ComEd
Interconnection Guidelines

(For Generators Greater than 20 MW)

Rev 0: Effective 07/22/2013

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1) INTRODUCTION

a) Purpose & Scope

This document provides guidance applicable to Generator Interconnection Customers (GIC) planning to operate generators greater than 20 MW that will be interconnected to the ComEd transmission system. This guideline is intended to provide standards that apply to various aspects of GIC interface with ComEd. It contains technical standards regarding generator interconnection, relay & protection, SCADA, communication, and metering. It also contains protocols that address generator interconnection arrangements, real estate transactions, facility energization, and post-energization interface associated with such generator interconnections.

This guideline is posted on the PJM website at www.pjm.com. This guideline is also available on the ComEd website at www.comed.com.

b) Definitions

Generator Interconnection Customer (GIC):

An entity that enters into the PJM process to interconnect a new generation facility to or to increase the capacity of an existing generation facility interconnected with the ComEd transmission system.

PJM Interconnection L.L.C. (PJM):

PJM is the regional transmission organization that is responsible to plan and operate the ComEd transmission system for the purpose of providing non-discriminatory access to generator interconnection customers for movement of wholesale energy. PJM manages the generator interconnection process and energy market.

Interconnections & System Studies (ISS):

A ComEd work group that interfaces with PJM, GIC and ComEd internal groups to facilitate generator interconnection and liaison with GIC during commercial operation.

Transmission System Operation (TSO):

A ComEd work group that operates the electrical grid as the designated authority.

Large Customer Solutions (LCS):

A ComEd work group that interfaces with GIC at various levels during and after generator interconnection.

Project Management (PM):

A ComEd work group that is responsible for managing the facilities study, design, and construction of the generator interconnection.

Metering Algorithm Memorandum of Understanding (MAMOU):

The document that describes the mechanism to translate meter readings into real time energy values and settlement values for retail and wholesale energy transactions. This document provides the basis for settlement of energy transactions in the PJM market.

2) PJM GENERATOR INTERCONNECTION PROCESS

PJM is responsible for managing the generator interconnection process. The detailed description of this process is provided in PJM Manuals 14A and 14B posted on PJM website. The following steps briefly summarize the PJM process as it applies to ComEd:

a) PJM Queue Number:

PJM assigns a unique queue number to a potential GIC when it enters the PJM interconnection process by submitting Attachment-N. PJM notifies ComEd about the potential generator interconnection by providing a copy of the Attachment-N.

b) Kickoff Meeting:

PJM schedules a kickoff meeting to review a GIC request for generator interconnection. In the kickoff meeting, PJM provides an overview of the PJM interconnection process. ComEd provides information on ComEd technical standards including scope of work for generator interconnection. ComEd also provides input to firm up the point-of-interconnection.

c) Interconnection Feasibility Study:

The interconnection feasibility study assesses the practicality and cost of accommodating interconnection of the generating unit or increased generating capacity. PJM performs load flow analyses to identify any reliability criteria violations associated with generation interconnection.

ComEd reviews the results of the feasibility study and provides the scope of network upgrades needed to mitigate reliability criteria violations, and the scope of direct connection (attachment facilities). Additionally, ComEd provides cost estimates for direct connection and network upgrades, together with lead-time to complete the direct connection and network upgrades.

The cost estimates provided in the interconnection feasibility study are order-of-magnitude cost estimates. These estimates typically do not include the feasibility, cost, or time required to obtain property rights and/or permits for construction of the interconnection facilities.

d) System Impact Study:

The system impact study refines the scope of direct connection (attachment facilities) and network upgrades as well as cost estimates.

e) Facilities Study:

The facilities study is performed by ComEd's PM group using ComEd and/or contract resources. The GIC is responsible to pay the actual cost of performing the facilities study.

f) Interconnection Service Agreement:

For a FERC jurisdictional and Qualifying Generation Facility (QF), PJM presents the 3-party Interconnection Service Agreement (ISA). Once the ISA is executed among the GIC, PJM and ComEd, the generator interconnection moves to the design and construction phase.

At this stage, the ComEd PM group assigns a specific project manager who interfaces with all stakeholders to complete ComEd's responsibilities related to ComEd-owned interconnection facilities.

g) Interconnection Construction Service Agreement:

Subsequent to executing the ISA, PJM presents the 3-party Interconnection Construction Service Agreement (ICSA) among the GIC, ComEd and PJM. The ICSA spells out the construction milestones and responsibilities to complete the generator interconnection.

FOR NON-FERC JURISDICTIONAL GENERATOR INTERCONNECTIONS, THE FOLLOWING TWO STEPS APPLY IN PLACE OF THE STEPS (f) AND (g):

h) Interconnection Agreement:

ComEd presents the 2-party Interconnection Agreement (IA) when a generator interconnection is non-FERC jurisdictional. Once the IA is executed between GIC and ComEd, the generator interconnection moves to the design and construction phase.

At this stage, the ComEd PM group assigns a specific project manager who interfaces with all stakeholders to complete ComEd responsibilities related to ComEd-owned interconnection facilities.

i) Wholesale Market Participation Agreement:

PJM presents the 3-party Wholesale Market Participation Agreement (WMPA) when the generator interconnection is non-FERC jurisdictional. The WMPA is executed among GIC, PJM and ComEd to establish the capacity rights of the GIC in the PJM market.

3) COMED TECHNICAL STANDARDS

The ComEd electric system consists of 765kV, 345kV, 138kV, 69kV, 34kV and 12kV networks. The generator interconnection design depends on the chosen voltage level. The following technical standards would apply to generator interconnection design at different voltage levels.

3.1) Generator Interconnections at 765kV & 345kV Voltage:

The 765kV and 345kV networks are critical components of the ComEd transmission system. The ComEd bulk power system is vital to maintaining system integrity and network reliability. The generator interconnection to a 765kV or a 345kV transmission line bisects that line into two segments. In certain parts of Illinois, multiple generators are located in close proximity to each other. The interconnection of multiple generators to a particular transmission line at relatively short distances would bisect that line multiple times leading to excessive segmentation.

Excessive segmentation of 765kV and 345kV transmission lines degrades system integrity and network reliability. A line with excessive segmentation presents various challenges including difficulty in outage planning, communications, increased maintenance costs and increased loss of system continuity.

Typically, ComEd will not allow bisecting a 765kV or 345kV transmission line within twenty miles of an existing or a proposed substation. A new GIC would be required to interconnect to an existing or a proposed substation. This practice encourages multiple generators to interconnect to a centrally located substation that will serve as a ‘generation hub’ and avoids negative aspects of excessive segmentation described above.

ComEd will identify the potential sites for generation hubs on 765kV and 345kV right of ways. A new GIC may interconnect to an existing substation or it may interconnect to a generation hub. The details of these two options are described below:

a) Generator Interconnection to an Existing Substation:

The existing ComEd substations at 765kV and 345kV voltage level are mostly designed with ring-bus configuration. The generator interconnection to an existing ring bus would require installation of an additional circuit breaker to expand the ring-bus and create a line position for generator lead, as shown in the following Figure-3.1.1.

The dead-end structure for the generator lead at the ComEd substation will serve as the point-of-interconnection between ComEd and the GIC.

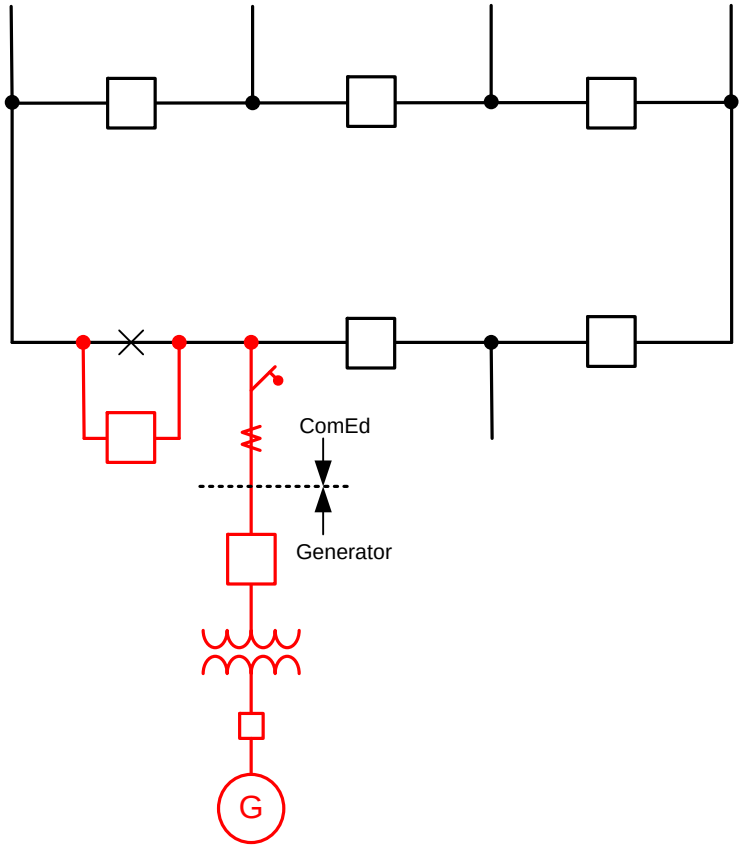


Figure-3.1.1: Generator interconnection to an existing ring-bus substation

b) Generator Interconnection at a Generation Hub:

A generation hub is essentially a 765kV or a 345kV interconnection substation that is shared by multiple transmission lines and generators. A generation hub employs breaker-and-a-half configuration in order to facilitate expansion and provide greater operational flexibility. A generation hub is designed to interconnect up to four generators and two transmission lines. The ultimate configuration shall meet ComEd and PJM planning criteria including loss of largest resource. For some interconnections, planning criteria and/or operational considerations may allow use of motor operated disconnect switches instead of bus-tie circuit breakers between buses 1-3 and buses 2-4.

ComEd will identify potential sites for generation hubs on 765kV and 345kV transmission right-of-ways and present them to the GIC to help the GIC choose the nearest generation hub site for interconnection.

Many of the ComEd 765kV and 345kV transmission line right of ways have double-circuit transmission lines. The generation hub design has the provision to tie-in both circuits (designated as A and B) of the double-circuit transmission line.

The following figures depict generator interconnection configuration for different scenarios that represent sequential interconnection of a 1st, 2nd and 3rd generator. The interconnection of 4th generator would depend on the equipment layout at the generation hub and is not covered in this guideline.

Figure-a: Interconnection of 1st generator at a generation hub (G1 on line-A)

Figure-b: Interconnection of 2nd generator at a generation hub (G1 on line-A & G2 on line-A)

Figure-c: Interconnection of 2nd generator at a generation hub (G1 on line-A & G2 on line-B)

Figure-d: Interconnection of 3rd generator at a generation hub (G1 on line-A, G2 on line-A & G3 on line-A)

Figure-e: Interconnection of 3rd generator at a generation hub (G1 on line-A, G2 on line-A & G3 on line-B)

Figure-f: Interconnection of 3rd generator at a generation hub (G1 on line-A, G2 on line-B & G3 on line-A)

Figure-g: Interconnection of 3rd generator at a generation hub (G1 on line-A, G2 on line-B & G3 on line-B)

Figure-a: **Interconnection of 1st generator at a generation hub (G1 on line-A)**

For the 1st generator, the scope of interconnection will include installation of 3 circuit breakers, line tie-in and termination of generator lead in breaker-and-a-half configuration, in addition to any system upgrades identified in PJM studies.

The dead-end structure for the generator lead at the generation hub will serve as the point-of-interconnection between ComEd and the GIC.

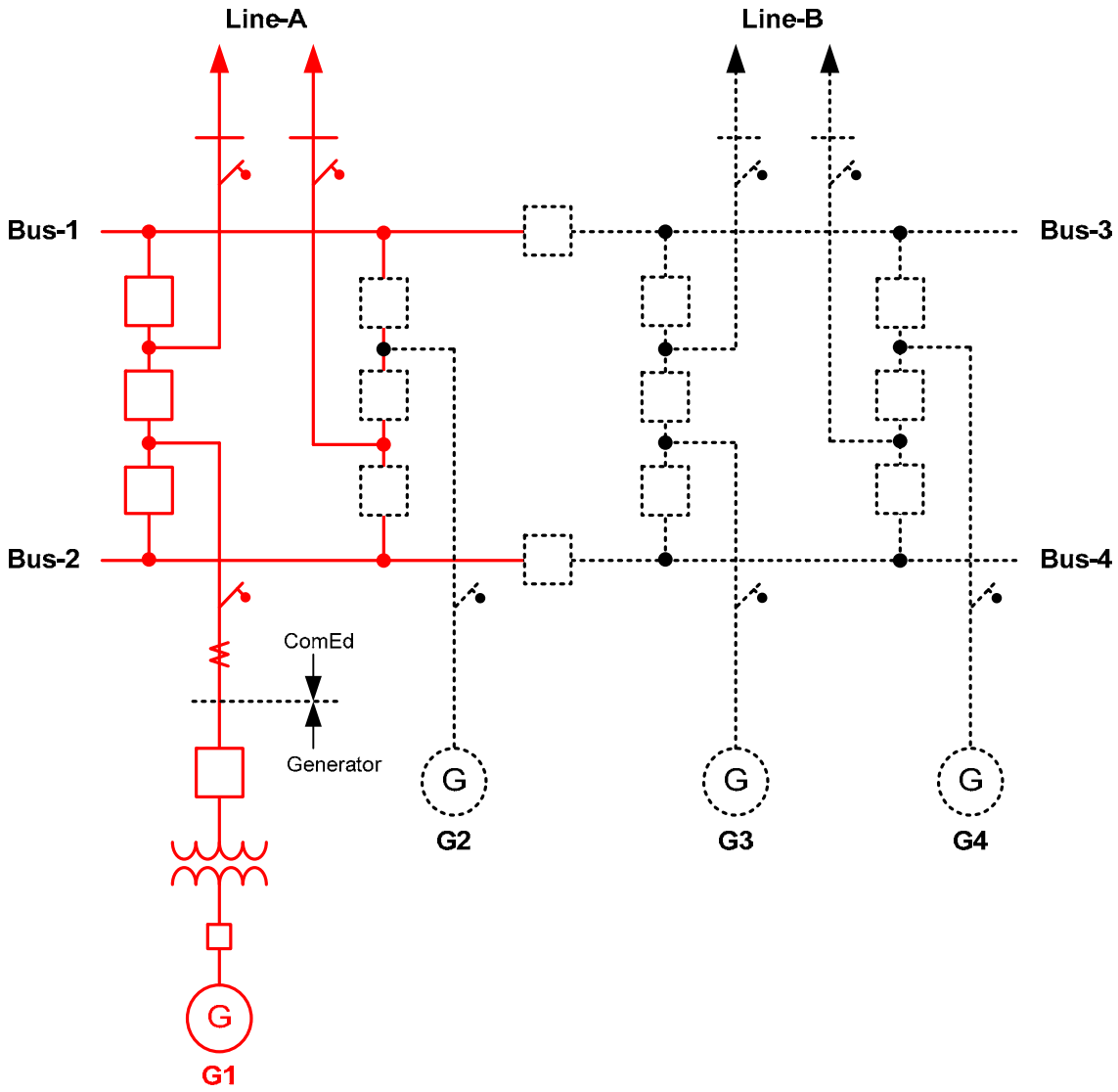


Figure-a: Interconnection of 1st Generator at a Generation Hub (G1 on Line-A)

Figure-b: **Interconnection of 2nd generator at a generation hub (G1 on line-A & G2 on line-A)**

For the 2nd generator, the scope of interconnection will include installation of 3 circuit breakers and termination of generator lead in breaker-and-a-half configuration, in addition to any system upgrades identified in PJM studies.

The dead-end structure for the generator lead at the generation hub will serve as the point-of-interconnection between ComEd and the GIC.

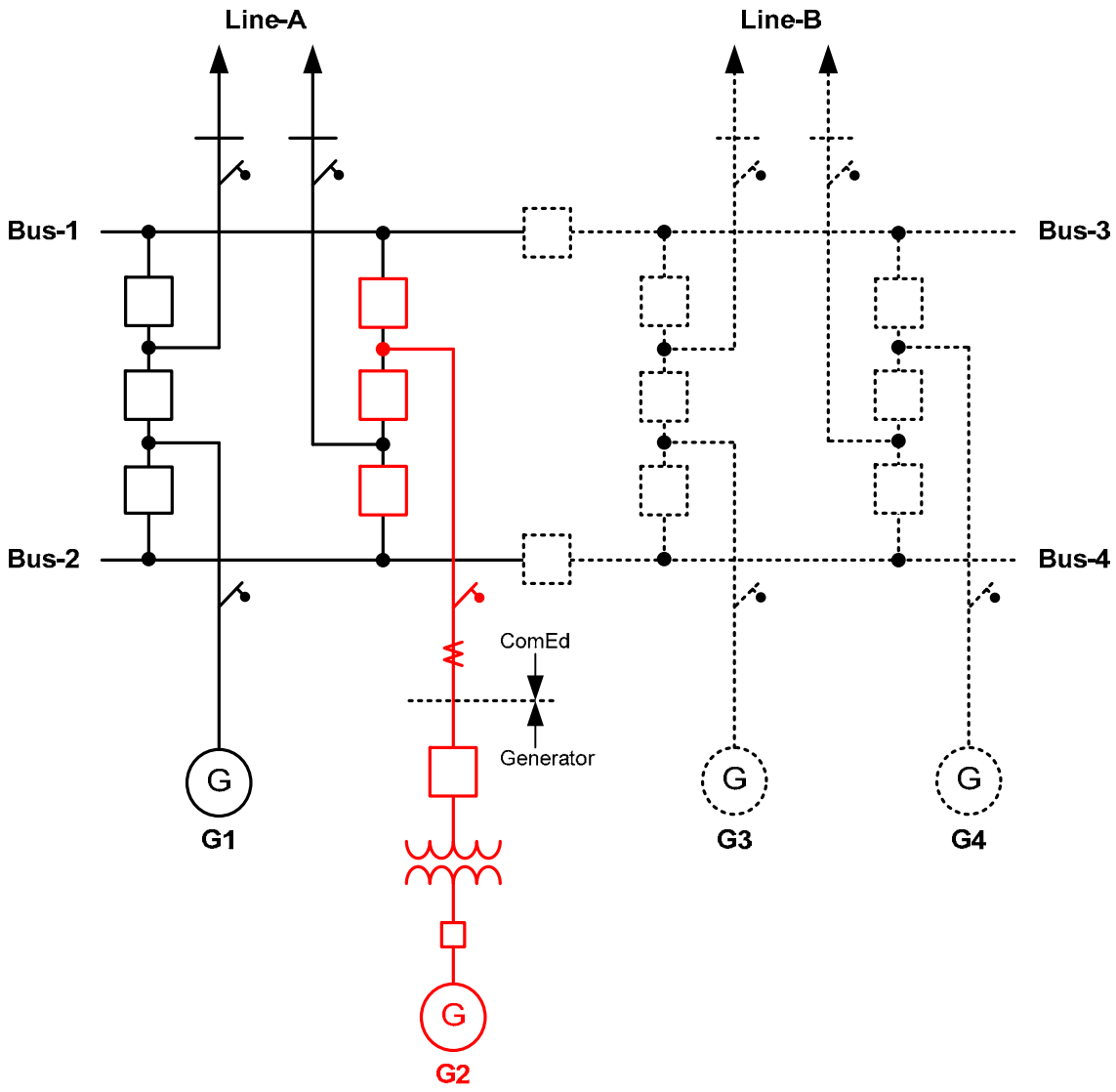


Figure-b: Interconnection of 2nd Generator at a Generation Hub (G1 on Line-A & G2 on Line-A)

Figure-c: **Interconnection of 2nd generator at a generation hub (G1 on line-A & G2 on line-B)**

This scenario applies to a generator that entered the PJM queue intending to interconnect to a different transmission line from the one to which the 1st generator is interconnected.

Under this scenario, the scope of interconnection will include installation of 3 line circuit breakers, 2 bus-tie circuit breakers, line tie-in and termination of generator lead in breaker-and-a-half configuration, in addition to any system upgrades identified in PJM studies. For some interconnections, planning criteria and/or operational considerations may allow use of motor operated disconnect switches instead of bus-tie circuit breakers between buses 1-3 and buses 2-4.

The dead-end structure for the generator lead at the generation hub will serve as the point-of-interconnection between ComEd and the GIC.

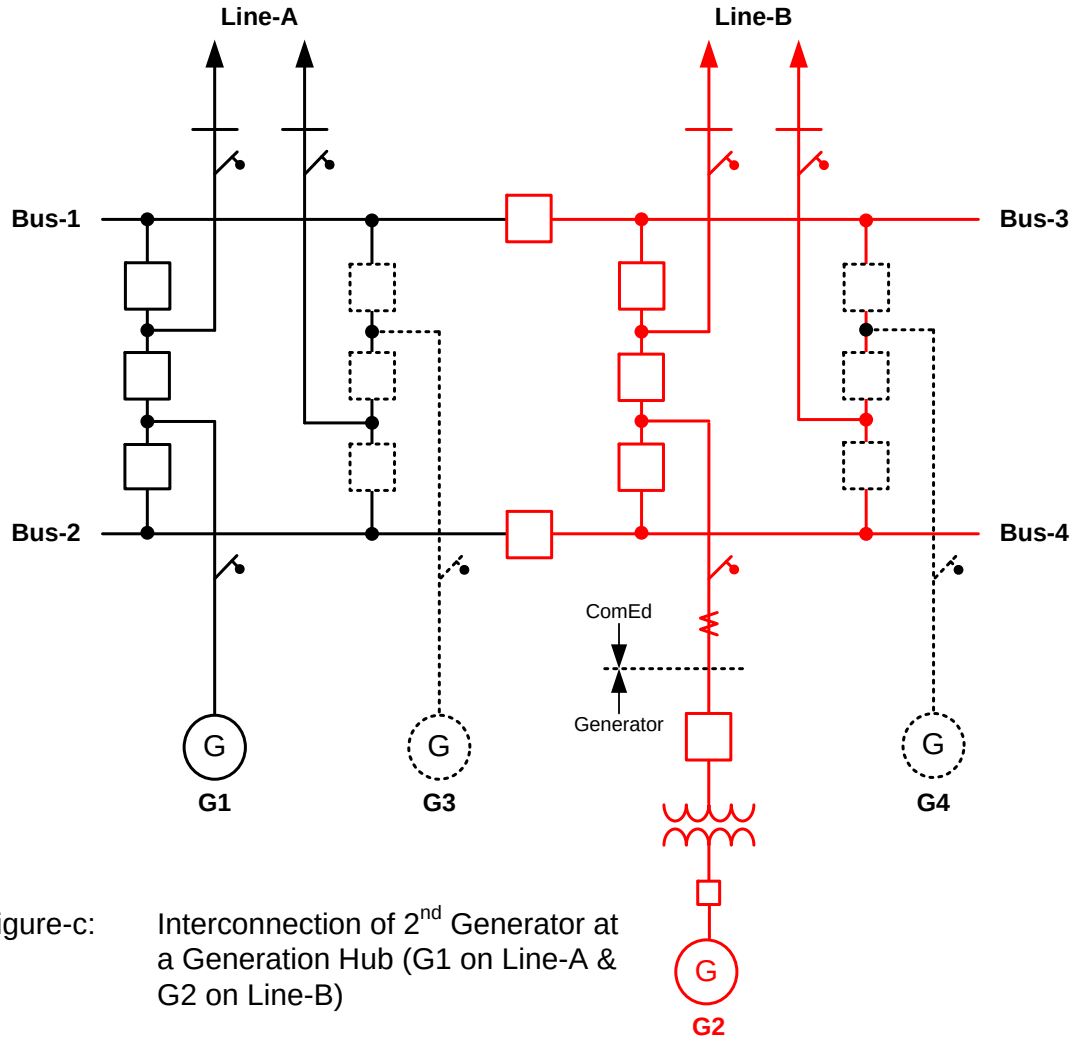


Figure-c: Interconnection of 2nd Generator at a Generation Hub (G1 on Line-A & G2 on Line-B)

Figure-d: **Interconnection of 3rd generator at a generation hub (G1 on line-A, G2 on line-A & G3 on line-A)**

This scenario applies to a 3rd generator interconnection when two generators are already interconnected to a generation hub and all of the three generators share line A.

Under this scenario, the scope of interconnection will include installation of 2 line circuit breakers, 2 bus-tie circuit breakers and termination of the generator lead in the breaker-and-a-half configuration, in addition to any system upgrades identified in PJM studies. For some interconnections, planning criteria and/or operational considerations may allow use of motor operated disconnect switches instead of bus-tie circuit breakers between buses 1-3 and buses 2-4.

The dead-end structure for the generator lead at the generation hub will serve as the point-of-interconnection between ComEd and GIC.

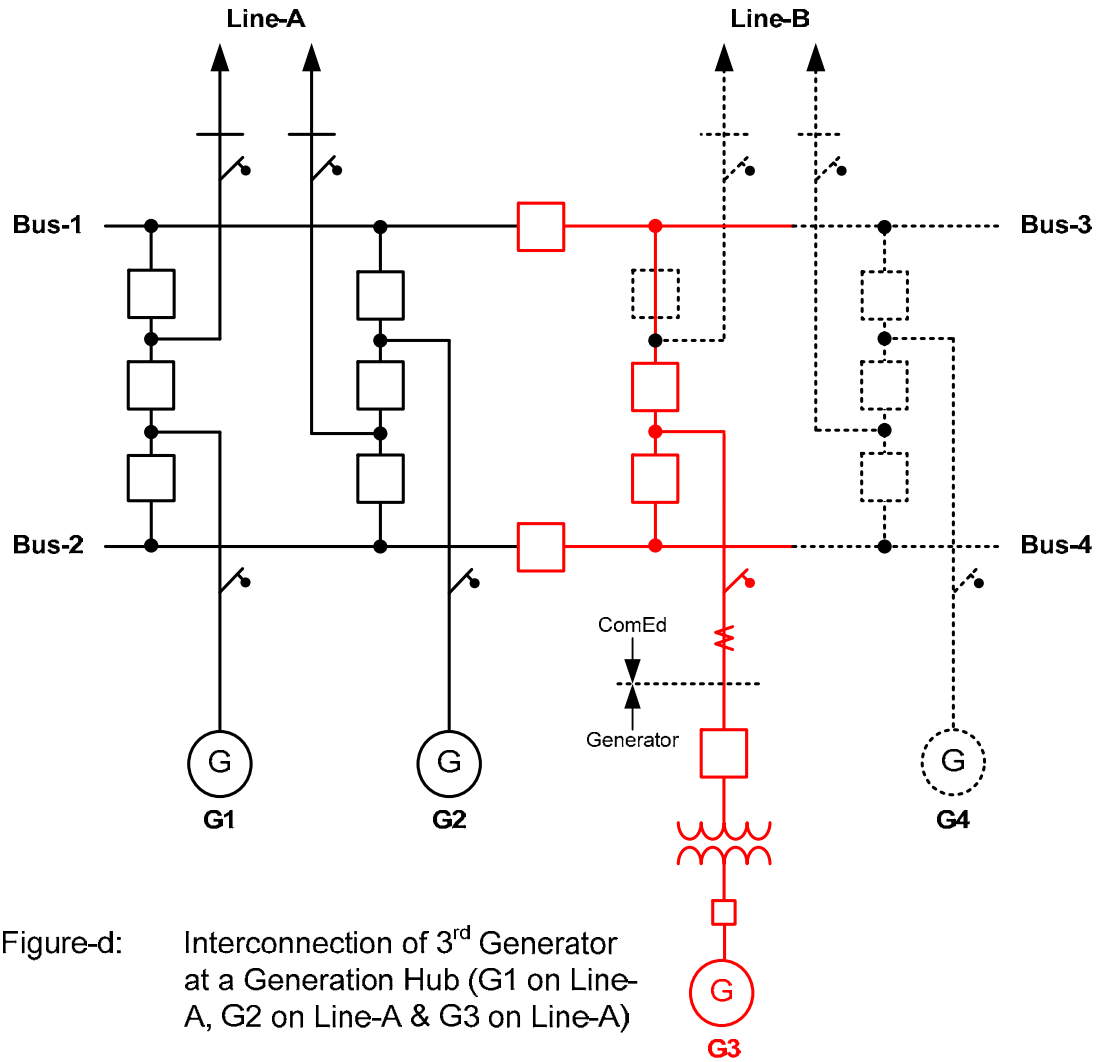


Figure-d: Interconnection of 3rd Generator at a Generation Hub (G1 on Line-A, G2 on Line-A & G3 on Line-A)

Figure-e: **Interconnection of 3rd generator at a generation hub (G1 on line-A, G2 on line-A & G3 on line-B)**

This scenario applies to a 3rd generator interconnection when two generators are already interconnected to a generation hub sharing the same line A and the 3rd generator is to be interconnected to a different line B.

Under this scenario, the scope of interconnection will include installation of 3 line circuit breakers, 2 bus-tie circuit breakers, line tie-in and termination of the generator lead in the breaker-and-a-half configuration, in addition to any system upgrades identified in PJM system studies. For some interconnections, planning criteria and/or operational considerations may allow use of motor operated disconnect switches instead of bus-tie circuit breakers between buses 1-3 and buses 2-4.

The dead-end structure for the generator lead at the generation hub will serve as the point-of-interconnection between ComEd and the GIC.

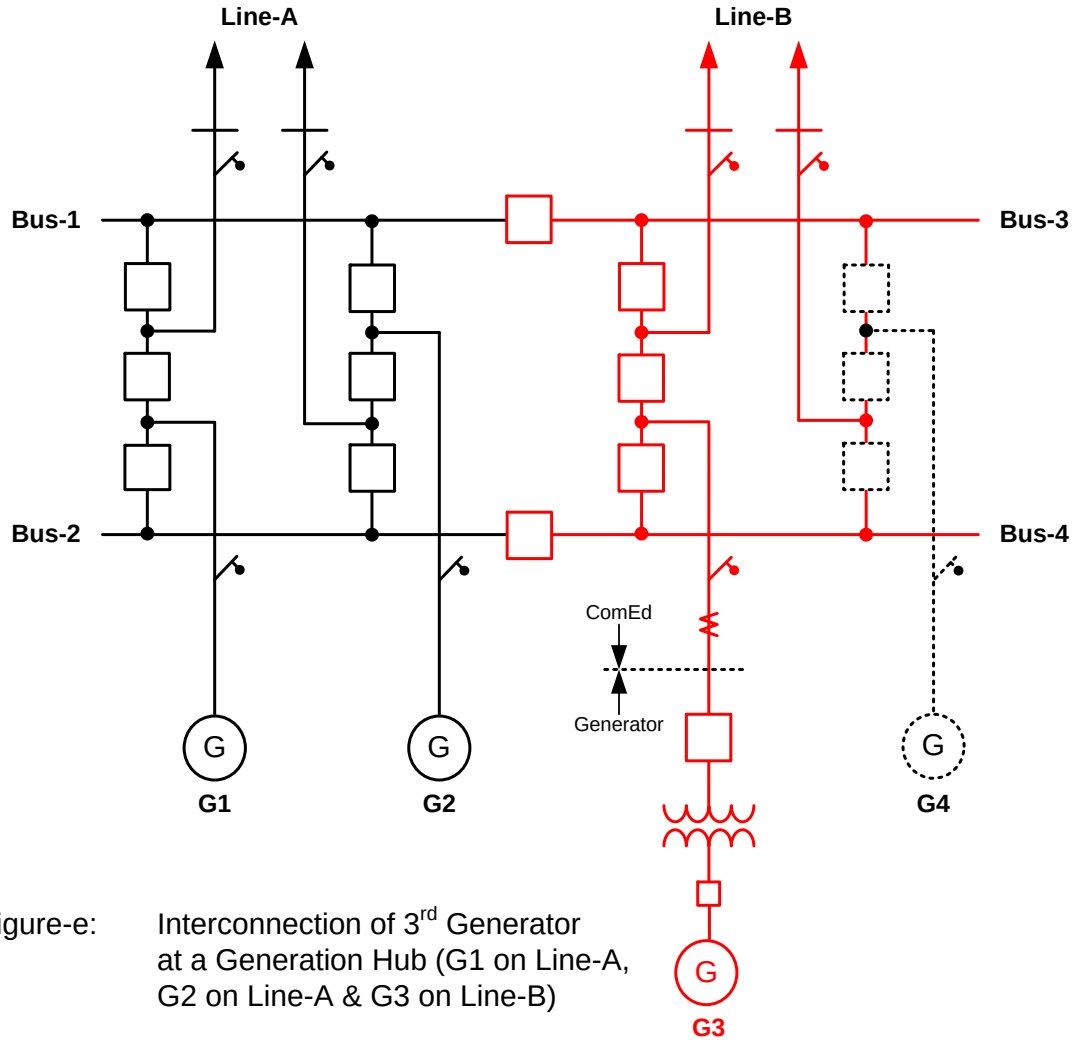


Figure-e: Interconnection of 3rd Generator at a Generation Hub (G1 on Line-A, G2 on Line-A & G3 on Line-B)

Figure-f: **Interconnection of 3rd generator at a generation hub (G1 on line-A, G2 on line-B & G3 on line-A)**

This scenario applies to a 3rd generator interconnection when the 1st generator is tapped to line A, 2nd generator is tapped to line B and 3rd generator is to be tapped to line A.

Under this scenario, the scope of interconnection will include installation of 3 circuit breakers and termination of generator lead in breaker-and-a-half configuration, in addition to any system upgrades identified in PJM system studies.

The dead-end structure for the generator lead at the generation hub will serve as the point-of-interconnection between ComEd and the GIC.

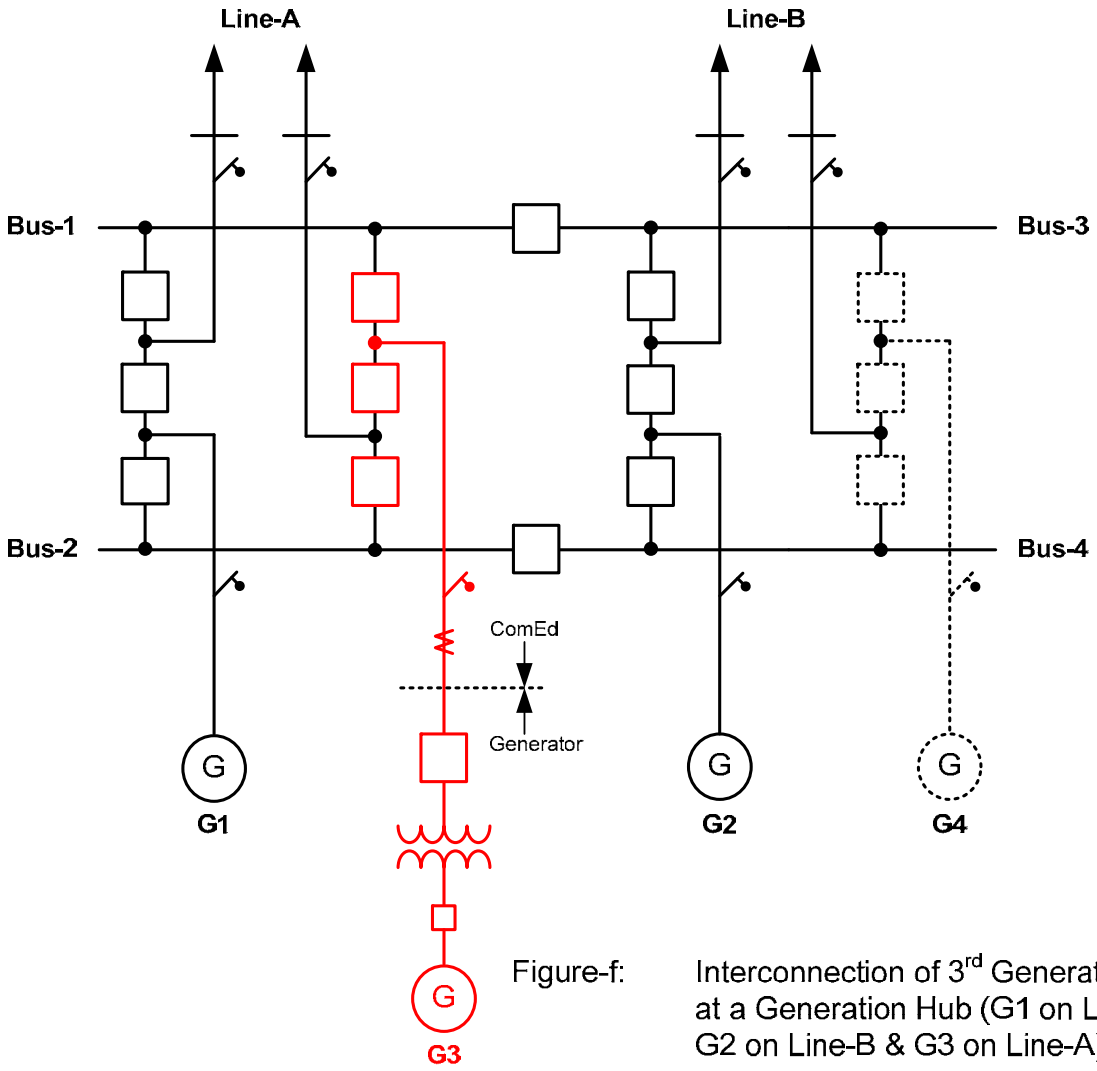


Figure-f: Interconnection of 3rd Generator at a Generation Hub (G1 on Line-A, G2 on Line-B & G3 on Line-A)

Figure-g: **Interconnection of 3rd generator at a generation hub (G1 on line-A, G2 on line-B & G3 on line-B)**

This scenario applies to 3rd generator interconnection when 1st generator is tapped to line A, 2nd generator is tapped to line B and 3rd generator is to be tapped to line B.

Under this scenario, the scope of interconnection will include installation of 3 circuit breakers and termination of the generator lead in the breaker-and-a-half configuration, in addition to any system upgrades identified in PJM system studies.

The dead-end structure for the generator lead at the generation hub will serve as the point-of-interconnection between ComEd and the GIC.

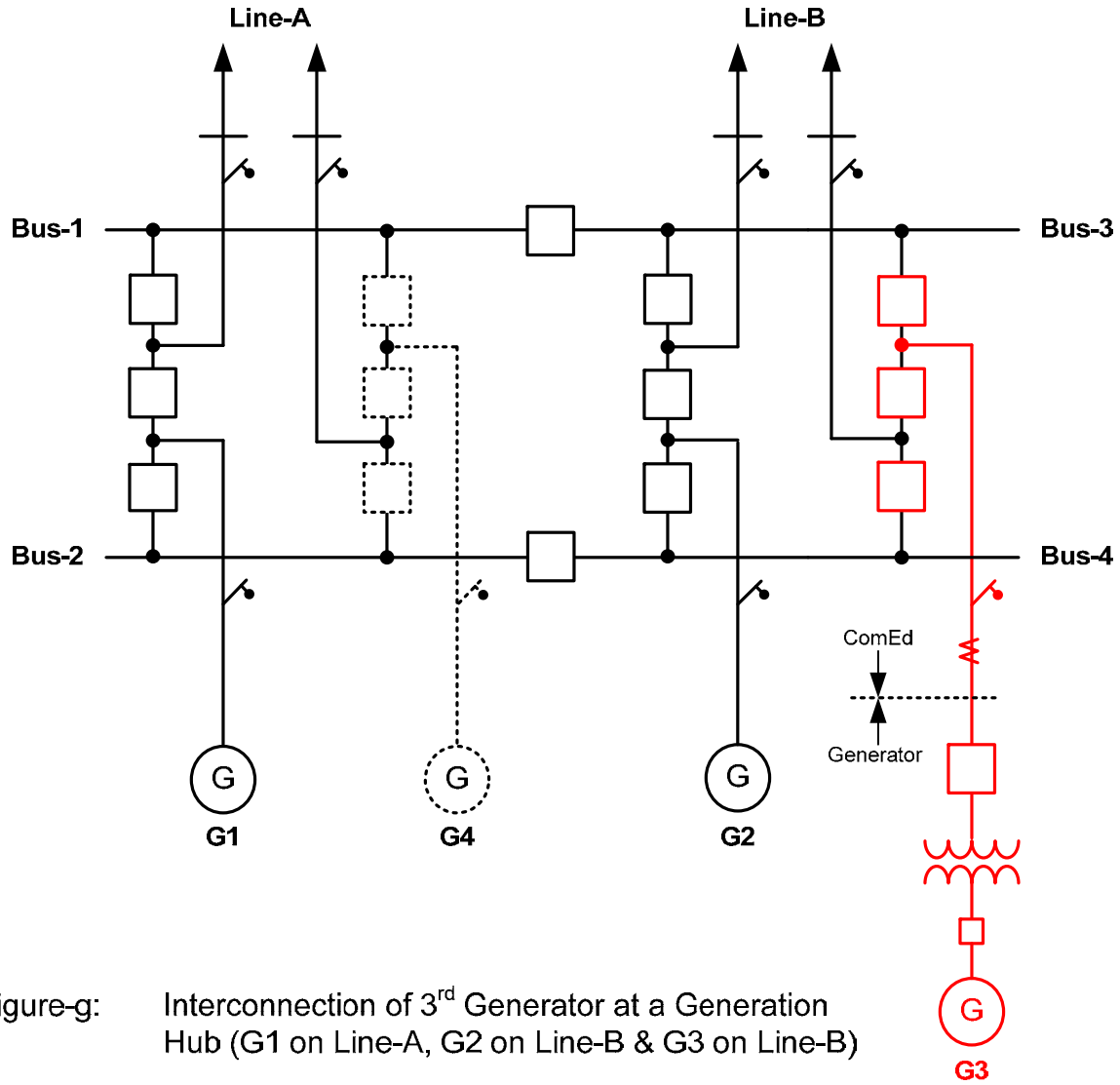


Figure-g: Interconnection of 3rd Generator at a Generation Hub (G1 on Line-A, G2 on Line-B & G3 on Line-B)

3.2) Generator Interconnections at 138kV Network:

At the 138kV voltage level, a generator can interconnect to an existing substation or to a new substation at a location of its choice as described below.

a) Generator Interconnection at an Existing Substation:

The existing ComEd substations at the 138kV voltage level are mostly designed with straight-bus configuration or T-bus configuration. The following figures depict generator interconnection at an existing 138kV substation with straight-bus and T-bus configurations.

Figure-3.2.1: Generator interconnection at an existing 138kV substation with straight-bus configuration

Under this scenario the 138kV straight-bus would be extended to create a new line termination to accommodate generator lead.

Under this scenario, the scope of interconnection will include installation of 1 circuit breaker and termination of generator lead in straight-bus configuration, in addition to any system upgrades identified in PJM studies. A maximum of 4 circuits are allowed on any given bus section.

The dead-end structure for the generator lead at the interconnection substation will serve as the point-of-interconnection between ComEd and GIC.

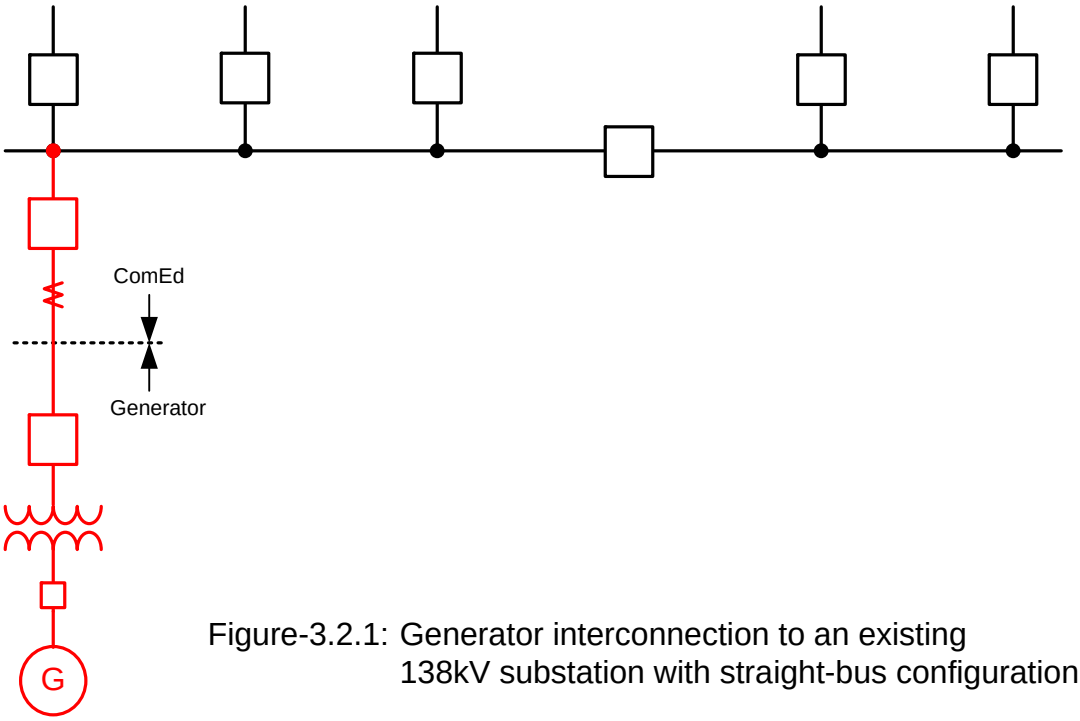


Figure-3.2.1: Generator interconnection to an existing 138kV substation with straight-bus configuration

Figure-3.2.2: <u>Generator interconnection at an existing 138kV substation with a T-bus configuration</u>

Under this scenario the 138kV T-bus would be extended to create a new line termination to accommodate generator lead.

Under this scenario, the scope of interconnection will include installation of 1 circuit breaker and termination of generator lead in T-bus configuration, in addition to any system upgrades identified in PJM studies. A maximum of 4 circuits are allowed on any given bus section.

The dead-end structure for the generator lead at the interconnection substation will serve as the point-of-interconnection between ComEd and GIC.

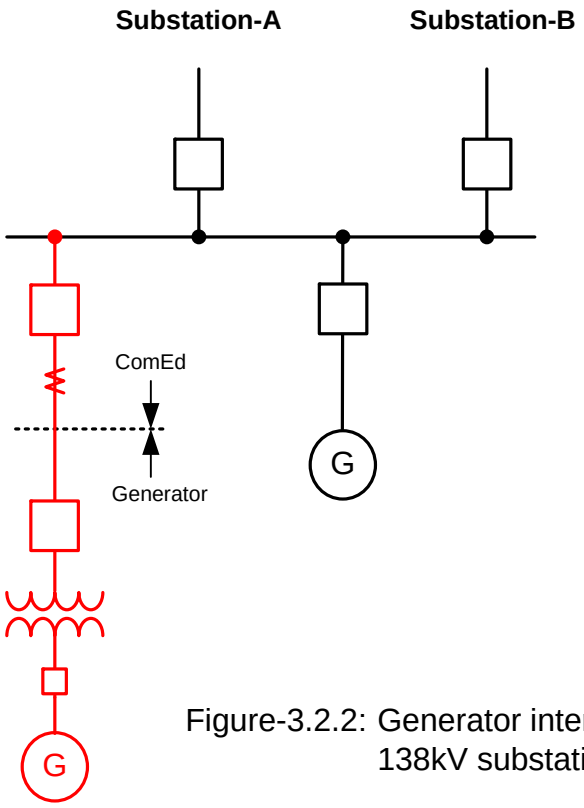


Figure-3.2.2: Generator interconnection to an existing 138kV substation with T-bus configuration

b) Generator Interconnection through a new Substation:

A generator may choose to interconnect to the 138kV network at a location of its choice. ComEd technical standards require installation of a new 138kV substation with a T-bus configuration to interconnect the generator.

Under this scenario, the scope of interconnection will include installation of 3 circuit breakers, line tie-in and termination of generator lead in T-bus configuration, in addition to any system upgrades identified in PJM studies.

The dead-end structure for the generator lead at the interconnection substation will serve as the point-of-interconnection between ComEd and GIC.

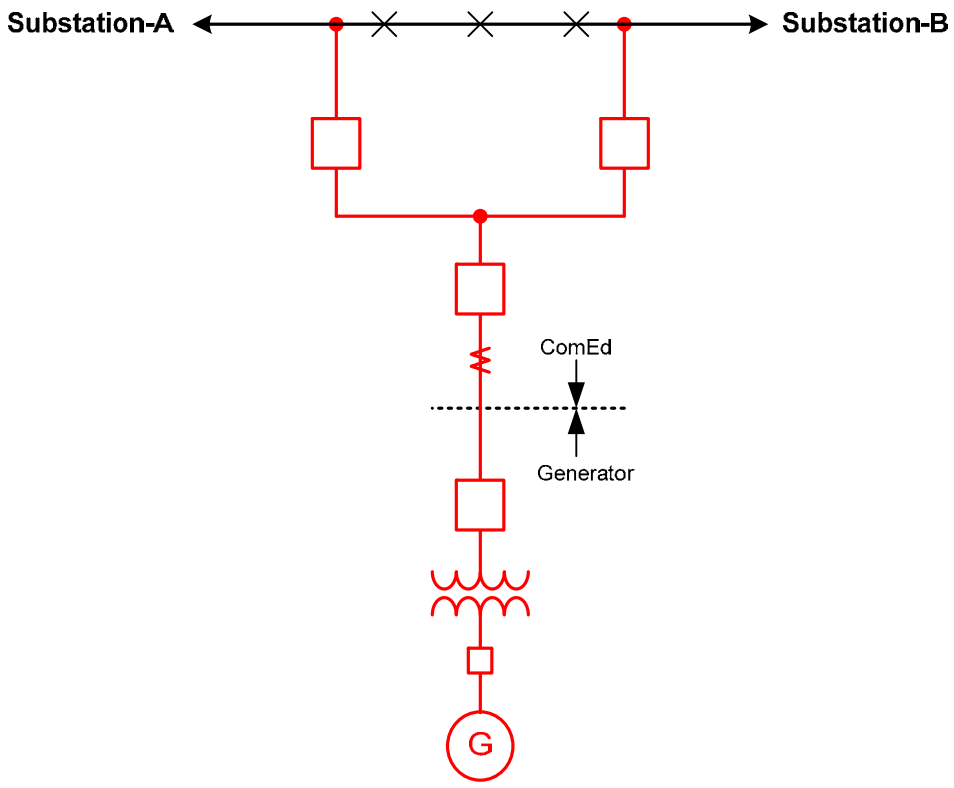


Figure-3.2.3 Generator interconnection to a new 138kV substation with T-bus configuration

4) INTERCONNECTION FACILITIES

The interconnection facilities include all facilities built to interconnect a GIC generating facility to the ComEd transmission network. In most cases, this would include a collector substation for a wind farm, generator lead, and an interconnection substation. The collector substation (for a wind farm) and generator lead are GIC-owned interconnection facilities. The interconnection substation is a ComEd-owned interconnection facility. Additionally, network upgrades may be necessary to maintain system adequacy with injection of GIC generation into the electric power system.

The GIC is responsible for all costs to engineer, design, procure, construct and commission all of the interconnection facilities and network upgrades. The following sections provide guidance on building interconnection facilities and network-upgrades.

4.1) ComEd-Owned Interconnection Facilities

After successful completion of generator interconnection, ComEd shall own and be responsible to maintain the interconnection substation and network upgrades.

The dead-end structure at the interconnection substation used to connect generator lead from GIC collector substation would serve as the point-of-interface or the point-of-interconnection between GIC and ComEd. ComEd shall own and be responsible to maintain the dead-end pole, support structures and insulators. The GIC shall own and be responsible to maintain the incoming generator lead (wire) and wire lugs. In regards to the Fiber Optic cable demarcation, the splice box at the base of the dead-end structure would serve as the point-of-interface between GIC and ComEd.

4.2) Engineering/ Construction Responsibility of ComEd-Owned Interconnection Facilities & Network-Upgrades

ComEd, as a Transmission Owner, will agree to the following split of responsibilities with the GIC for ComEd-owned interconnection facilities and network upgrades.

4.2.1) Work on Greenfield Site

a) The GIC may elect to build interconnection facilities on greenfield sites such as new substations and transmission lines. Under this option, the GIC will engineer, design, procure, construct and commission greenfield interconnection facilities that will be owned by ComEd. The GIC shall hire ComEd approved contractors and vendors, and use ComEd standards/specifications with ComEd oversight and approval.

b) ComEd shall specify the protection system design and provide all settings for protective systems that protect ComEd equipment.

c) ComEd shall engineer, design, procure, construct and commission the line attachments (tie-in work) to the ComEd-owned interconnection facilities on Greenfield sites.

d) The GIC shall coordinate the schedule for its work with ComEd to insure that its requests for oversight/approval are matched with ComEd resources.

4.2.2) <u>Work within Energized Substation</u>

a) ComEd, having overall responsibility for maintaining reliability of the transmission system, and to avoid the possibility of any negative impact on system reliability and stability, will not mutually agree to allow a GIC to construct and commission the interconnection facilities and network upgrades within energized substations. Please refer to the PJM Open Access Transmission Tariff for further information regarding Option-to-Build options and rights.

b) The GIC may elect to engineer, design, and procure for ComEd-owned interconnection facilities and network upgrades, provided GIC hires ComEd approved engineering contractors and vendors and uses ComEd standards/specifications with ComEd oversight and approval.

c) ComEd shall specify the protection system design and provide all settings for protective systems that protect ComEd equipment.

d) The GIC shall coordinate the schedule for its work with ComEd to insure that its requests for oversight/approval are matched with ComEd resources.

In exercising option to build for ComEd-owned interconnection facilities, GIC must adhere to Good Utility Practices, the National Electrical Code, the National Electrical Safety Code, North America Electric Reliability Corporation, Reliability First Corporation, PJM standards, ComEd planning criteria and guidelines, and all applicable laws and regulations.

Before proceeding with construction under the option to build, the GIC must furnish six sets of final design documents to ComEd for review and acceptance. The GIC design documents (electrical prints, relay settings, etc) will be reviewed by ComEd. Project delays due to untimely submittal of complete design documents are the responsibility of the GIC. These documents must be of good engineering quality and include the following:

- One-line diagram showing the connections between the generator(s) and the ComEd system.
- Three-line diagrams showing current and potential circuits for protective relays.

- Relay tripping and control schematic diagram.
- Instruction books for relays.

Additional engineering meetings may be necessary to discuss the design documents. If changes are necessary, the GIC shall incorporate all changes and corrections and submit six sets of corrected prints to ComEd before proceeding with construction.

4.3) ComEd-Approved Contractors & Vendors

The following guideline is provided on ComEd-approved contractors and vendors that GIC is required to hire to build ComEd-owned interconnection facilities and network upgrades.

- A list of ComEd-approved contractors and vendors is posted on PJM website.

- PJM rules allow the GIC to propose new contactors and vendors that have not been ComEd-approved. ComEd shall evaluate the proposed contractors and vendors using the same process as for any new contractor ComEd would consider for work on its system.

- The proposed contractor shall submit commercial and technical information for evaluation against seven (7) key criteria. The ComEd Supply Organization first evaluates the commercial submittals (financial, insurance and safety record), and if the proposed contractor passes that screening, the Project Manager shall assemble a pre-qualification team for the technical evaluation. The team may include Project Manager, Construction Manager, T&S or Distribution Engineering, Line Organization Management (Ops and Substation Regional Managers) and Testing. The technical reviews may include meetings with the contractor and GIC led by the Project Manager.

- Using the Contractor Pre-Qualification Process, a score is assigned for each of the 7 key criteria. Based on the total score, the contractor is either rejected, approved, or approved with conditions. The Project Manager or Supply representative issues a letter to the contractor with the pre-qualification conclusion, with copy to the GIC and PJM. An additional copy is maintained in the Project Notebook.

4.4) GIC-Owned interconnection Facilities

The GIC is responsible to engineer, design, procure, construct, commission, operate and maintain GIC-owned interconnection facilities, in accordance with Good Utility Practices, the National Electrical Code, the National Electrical Safety Code, North America Electric Reliability Corporation, Reliability First Corporation, PJM standards and all applicable laws and regulations. This includes installing, setting, and maintaining all protective devices necessary to protect the GIC interconnection facilities.

The GIC is responsible to coordinate with ComEd during the engineering, design and construction phases of its equipment in order to ensure coordination of protective relay devices.

ComEd functional relay requirements will be provided to the GIC during the detailed design phase of the project. The information for the specific project will indicate the protective functions for which the GIC is to provide relays and related equipment. The GIC will indicate the specific relay type(s) and range proposed for each function. The GIC must also provide proposed current and potential transformer ratios, connections, and locations as related to the electrical one-line diagram.

The GIC is responsible for coordinating the design of its own generator step-up electrical facility with PJM and ComEd.

Within one (1) month following commercial operation of generating unit(s), GIC must provide ComEd with certified documentation demonstrating that “as-built” Customer Facility and GIC-owned interconnection facilities are in accordance with applicable PJM studies and agreements.

5) REAL ESTATE REQUIREMENTS

There are four scenarios with respect to real estate assets and rights necessary for completion of the interconnection and subsequent operation of GIC's project as described below:

a) First generator interconnecting to a generation hub

Under this scenario, ComEd would identify the search area for the potential site for a generation hub, using the following criteria:

1) Centrally located to facilitate interconnection of multiple generators.
2) Comprised of at least 20 acres.
3) Located close to the transmission line
4) Located 20-25 miles from an existing substation or another generation hub.

ComEd and the GIC shall work together to select and acquire a suitable site within the search area, to locate generation hub.

The GIC would be responsible to purchase or otherwise obtain all necessary and appropriate (i) real estate property rights (whether in the form of fee simple ownership, a perpetual easement, a perpetual license or other perpetual right) in accordance with all ComEd requirements and (ii) permits and approvals from all applicable governmental authorities and property owners (collectively, the "Property Rights and Permits"), to install and terminate the generator lead from GIC's collector substation to the generation hub.

b) A generator interconnecting to an existing generation hub

This scenario would apply to 2nd, 3rd or 4th generator interconnecting to an existing generation hub. Under this scenario, the GIC would be responsible to purchase or otherwise obtain all necessary and appropriate (i) real property rights (whether in the form of fee simple ownership, a perpetual easement, a perpetual license or other perpetual right) in accordance with all ComEd requirements and (ii) permits and approvals from all applicable governmental authorities and property owners (collectively, the "Property Rights and Permits"), to install and terminate the generator lead from GIC's collector substation to the generation hub.

c) A generator interconnecting by building a new substation at a new site

This scenario would apply to generators that do not qualify to interconnect at a generation hub. Under this scenario, the GIC would be responsible to purchase or otherwise obtain all necessary and appropriate (i) real property rights (whether in the form of fee simple ownership, a perpetual easement, a perpetual license or other perpetual right) in accordance with all ComEd requirements and (ii) permits and approvals from all applicable governmental authorities and property owners

(collectively, the "Property Rights and Permits"), to install the following facilities:

- An appropriately located real estate site that is approximately five (5) acres in size for the location, construction and operation of the Interconnection Substation (the "Interconnection Substation");

- A line section to tie-in the transmission line to the Interconnection Substation (the "Line Section"); and.

- Transmission line (generator lead) to interconnect GIC's collector substation to the Interconnection Substation.

Upon completion of the construction and installation of the Interconnection Substation and the Line Section, the GIC shall transfer all of the Property Rights and Permits to ComEd, at no cost or expense to ComEd, pursuant to documentation that is acceptable to ComEd together with all of the Property Transfer Documents described below.

d) <u>A generator interconnecting by expanding an existing substation</u>

Under this scenario, the GIC would be responsible to purchase property or otherwise obtain all Property Rights and Permits to install the following facilities:

- Additional land to expand a ComEd owned and operated existing substation; and.

- Transmission line (generator lead) to interconnect GIC's collector substation to the existing ComEd Substation.

Upon completion of construction, the GIC is obligated to perform or cause to be performed on the additional land or, if GIC is undertaking no construction, upon acquisition of all Property Rights and Permits for the additional land, GIC shall transfer all of the Property Rights and Permits to ComEd, at no cost or expense to ComEd, pursuant to documentation that is acceptable to ComEd together with all of the Property Transfer Documents described below.

<u>Real Estate Transaction</u>

The form of transfer documents and the type of real estate transactions will be determined by the type of facility or the required Property Rights and Permits that need to be transferred to ComEd. This transaction may include:

- Conveyance of fee simple ownership in some or all of the real property to ComEd.

- Conveyance of perpetual easements (exclusive and nonexclusive) required for all equipment and facilities associated with the substation and transmission lines

including, but not limited to, access, drainage, fiber, and such other overhead and underground facilities as ComEd may reasonably require for the construction, use, maintenance and operation of the generation hub or the interconnection substation.

- Conveyance of perpetual transmission, fiber, and facilities easements (exclusive and nonexclusive) for the purposes of interconnecting the interconnection substation with the ComEd transmission system, including such overhead and underground electrical, fiber, and related communications, transmission and distribution facilities.

In each of the three transaction scenarios outlined above, or any combination thereof, the GIC will be responsible for executing and delivering all documentation requested by ComEd or required by any third party title insurer, surveyor or property owner to transfer the Property Rights and Permits, which may include, without limitation, special warranty deeds, easements, purchase and sale agreements containing representations and warranties acceptable to ComEd, assignments, bills of sale, affidavits, certifications, statements, certifications as to value of improvements, surveys, title policies, and releases, and such other documentation necessary to obtain a title policy in favor of ComEd covering the property rights and interests conveyed (the "Transfer Documents").

To facilitate transfer of property rights and permits, ComEd will provide the form of purchase and sale agreement that will incorporate terms and conditions that reflect ComEd's standard business practices, together with engineering review of proposed GIC facilities that involve ComEd real estate and/or right of way.

Interconnection before Conveyance

If it becomes necessary to interconnect GIC to the ComEd system before the conveyance of property and facilities is complete, Interconnections & System Studies will require the customer to execute an Operational Control Agreement prior to interconnection.

At a minimum, the operations agreement should include the following requirements:

- The customer's acceptance of full liability for all customer owned equipment
- The customer must meet all applicable NERC requirements for equipment that has not been conveyed
- Prior to conveyance, the customer must provide ComEd with maintenance records for batteries and relays being conveyed

GIC's Scope

It is GIC's responsibility to purchase property, acquire rights and obtain any required permits or zoning for the transmission, distribution and or communication facilities

required to interconnect its generation. In addition, the GIC will grant to ComEd such rights and interests as may be reasonably necessary to interconnect the generation facilities and associated network upgrades to the ComEd system.

It is imperative, when the GIC is required by the scope of a project to provide information, that the deliverables itemized below be received by ComEd as soon as possible. This will facilitate a timely review and will allow ComEd to address the real estate aspects of the project in a timely manner.

The GIC is responsible for providing the following:

The following current information covering all interests and rights to be conveyed to ComEd:

1. A title commitment covering all real estate assets to be conveyed to ComEd (whether by deed, easement, assignment or otherwise) (the "Real Property") issued by a title company reasonably acceptable to ComEd (the "Title Commitment").

2. Copies of all documents referenced in all of the exceptions listed in the Title Commitment.

3. Copies of all documents creating the Property Rights and Permits.

4. ALTA/ACSM Land Title Survey of the Real Property.

5. Topographic survey at a contour interval appropriate to the relief and size of the Real Property.

6. Phase I Environmental Assessment Report (Phase 2 if appropriate or necessary as determined by ComEd) and any other environmental reports, notifications and documents associated with or related to the Real Property.

7. Wetland Delineation reports for all of the Real Property.

8. Annexation Agreement(s), zoning changes or other governmental agreements or approvals entered into or proposed with respect to the Real Property.

9. All jurisdictional permits, such as special use and building permits, that have been issued for the project or copies of pending applications that relate to or affect the Real Property.

10. Detailed civil engineering drawings showing the proposed site plan, layout, drainage, access and facilities.

11. At the closing of the conveyance transaction, all original warranties and plans shall be delivered to ComEd.

12. A statement of value of all improvements that have been or will be constructed on the Real Property.

13. An asset map row for the improvements. All of the documentation required by the purchase and sale agreement.

14. Such other information and documentation as ComEd may reasonably require.

Additional information may also be required, depending on project requirements. Requests for such information will be transmitted to the GIC during project development and in connection with ComEd's review of the foregoing documents and materials.

ComEd's Scope

Project Management:

The ComEd Project Manager leads ComEd's real estate process. ComEd Project Management and Engineering, in conjunction with the GIC, develop designs that define what the real estate needs will be and the Real Estate & Facilities group supports that plans execution. The ComEd Project Manager responsibilities include activities such as:

a) Allow a minimum of 6 months for preparation and due diligence. More time in advance may be required depending on the real estate being managed.

b) Periodic meetings, commensurate with the size of the acquisition need to take place. These may be weekly depending on the upcoming project milestones.

c) Establish the date(s) for closing the real estate transaction(s) to meet the overall project schedule.

d) Define the scope of the real estate activities required for the project.

e) Monitor the status of real estate activities to ensure that the process is moving forward and will meet the closing date(s).

f) Provide guidance on technical/operational matters that must be addressed during the real estate process.

g) Monitor the status of real estate activities to ensure that the process is moving forward and will meet the closing date(s)

h) Provide guidance on technical/operational matters that must be addressed during the real estate process

i) Coordinate with internal departments, such as Environmental Services, to ensure that appropriate ComEd processes and requirements are being met

j) Establish a project ID for land transfer and provide Finance the letter of valuation for equipment and property conveyed so it may be added to ComEd's assets

k) Conduct a Final Acceptance walk down with ComEd Team. This includes any other properties or easements acquired by the project under the PJM Option to Build (microwave repeater sites, fiber easements, aux power or transmission line easements, etc).

l) Provide PJM with required communications prior to land conveyance.

m) Engage Environmental Services Department for the review and approval of environmental permits, etc.

Real Estate:

The Real Estate Department, in conjunction with BSC Legal, executes the tasks involved in the real estate portion of the project with activities such as:

1) Leading the real estate calls to ensure that progress is being made and that issues are being managed.

2) Monitoring and guiding completion of customer due diligence requirements (examples of these are zoning, permits etc.).

3) Negotiating mutually acceptable terms and conditions in the real estate documents required for the project.

4) Coordinating the process for securing internal approval of customer facilities to be located on property in which ComEd has an interest.

5) Guiding customer rights acquisition on behalf of ComEd.

6) Conducting a formal real estate closing to accomplish transfer of property ownership.

7) Developing and maintaining a real estate closing check list. This varies somewhat for each project, to track the status of all documents and other real estate deliverables required by the project.

6) RELAY & PROTECTION REQUIREMENTS

General Need for System Protection in the Presence of Parallel Generation

The components of the transmission system are subject to a variety of natural and man-made hazards; among these are lightning, wind, wildlife, and vandalism. Damaged or short-circuited equipment should be switched out of service as soon as possible to minimize safety hazards, to avoid minimize equipment damage, and to maintain system stability. Generation operated in parallel with the transmission system provides an additional source of energy that must also be disconnected in case of an emergency. It is essential that a suitable system of protection be used to minimize these hazards and to prevent the reduction of quality of service to other transmission customers.

General Effects of Interconnected Generation on System Protection Requirements

The addition of GIC's generation shall not introduce a hazard or adversely affect the quality of service to ComEd customers. Protective equipment must be added to standard ComEd facilities to provide adequate protection of the transmission system. ComEd's protection system designs and requirements are based on years of system operating experience and analysis of events both internal and external to ComEd as well as requirements from the various regulatory organizations. Requirements for additional protective equipment due to interconnected operation will vary depending on the size of the GIC's generation and on the nature of the ComEd local system.

Interconnection Overview

Designs intended for generation interconnections on the ComEd distribution system can be found in the Exelon Energy Delivery's Interconnection Guideline for generators greater than 2MVA and less than or equal to 20MVA.

Protective relaying designs for new interconnections are required to match the most current requirements and standards for protection used on the rest of the ComEd system at the voltage level of the interconnection. The 345 kV and above transmission lines that make up ComEd's transmission system are vital to maintaining system stability, regional stability, and crucial to ensuring the reliable power flow through the service territory. Thus, at ComEd, requirements for equipment connected to or operating at 345kV and above are subject to the most stringent requirements while equipment connected to operating at 138kV or below are subject to somewhat lesser requirements. Although 138kV plays a lesser role in maintaining system stability than 345kV, a majority of ComEd's customers are connected at the 138kV level so protection systems still require a high level of reliability. Some 138kV areas within ComEd's system are subject to nearly the same requirements as 345kV and above due to very high load densities or other reasons. Requirements for 345kV and up and 138kV or below interconnections are described herein for the most commonly encountered configurations. These protection schemes and requirements are guidelines; final requirements are established during the engineering process.

Detailed protection requirements for adding generation to a ComEd transmission line with existing generation must be made on a case-by-case basis. Adding generation to the transmission line may require additional protection at other existing installations.

As a rule, generation that is less than 20 MVA may be connected to the distribution system, generation from 20 to 300 MVA is usually connected to the 138 kV, and generation in excess of 300 MVA is connected to the 345 kV.

6.1) Protection Requirements of 345kV and above Interconnections:

When connecting to an existing station, the interconnection configuration will follow the configuration at that station (ring bus, straight bus, or breaker and a half (generation hub)) with new breaker/breakers or bus position as required. In some cases, system conditions may require that a generator be connected to an existing line by splitting the line. Typically, a 3 breaker ring configuration is used when splitting a 345kV line.

Three terminal lines are not allowed by ComEd or PJM at 345kV and above voltage (EHV) level.

For some GIC Plant installations, the most appropriate interconnection point to the ComEd system would be directly into the bus at an existing ComEd substation. If the ComEd substation had a ring bus configuration, the GIC interconnection point would have to maintain the integrity of the substation design. This would require the addition of at least one new circuit breaker at the substation. The effect on the substation protection would depend on the site specifics. Protection also would have to be installed on the line to the generator.

Redundancy of protection is required per ComEd standards, NERC Planning Standards, PJM Standards, and/or RFC Standards which specify that no single protection system component failure can cause a fault to remain on the system. Protective relaying systems on the 345 kV and above system shall include two complete schemes, each including primary and back-up protection. Independent current transformers, potential transformer secondaries, and DC source (separate batteries are required at 345kV) will feed each system. The relaying schemes will be complementary in terms of their principle of measurement rather than redundant and be of varying construction to minimize the chance of a common mode failure. The standard medium of system protection communication on the 345kV system is fiber optic and/or digital microwave based equipment. The following one line drawing and minimum protection scheme design requirements drawings illustrate these concepts for 345kV and above interconnections:

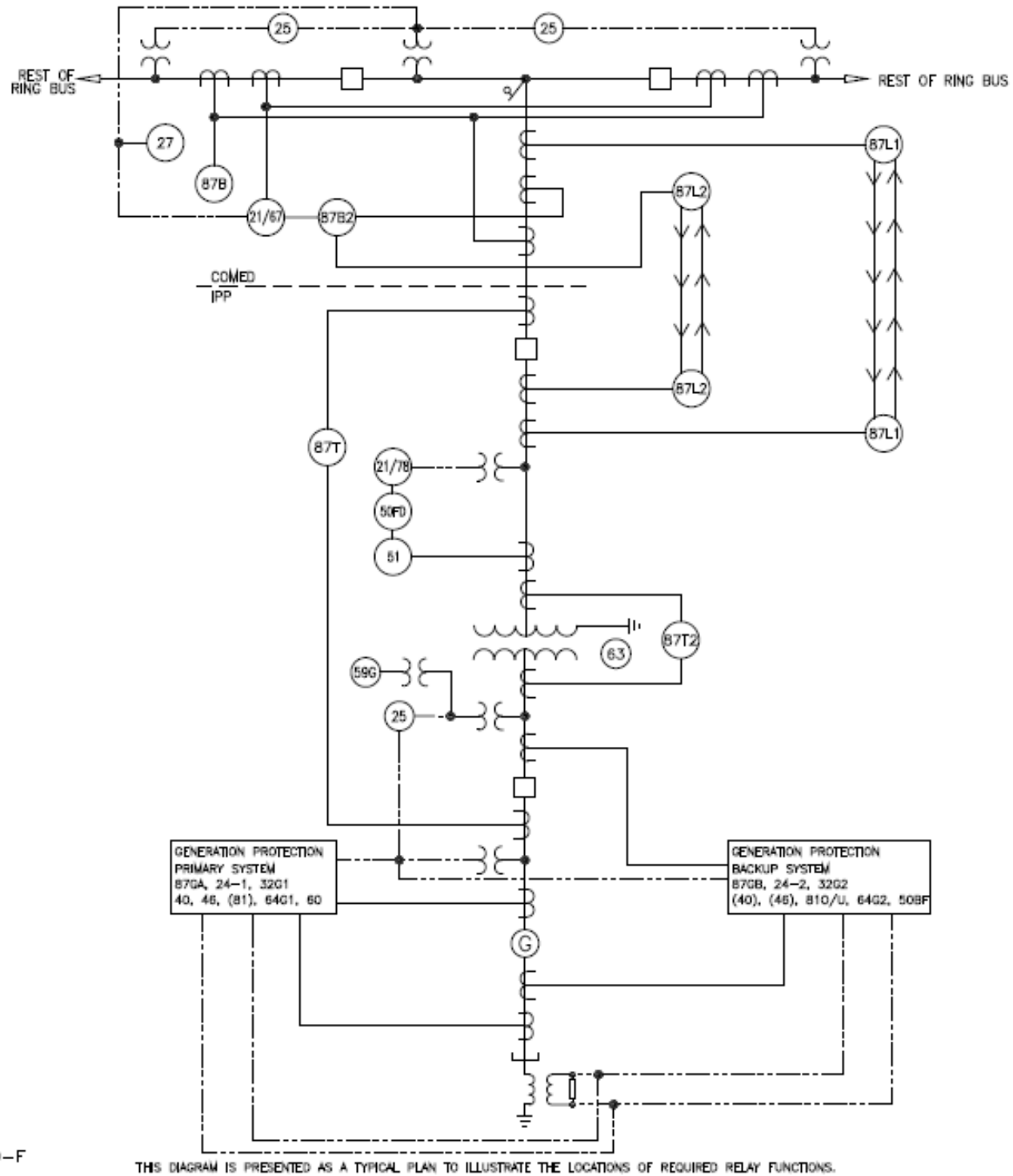
PRELIMINARY RELAY REQUIREMENTS
CUSTOMER OWNED GENERATION PARALLELED WITH COMED

PLAN F

A. A TOTAL GENERATION GREATER THAN OR EQUAL TO 10MVA

------AND------

B. CONNECTED TO 345KV OR 765KV



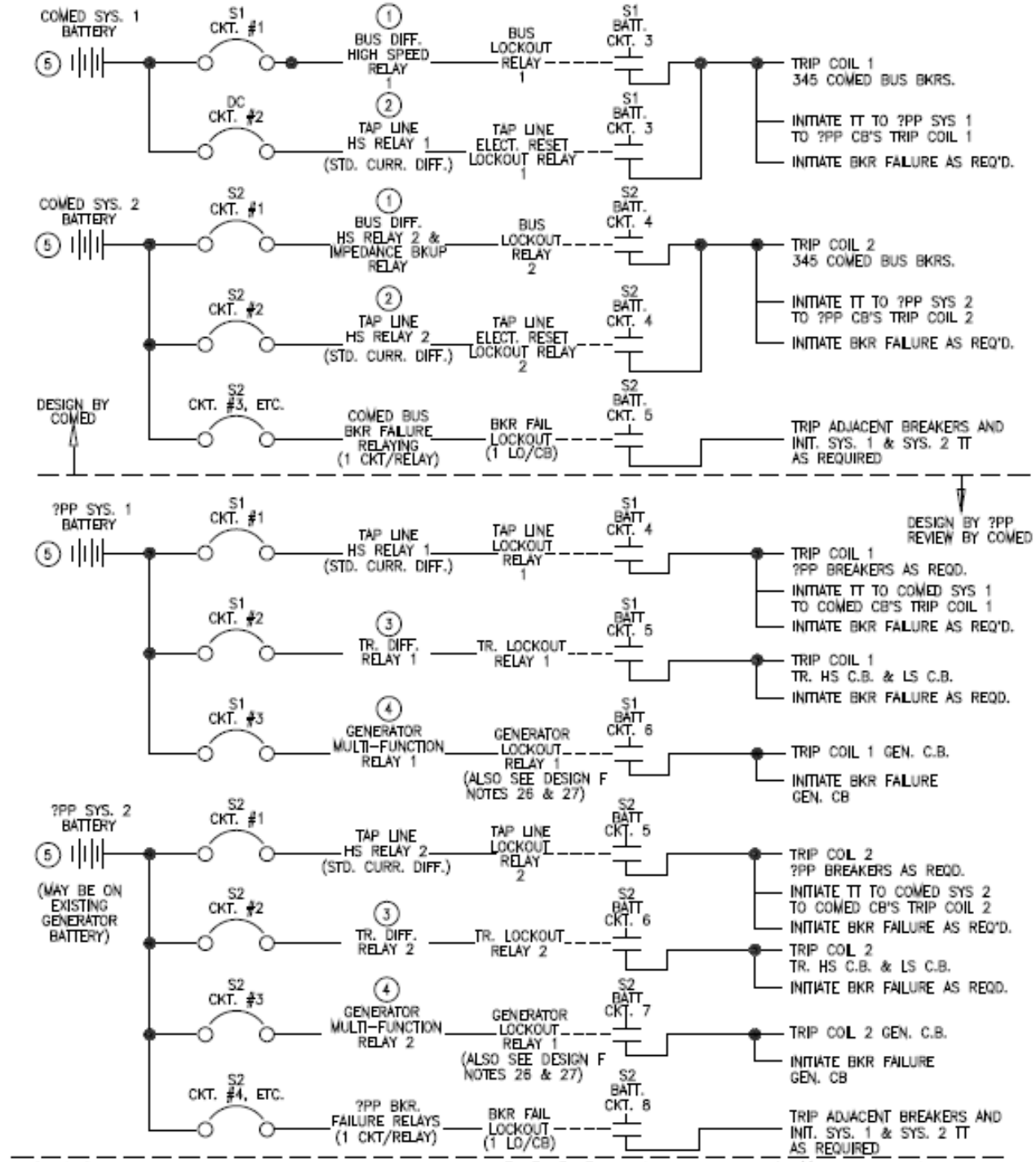
KD-F

THIS DIAGRAM IS PRESENTED AS A TYPICAL PLAN TO ILLUSTRATE THE LOCATIONS OF REQUIRED RELAY FUNCTIONS.

GENERAL MINIMUM PROTECTION SCHEME DESIGN REQUIREMENTS FOR

DESIGN F

2 SEGREGATED HIGH SPEED SCHEMS MUST COVER A FAULT AT ANY LOCATION FOR EHV ?PP'S
SENSING MUST BE SEGREGATED AS WELL FOR TRIPPING



GENERAL NOTES:
- BATTERY/CHARGER ALARM MONITORING IS REQUIRED.
- MICROPROCESSOR RELAY FAILURE ALARM MONITORING IS REQUIRED.

DESIGN F

(1)(2)(3)(4) RELAYS TO BE DIFFERENT MODELS, PREFERABLY BY DIFFERENT MANUFACTURERS.

(5) SEGREGATION OF SYSTEMS BETWEEN TRIP COIL 1 AND TRIP COIL 2 IS RECOMMENDED IF AVAILABLE.

6.2) Protection Requirements of 138kV and below Interconnections:

When connecting to an existing station, the interconnection configuration will follow the configuration at that station (straight bus or ring bus) with a new breaker or bus position. In some cases, system conditions may require that a generator be connected to an existing line by splitting the line. Typically, a three breaker T configuration is used when splitting a 138kV line. Large generators connected to the 69 kV or 138 kV transmission systems may require the use of a ring bus.

Adding a fourth source to a three-terminal line or a third source to a two-terminal line limits the effectiveness of protective relay schemes and reduces system reliability. This type of configuration can limit the amount of power that can be supplied by the weakest source to the line, cause compromises and degradation of line protection, and limit transmission availability to the GIC. Thus, ComEd typically does not allow three terminal line configurations for generator interconnects and the line will be broken into two lines. A three breaker straight or ring bus substation will be installed if connection to an existing ComEd substation is not feasible. New line protection packages are needed for the two new lines created by splitting the existing ComEd line and for the line to the generator.

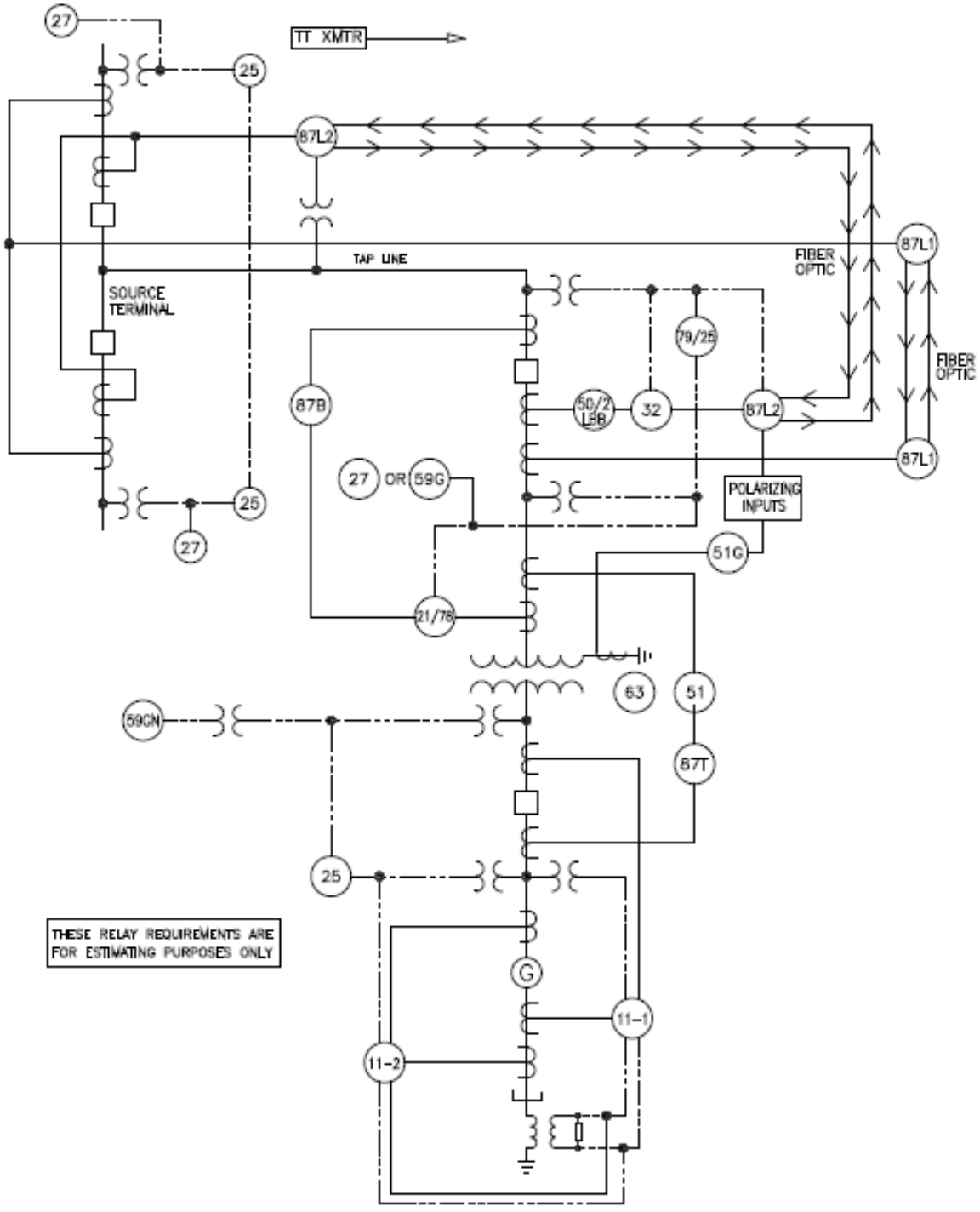
For some GIC Plant installations, the most appropriate interconnection point to the ComEd system would be directly into the bus at an existing ComEd substation. If the ComEd substation is a ring bus configuration, the GIC interconnection point would have to maintain the integrity of the substation design. This would require the addition of at least one new circuit breaker at the substation. The effect on the substation protection would depend on the site specifics. Protection also would have to be installed on the line to the generator.

Redundancy of protection is required per ComEd standards, NERC Planning Standards, PJM Standards, and/or RFC Standards which specify that no single protection system component failure can cause a fault to remain on the system. ComEd 138kV protection system standards may be greater in some areas of the service territory than shown in the diagrams. The following one line drawing and minimum protection scheme design requirements drawings illustrate these concepts for 138kV and below interconnections:

PRELIMINARY RELAY REQUIREMENTS
CUSTOMER OWNED GENERATION PARALLELED WITH COMED

PLAN E

A. A TOTAL GENERATION GREATER THAN 10MVA
——————AND——————
B. CONNECTED TO 69KV OR 138KV
——————AND——————
C. RING BUS OR T-TAP CONNECTION



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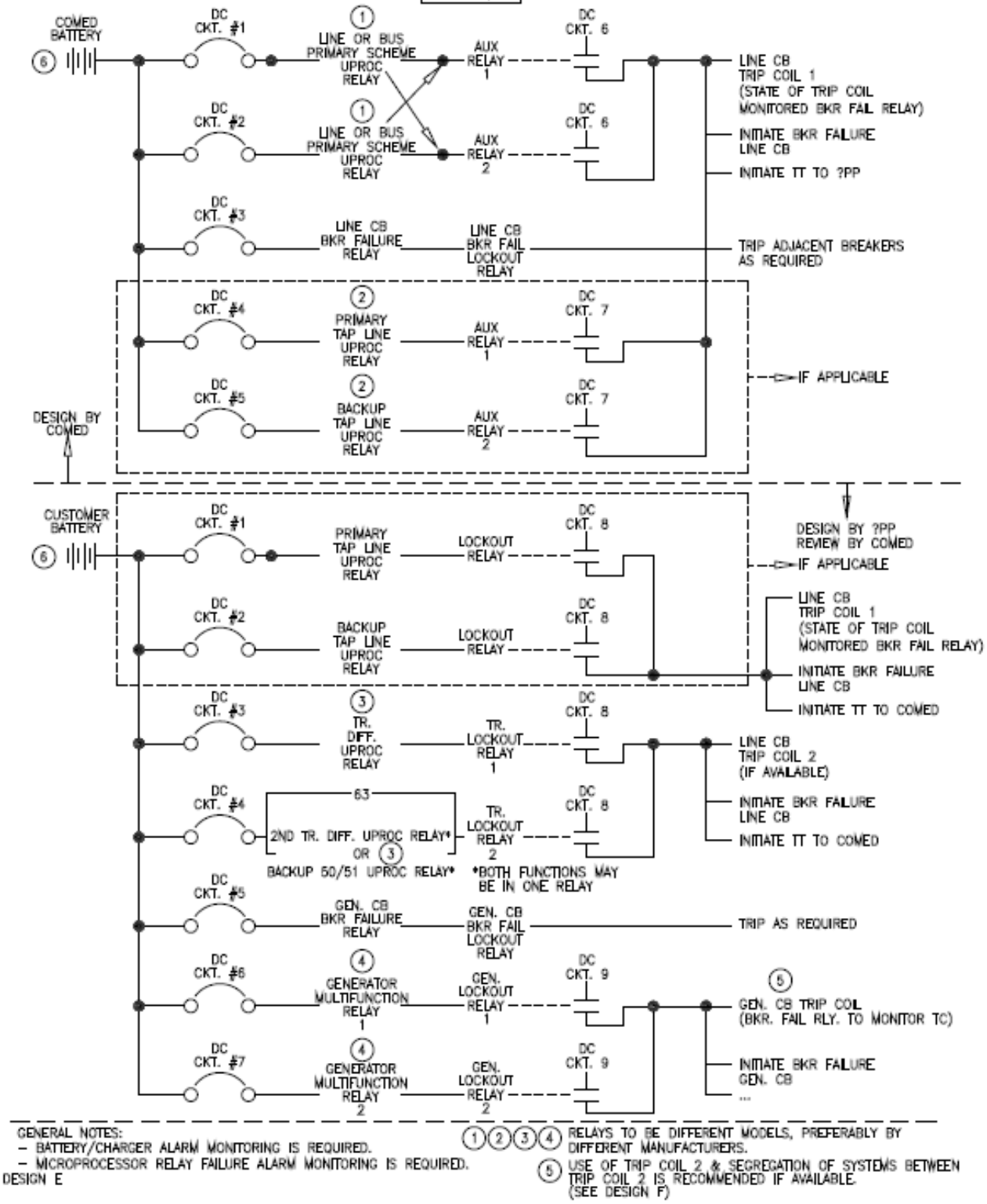
GENERAL MINIMUM PROTECTION SCHEME DESIGN REQUIREMENTS FOR

DESIGN E



GENERAL NOTES:
- BATTERY/CHARGER ALARM MONITORING IS REQUIRED.
- MICROPROCESSOR RELAY FAILURE ALARM MONITORING IS REQUIRED.

DESIGN E

(1)(2)(3)(4) RELAYS TO BE DIFFERENT MODELS, PREFERABLY BY DIFFERENT MANUFACTURERS.

(5) USE OF TRIP COIL 2 & SEGREGATION OF SYSTEMS BETWEEN TRIP COIL 2 IS RECOMMENDED IF AVAILABLE. (SEE DESIGN F)

Review and Approval of GIC Protection System Designs:

ComEd will review and approve the design of all customer owned protection systems that are identified in the 345kV and above and 138kV and below one line diagrams and minimum design requirement drawings above. ComEd approval is required prior to the start of detailed customer design work.

ComEd will review and approve the settings of protective relays for any intertie tap lines, GSUs, and for any generator setting that must coordinate with the ComEd Transmission System. ComEd approval is required prior to energization of GIC equipment.

Testing of GIC Protection System Designs:

ComEd will witness customer testing of any GIC protection system where the design is required to be reviewed and approved including proper application and testing of relay settings required for coordination with the ComEd transmission system. ComEd's approval of all testing is required prior to energization of GIC equipment.

ComEd requires a high current test (also known as a through-fault test) for any bus or GSU transformer differential schemes prior to energization of these schemes. ComEd will witness this test. ComEd review and approval of the results of this test is required prior to energization of GIC equipment. This test is typically performed just prior to livening.

A witness test list will be provided for a given site and will be the ultimate governing document on what is required. A ComEd tester's time is generally scheduled at least 5 weeks in advance by the Regional Testing Group Work Management department. Testing Group individuals are not scheduled for work until completed and approved prints, and other required documentation, are in hand. GIC representatives shall work with ComEd work management to schedule tester's time for witness testing and review of testing documentation. Four (4) sets of approved blueprints (as built) must be provided to the ComEd testing department. The project delays may be caused by untimely submittal of approved blueprints by the GIC.

Reclosing of ComEd Supply Lines

Most faults on overhead lines are transient. That is, if the line is de-energized promptly, it can be reclosed and returned to service. Examples of such transient faults include momentary tree contact due to wind, and insulator flashover due to lightning. Automatic reclosing of overhead lines is standard industry practice to improve the reliability of supply. In many cases, the line can be de-energized and reclosed within one second, with minimal disruption of service to the GIC.

Effects of Interconnected Generation on Automatic Reclosing

Automatic reclosing on ComEd's transmission lines can potentially damage generating equipment operated in parallel with the T&D system. Severe mechanical stress on the

generating equipment may occur if the line is reclosed while the generator is still connected to the ComEd system. This applies to both synchronous and induction generators. With synchronous generators, damage may occur when they are out of synchronism when the supply is restored; with induction generators, damage may occur if they are operating at a speed higher or lower than normal when reclosed to the system. ComEd will not eliminate automatic reclosing of overhead supply lines because that would severely reduce the reliability of service to other GICs. ComEd will attempt to reclose into a dead line from a non-generating terminal. At 345kV and above, a delayed reclose attempt long enough for a generator to cease oscillation will be applied at the most stable generating terminal of a line with generation at both ends. At 138kV and below, the first reclosing attempt is typically high-speed to maintain reliability to distribution customers and standard distribution substations require this mode. Although unlikely, some 138kV configurations may require direct tripping of connected generation for line faults.

Possible Reclosing Scenarios and GIC Responsibilities

The GIC is responsible for protecting the generating facility's equipment so that automatic or manual reclosing, faults, or other disturbances on the ComEd System do not cause damage to the equipment.

When automatic reclosing may result in equipment damage or a safety hazard, either to the ComEd System or the GIC facilities, ComEd and/or PJM may require that additional protective equipment be installed. This will usually consist of communication and/or control equipment to disconnect the GIC’s generator (or to confirm that it is disconnected) before the ComEd transmission line is reclosed.

7) SCADA REQUIREMENTS

Some generators will require continuous telemetry to ComEd's and PJM's operation facilities. These will typically be large generators, generators involved in wholesale transactions or generators that are dispatchable by PJM. Telemetry may be required for one or more of the following reasons:

a) **System Control.** PJM has an obligation to maintain frequency and generation/load balance within its service territory. Changes in the status of large amounts of generation, without real-time telemetry, are detrimental to system control.

b) **Transmission System Operation.** The status of large generators significantly impacts operating decisions. Operators need to know the status of these large generators before performing routine or emergency switching.

c) **Public Safety.** Generators can potentially keep a portion of the electrical grid energized while isolated from the ComEd System. It is critical to detect these situations as soon as they occur so that corrective action can be taken, since the safety of the public and of ComEd workers is at stake.

Generators that meet the following criteria require implementation of telemetry to ComEd's and PJM's control center and dial-up telephone communication to the revenue meter. Required telemetry is listed below each criterion. If more than one criterion applies to a generator, the telemetry requirements of each criterion must be met.

If the GIC is involved in a Power Purchase Agreement (PPA) or participating in the PJM capacity markets which contains unit specific performance or a unit specific payment structure

- Continuous telemetry required.
- Instantaneous revenue grade MW and MVAR; and cumulative revenue grade MWhr and MVARhr at the generator's step-up transformer high side (or equivalent net output) for each unit.
- Instantaneous revenue grade MW and MVAR; and cumulative revenue grade MWhr and MVARhr at all points of interconnection with ComEd and all points of service from ComEd.

If multiple GIC's generators over a large area with an aggregate generation greater than 40 MW are being centrally controlled

- Continuous telemetry required.
- Aggregate instantaneous MW of all generators.

7.1) General Design Requirements

There are two concerns with telemetry at GIC sites:

- The normal requirements for substation remote supervision and operation
- The unique requirements for GIC service, as emphasized in this document.

PJM requirements

When telemetry is required, as described earlier in this document, the following design will be used.

ComEd SCADA Engineering will specify the SCADA system required. SCADA technology is constantly evolving, so specific devices are not referenced in this document. But the system will typically provide the following 5 basic functions:

1. Monitor status, control, and metering of the ComEd substation and any ComEd equipment.

    a) One or more input/output modules/cards to accommodate any hard-wired alarms, status and controls

    b) Serial and/or IP data connections to protective IEDs, equipment monitors, revenue meters, etc.

2. Provide substation information to the ComEd SCADA system

    a) A serial or IP data connection to the ComEd SCADA system from the SCADA data concentrator

    b) The data connection can be via a telco circuit, a fiber optic cable, a microwave channel, or a radio pathway as specified by ComEd based on availability at the site and ability to meet all ComEd SCADA and security requirements.

3. Provide substation information to onsite personnel

    A utility-grade pc is typically used to act as a substation HMI. The pc will have a serial or IP connection to the SCADA data concentrator to acquire the substation data.

4. Provide ComEd substation information to the GIC

    a) Current practice is to establish a DNP 3.0 serial connection between the ComEd data concentrator and the GIC control system. The GIC will act as the DNP master and poll the ComEd system for any desired information.

b) For larger installations, a fiber optic cable is typically installed between the ComEd and GIC facilities. This DNP connection is most easily accomplished by using a pair of fibers in this cable.

c) The ComEd system will be programmed to only provide information relevant to the GIC connection. This data typically includes the revenue metering data, as well as status of equipment relating to the GIC connection/tap on the ComEd system.

5. Provide ComEd SCADA system with GIC substation information

a) Current practice is to establish a 2nd DNP 3.0 serial connection between ComEd and the GIC. ComEd will now act as the DNP master and poll the GIC on this 2nd DNP connection to gather information about the GIC facility.

b) Like with the first DNP connection, for larger installations a fiber optic cable is typically installed between the ComEd and GIC facilities. This DNP connection is most easily accomplished by using a pair of fibers in this cable.

8) COMMUNICATION REQUIREMENTS

Communications will be required for Relay Protection schemes, SCADA, telemetry, voice/data, Revenue Metering, and other Substation services. The Substation is a harsh environment that will require extraordinary means of construction in order to provide safe, dependable, and reliable service for all required connections.

Relay Requirements

Communications for Relay schemes need to be provided on equipment that meets the same IEEE C.37.90 requirements as the Relays themselves. The type of Communications equipment utilized will vary based on the Transmission voltage level that is being protected. As mentioned in 6.1, the standard medium of system protection communication on the 345kV system is fiber optic and/or digital microwave based equipment. For 138kV systems, the standard medium of system protection communication equipment is power line carrier, although fiber optic and/or digital microwave based equipment could be considered. Any other technologies must be reviewed and approved by Com Ed prior to the start of customer design work. This review will occur at the same time the Relay schemes are reviewed.

SCADA/Telemetry/Revenue Metering Requirements

Communications for SCADA/Telemetry/Revenue Metering have slightly less stringent requirements unless they are using the same equipment that the Relay schemes are using. These communications can be made on fiber optic and/or digital microwave based equipment, depending on availability. They can also be provided on leased lines, but all connections to telephone companies will require protection on the phone cabinets for the incoming copper cables. A Ground Potential Rise (GPR) study will be required for any copper cable connections to the phone company. Any other technologies must be reviewed and approved by Com Ed prior to the start of customer design work.

Other Voice/Data Requirements

Communications for other voice/data services, including Plain Old Telephone Service (POTS) lines, Fire Protection, LAN/Internet, etc. also do not have the same stringent requirements as the Relay schemes, unless they are using the same equipment. Any communications provided by leased lines from the phone company will require the same GPR studies as described above in the SCADA Requirements. These communications can be provided over fiber optic and/or digital microwave based equipment, with some exceptions:

1) A POTS line intended for voice use cannot be provided over fiber optic and/or digital microwave based Com Ed systems due to concerns for the use of “911” calls. So this must be provided by the phone company.
2) The primary Fire Protection circuit, if required, cannot be provided over a “private network” (i.e., a Com Ed based fiber optic and/or digital microwave system) per NFPA72. However, if Fire Protection is not required, and is simply

being added because it’s wanted, then this channel can be through SCADA or some other communications means, as approved by Com Ed.

3) Any other technologies must be reviewed and approved by Com Ed prior to the start of customer design work.

9) MISCELLANEOUS REQUIREMENTS

The following paragraphs describe additional requirements before a GIC comes online.

9.1) Retail Energy Supply

The GIC must choose a retail energy supplier for its station retail consumption. A generator may draw retail energy through both the interconnection revenue meter and other retail meters at the facility. The total retail energy is the sum of all retail meters and the hourly net inflow through the interconnection revenue meter. The retail energy consumption is billed to the GIC who is responsible to pay the retail energy supplier.

Generators located within ComEd's service territory have two options to choose from for retail energy supply, from ComEd or from a Retail Electric Supplier (RES). ComEd provides retail energy through a bundled service under the provisions of Rate BESH – Basic Electric Service – Hourly Energy Pricing and Rider ZSS- Zero Standard Service, of ComEd's Schedule of Rates filed with the Illinois Commerce Commission (ICC).

A generator may choose a RES for retail energy supply. In this scenario, ComEd would provide unbundled retail delivery service under the provisions of Rate RDS – Retail Delivery Service and Rider ZSS – Zero Standard Service, of ComEd's Schedule of Rates filed with the Illinois Commerce Commission (ICC).

Generators located outside the ComEd service territory who choose not to contract a retail energy supplier and opt for self-supply must make appropriate billing/payment arrangement with PJM to cover for net-negative months i.e. calendar months during which total power generated Megawatt-Hour (MWH) is less than station auxiliary power consumed MWH.

It should be noted that Rider POG – Parallel Operation of Retail Customer Generating Facilities (Rider POG) applies to all GICs independent of the GIC's choice of retail energy supplier. Consequently, among other documents, the necessary retail paperwork includes a Rider POG election form and the GIC must select either Option A or Option B.

9.2) Metering Algorithm Memorandum of Understanding (MAMOU)

The Metering Algorithm Memorandum of Understanding (MAMOU) is unique to the Point-of-Interconnection (POI) and describes the real time, retail, and wholesale algorithms applied to meter values that result in a net energy value for the Generator Interconnection Customer (GIC), as well as describes how real-time meter information is passed onto PJM. This document provides the basis for settlement of energy transactions in the PJM market for the GIC.

Commonwealth Edison Company (ComEd) is the Transmission Owner for the generator interconnection and will administer this MAMOU. PJM is transmission

provider that administers the wholesale electric market and is responsible for the market settlement of wholesale energy transactions.

The interconnection revenue meter must be revenue grade bi-direction (dual-channel) meter capable of reading low inflow (retail power) and high outflow (wholesale power). The interconnection revenue meter is installed at the Point-of-Interconnection to measure energy flow in both directions (inflow and outflow).

For the purpose of this document, a generating unit is defined as a set of generators modeled in PJM as a single unit and having a unique PJM eMTR ID. If there is only one generating unit with only one eMTR ID behind the interconnection revenue meter, ComEd is willing to submit the meter data to PJM eMTR. However, if there are multiple generating units with multiple eMTR IDs behind one interconnection revenue meter, one of these generating units must serve as primary generator and other generating units would serve as secondary generators.

Under this scenario, all secondary generators behind the interconnection revenue meter shall submit their individual meter data to their individual PJM eMTR ID. ComEd shall submit residual meter data to PJM eMTR ID for the primary generator, which will be calculated by subtracting eMTR values of secondary generators from the hourly readings of the interconnection revenue meter. ComEd will submit corrections only for the primary generator if post PJM eMTR deadline correction/adjustments for the interconnection revenue meter are needed.

9.3) Metering Requirements

ComEd shall procure and install, at GIC's expense, metering equipment including CT/PT and bi-directional revenue grade meter, on the ComEd side of the Point-of-Interconnection at the Interconnection Substation.

The metering equipment shall be designed to measure both wholesale energy (high MWH and MVARH readings) and retail energy (low KWH and KVARH readings) and meet metering requirements stated in PJM Manuals M01 & M14D. The metering equipment shall provide the following generator data:

a) Instantaneous net MW for the generator.
b) Instantaneous net MVAR for the generator.
c) Instantaneous Voltage value.
d) Hourly compensated net MWH for the generator.
e) Hourly compensated net MVARH for the generator.

ComEd shall procure and install, at GIC's expense, communication circuits to transmit real-time generator data to ComEd and PJM via a SCADA RTU.

ComEd shall own and maintain metering equipment and communication circuits at the Interconnection Substation.