electric system, then a separate agreement shall be executed by Company and Customer detailing the charges and terms and conditions of payment.

**7. Insurance.** Customer shall maintain reasonable amounts of insurance coverage against risks related to the Generation Facilities for which there is a reasonable likelihood of occurrence. Customer shall agree to provide Company from time to time with proof of such insurance upon Company's request.

**8. Indemnification.** Each Party (the "Indemnifying Party") to the extent permitted by law shall indemnify and hold harmless the other Party 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 used in connection with this Agreement. Upon written request of the Party seeking relief under this Section 8, the Indemnifying Party shall defend any suit asserting a claim covered by this Section 8. If a Party is required to bring an action to enforce its rights under this Section 8, either as a separate action or in connection with another action, and said rights are upheld, the Indemnifying Party shall reimburse such Party for all expenses, including attorney's fees, incurred in connection with such action.

**9. Effective Term and Termination Rights.** This Agreement shall become effective when executed by both Parties and shall continue in effect until terminated in accordance with the provisions of this Agreement. This Agreement may be terminated for the following reasons: (a) Customer may terminate this Agreement at any time by giving Company at least sixty (60) days' prior written notice stating Customer's intent to terminate this Agreement at the expiration of such notice period; (b) Company may terminate this Agreement at any time following Customer's failure to generate energy from the Generation Facilities in parallel with Company's electric system by the later of two years from the date of execution of this Agreement or twelve (12) months after completion of the interconnection provided for by this Agreement; (c) either Party may terminate this Agreement at any time by giving the other Party at least sixty (60) days' prior written notice that the other Party is in default of any of the material terms and conditions of this Agreement, so long as the notice specifies the basis for termination and there is reasonable opportunity for the Party in default to cure the default; or (d) Company may terminate this Agreement at any time by giving Customer at least sixty (60) days' prior written notice in the event that there is a change in an applicable rule or statute affecting this Agreement.

Upon termination of this Agreement, Customer's Generation Facilities shall be disconnected from the Company's system.

Termination of this Agreement shall not relieve either party of its liabilities and obligations, owed or continuing at the time of the termination.

**10. Termination of Any Applicable Existing Agreement.** From and after the date when service commences under this Agreement, this Agreement shall supersede any oral and/or written agreement or understanding between Company and Customer concerning the service covered by this Agreement and any such agreement or understanding shall be deemed to be terminated as of the date service commences under this Agreement.

**11. Force Majeure.** For purposes of this Agreement, the term "Force Majeure" means any cause or event not reasonably within the control of the Party claiming Force Majeure, including, but not limited to, the following: acts of God, strikes, lockouts, or other industrial disturbances; acts of public enemies; orders or permits or the absence of the necessary orders or permits of any kind which have been properly applied for from the government of the United States, the State of Ohio, any political subdivision or municipal subdivision or any of their departments, agencies or officials, or any civil or military authority; unavailability of a fuel or resource used in connection with the generation of electricity; extraordinary delay in transportation; unforeseen soil conditions; equipment, material, supplies, labor or machinery shortages; epidemics; landslides; lightning; earthquakes; fires; hurricanes; tornadoes; storms; floods; washouts; drought; arrest; war; civil disturbances; explosions; breakage or accident to machinery, transmission lines, pipes or canals; partial or entire failure of utilities; sabotage; injunction; blight; famine; blockade; or quarantine.

If either Party is rendered wholly or partly unable to perform its obligations under this Agreement because of Force Majeure, both Parties shall be excused from whatever obligations under this Agreement are affected by the Force Majeure (other than the obligation to pay money) and shall not be liable or responsible for any delay in the performance of, or the inability to perform, any such obligations for so long as the Force Majeure continues. The Party suffering an occurrence of Force Majeure shall, as soon as is reasonably possible after such occurrence, give the other Party written notice describing the particulars of the occurrence and shall use commercially reasonable efforts to remedy its inability to perform; provided, however, that the settlement of any strike, walkout, lockout or other labor dispute shall be entirely within the discretion of the Party involved in such labor dispute.

**12. Dispute Resolution.** In the event that Customer and Company are unable to agree on matters relating to this Agreement, either Customer or Company may submit a complaint to the Commission in accordance with the Commission's applicable rules.

The Company or the Customer who is a nonmercantile, nonresidential customer may seek resolution of any disputes related to this Agreement in accordance with Chapter 4901:1-26, Ohio Administrative Code Alternative Dispute Resolution.

**13. Commission Jurisdiction.** Both 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 Company's commitments hereunder are subject to such approval.

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

**Ohio Power Company dba AEP Ohio**

**(Customer's Name)**

By: \_\_\_\_\_

By: \_\_\_\_\_

Printed Name: \_\_\_\_\_

Printed Name: \_\_\_\_\_

Title: \_\_\_\_\_

Title: \_\_\_\_\_

## **Exhibit A – Generation Facilities**

(Exhibit A will contain additional detailed information about the Customer Facilities such as an electrical one-line diagram, relay settings and description of operation. The application would be included here.)

## **Exhibit B – Facilities Required for Interconnection**

(Exhibit B will contain a listing of changes/additions to facilities and milestones (e.g. station, metering, SCADA, etc). The system impact study would be included here. This study should include the requirements for metering and SCADA.)

SAMPLE



APPLICATION FOR INTERCONNECTION
OF GENERATION EQUIPMENT
20 MEGAWATTS OR LESS
(Standard Form Application)

A unit of American Electric Power

A Short Form Application is available for inverter-based systems (50 kW or less).

An Application is a complete application when it provides all applicable and correct information required below. Additional information to evaluate a request for interconnection may be required pursuant to the application process after the Application is deemed complete.

Applications for Interconnection (2 MW or less) are subject to an application charge of \$50 + \$1/kW of installed capacity. Applications for greater than 2 MW are subject to an application charge of \$100 + \$2/kW of installed capacity.

Applicant

Legal Name:
Mailing Address:
City: State: Zip:
Phone: ( ) Phone: ( )
E-mail address:

Alternate Contact

Name:
Mailing Address:
City: State: Zip:
Phone: ( ) Phone: ( )
E-mail address:

Service Location

Street Address:
City: Zip:
Electric Service Account Number:
Existing Electric Service: Capacity: Amps Voltage: Volts
Service Character: ( ) Single Phase ( ) Three Phase
Site Maximum Demand: kW Annual Energy Consumption kWh
Requested Point of Interconnection:
Location of Utility Accessible Lockable Disconnect Switch: (e.g. West wall next to utility meter)
Estimated In-Service Date:

**Consulting Engineer or Contractor**

Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
Phone: (\_\_\_\_) \_\_\_\_\_ Phone: (\_\_\_\_) \_\_\_\_\_ E-mail: \_\_\_\_\_

**Generator Qualifications**

Energy Source:  Solar  Wind  Hydro: type (e.g. run-of-river) \_\_\_\_\_  
 Diesel  Natural Gas  Fuel Oil  Other: (specify) \_\_\_\_\_  
Type of Generator:  Inverter Based  Synchronous  Induction  
Generator Nameplate Ratings: \_\_\_\_\_ kW \_\_\_\_\_ KVA \_\_\_\_\_ Volts  
Number of Generators: \_\_\_\_\_ Service Character:  Single Phase  Three Phase  
Inverter Ratings: \_\_\_\_\_ kW \_\_\_\_\_ KVA \_\_\_\_\_ Volts Number of Inverters \_\_\_\_\_  
Maximum Net Export Capability: \_\_\_\_\_ kW Estimated Annual Energy Production: \_\_\_\_\_ kWh

This Generating Equipment is intended to be used to:

- Emergency/Standby – Operated when AEP service is not available. Paralleling is for short durations.
- Peak Shaving – Operated during peak demand periods. Paralleling is for extended times.
- Base Load Power – Operated continuously at a pre-determined output. Paralleling is continuous.
- Cogeneration – Operated primarily to produce thermal energy. Paralleling is extended or continuous.
- Renewable non-dispatched – Operated in response to an available renewable resource.  
Paralleling is for extended times.

List components of the generation equipment that are currently certified by a nationally recognized testing and certification laboratory (NRTL) and/or listed by the Underwriters Laboratory:

Equipment Type	UL Listing or certifying NRTL Certification
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____

**Generation Equipment Technical Information**

*Attach electrical one-line diagram showing the configuration of all generating facility equipment, transformers, switchgear, switches, circuit breakers, fuses, current and potential transformers, and protection and control schemes. (This diagram must be signed and stamped by a licensed Professional Engineer if the facility is larger than 50kW).*

*Attach documentation and nameplate data that describes and details the operation of all protection and control schemes. i.e. inverter, generation equipment, transformer, switches, etc.*

*Attach site documentation that indicates the precise physical location of the proposed generating facility and location of protective interface equipment (e.g.USGS topographic map or other diagram or documentation).*

*Attach installation test plan for all the tests required by IEEE 1547 and the periodic maintenance schedule recommended by the equipment manufacturer.*

*Attach "Certificate of Liability Insurance"*

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

**APPLICANT'S SIGNATURE:** \_\_\_\_\_

**TITLE:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

*Return Completed Application to: AEP Ohio  
Attn: DG Coordinator  
850 Tech Center Dr  
Gahanna, Ohio 43230-6605  
614-883-6775 Office / 614-883-7915 Fax  
[dgcoordinator-ohio@aep.com](mailto:dgcoordinator-ohio@aep.com)*