DTE Electric

MICHIGAN ELECTRIC UTILITY Generator Interconnection Procedures Level 1 and 2 Projects with Certified DER Capacity Less Than 150 kWac

March 22, 2024

INTRODUCTION

Level 1, 2

This Generator Interconnection Procedure document outlines the process & requirements used to install or modify generation projects with Certified DER Capacity ratings less than or equal 150 kWac designed to operate in parallel with the DTE Electric Company (DTE or the Company) electric system. Technical requirements (data, equipment, relaying, telemetry, metering) are defined according to generation type, location of the interconnection, and mode of operation (Export or Non-Export). The process is designed to provide an expeditious interconnection to the DTE electric system that is both safe and reliable.

This document has been filed with the Michigan Public Service Commission (MPSC) and complies with rules established for the interconnection of parallel generation to the DTE electric system in the MPSC Order in Case No. 20890

The term “Project” will be used throughout this document to refer to electric generating equipment and associated facilities that are not owned or operated by DTE. The term “Applicant” means a person or entity submitting an interconnection application, a legacy net metering program application, or a distributed generation program application. An applicant is not required to be an existing customer of an electric utility. An electric utility is considered an applicant when it submits an interconnection application for a DER that is not a temporary DER.

This document does not address other Project concerns such as environmental permitting, local ordinances, or fuel supply. Nor does it address agreements that may be required with DTE and/or the transmission provider, or state or federal licensing, to market the Project’s energy. An interconnection request does not constitute a request for transmission service.

It may be possible for DTE to adjust the requirements stated herein on a case-by-case basis. The review necessary to support such adjustments, however, may be extensive and may exceed the costs and timeframes established by the MPSC and addressed in these procedures. Therefore, if requested by the Applicant, adjustments to these procedures will only be considered if the Applicant agrees in advance to compensate DTE for the added costs of the necessary additional reviews and to also allow DTE additional time for the additional reviews.

DTE may apply for a technical waiver from one or more provisions of these rules and the MPSC may grant a waiver upon a showing of good cause.

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INTERCONNECTION PROCESS

Customer Project Planning Phase

An Applicant may contact DTE before or during the application process regarding the project. DTE can be reached by phone, e-mail, or by the external website to access information, forms, rates, and agreements. DTE requires a pre- application report to be completed for Level 4 or greater projects.

An interconnection process flow diagram can be found in Appendix A.

Interconnection fees can be found in ***Appendix B***. Procedure definitions can be found in ***Appendix C***.

Pre-Application Report

An Applicant shall submit a completed pre-application report form (**Appendix J)** only if they desire to do so for level 1 or 2, it is not required or recommended. It is required for any proposed level 4 or 5 project. A pre-application report fee will be required (**Appendix B**). DTE provides the following in its pre-application reports if the following is existing and readily available, otherwise it will be indicated as such on the report:

1. The substation bus, bank, or circuit most likely to serve the proposed point of common coupling (PCC). This identification does not necessarily indicate that this would be the circuit to which the project would ultimately connect.
2. The total capacity, in MWac, of the substation bus, bank, or circuit based on normal or operating ratings likely to serve the proposed PCC.
3. The existing aggregate generation capacity, in MWac, interconnected to a substation bus, bank, or circuit likely to serve the proposed PCC.
4. The aggregate generation capacity, in MWac, of DER not yet built, but found in previously accepted interconnection applications, for a substation bus, bank, or circuit likely to serve the proposed PCC.
5. The available capacity, in MWac, of the substation bus, bank, or circuit likely to serve the proposed PCC.
6. The substation nominal distribution voltage.
7. The nominal distribution circuit voltage as the proposed PCC.
8. The label, name, or identifier of the distribution circuit on which the proposed PCC is located.
9. The approximate circuit distance between the proposed PCC and the substation.
10. The actual or estimated peak load and minimum load data at any relevant line section or sections, including daytime minimum load and absolute minimum load, when available. If not readily available, the report must indicate whether the generator is expected to exceed minimum load on the circuit.
11. Whether the point of common coupling is located behind a line voltage regulator and whether the substation has a load tap changer.
12. Limiting conductor ratings from the proposed point of common coupling to the distribution substation.

13. Number of phases available at the primary voltage level at the proposed point of common coupling, and, if a single phase, distance from the 3-phase circuit.
14. Whether the point of common coupling is located on a spot network, area network, grid network, radial supply, or secondary network.
15. Based on the proposed PCC, whether power quality issues may be present on the circuit.
16. Whether or not the area has been identified as having a prior affected system.
17. Whether or not the site will require a system impact study for high voltage distribution based on size, location, and existing system configuration.

DTE will process pre-application report requests in the order in which they are received. Pre-application reports will be provided within 20 business days of receipt of the completed request form and payment of the fee. Any pre-application reports produced by DTE are non-binding and do not confer any rights on the applicant.

An applicant may request additional pre-application reports, including different proposed PCCs for the same project. No more than 10 pre-application reports may be submitted by an applicant and its affiliates during a 1-week period.

Application Review & Track Assignment

The Applicant must first submit an Interconnection Application (***Appendix D***) to DTE. A separate application is required for each Project, or Project site and for any subsequent changes to a site after approval. If a single Project contains multiple types of DER, include all DER in a single application form. Applications may require additional information necessary to comply with MISO reliability and modelling requirements as applicable. An applicant shall complete a submittal of the required interconnection application and interconnection filing fee per the table in **Appendix B**.

Documentation of site control must be submitted with the application by the Applicant. For level 1 and 2 DERs, site control may be demonstrated by providing documentation that shows any of the following:

- For level 1 or 2 DERs, proof of site control may be demonstrated by the site owner's signature and contact information on the application.

  Otherwise:

- Ownership of, a leasehold interest in, or a right to develop a site for the purpose of constructing and operating the DER.
- An enforceable option to purchase or acquire a leasehold site for this purpose.
- A legally binding agreement transferring a present real property right to specified real property along with the right to construct and operate a DER on the specified real property for a period of time not less than 5 years.

In addition to the DER Capacity of the site, an Applicant is required to provide the desired export capacity in the application if it is less than the DER Capacity, which is a lower amount defined by using one of the accepted power limiting methods found in the interconnection technical requirements section.

Within 10 business days of receipt of the completed application and Interconnection application payment. DTE will notify the Applicant if the Interconnection Application if it is conforming, incomplete or non-conforming. If any portion of the Interconnection Application, data submittal (site plan and one-line diagrams, etc), or filing fee is incomplete and/or missing; DTE will provide a list of deficiencies to the Applicant with explanations. The Applicant shall provide a modified application within 60 business days from the date the Applicant was notified by DTE, with up to 2 resubmissions during this time period to resolve the deficiencies. After each submission of information, DTE will notify the Applicant within 10 business days that the interconnection application is either accepted, or rejected due to continuing deficiencies. If the Applicant does not meet the timelines required, the application may be withdrawn by the utility. Once DTE has accepted the application, DTE will notify the Applicant that the application is complete and accepted, and whether the Project will be processed following the non-export track, fast track, or study track. The applicant may indicate that they wish to proceed directly to non-export or study track on the application.

For projects applying for interconnection and applying for participation in a specific Tariff or market program, additional procedures and requirements may be required in addition to these procedures and will be present in program or tariff specific procedures.

Non-Certified Equipment

Project with non-certified equipment shall use the level 3,4,5 procedures. The procedures in this document are not applicable to Non-certified projects.

Non-Export Track

The non-export track is available to all projects, however most level 1 and 2 projects should utilize fast track. Notwithstanding, The non-export track is available to all projects that will not inject electric energy into the distribution system or create inadvertent export and that have an existing electrical service at the applicant's premise. In order to be eligible for the non-export study process the Project is required to have reverse power flow (32) relaying, submit a three line protection drawing, and any other protection function, communication or control as determined by DTE for the safety of customers, and reliable operating of the electrical system as defined within these interconnection procedures technical requirements. Within 20 business days of providing notice of an approved application, DTE will perform a study using the initial review screens in **Appendix H** to determine the suitability of the interconnection equipment and provide the results to the Applicant.

If the results indicate that no interconnection facilities, distribution upgrades, further study, or Project modifications are required, DTE will provide specifications within 20 business days for any equipment required to be installed by the Applicant. DTE may provide required coordination with the utility, settings for the installed protective equipment, inverters or other devices that needs to be configured and validated prior to commissioning. DTE reserves the right to revise those settings as needed. Within 10 business days of receiving the equipment specifications, the Applicant shall notify DTE whether it will proceed to an Interconnection and Operating Agreement or will withdraw the application. The failure of the Applicant to notify DTE within the required time period shall result in the application being withdrawn.

If the results indicate further study is required, DTE will present options and the Applicant shall decide whether to proceed to a supplemental review under the fast-track process, the study track, facilities study, or to withdraw the application. The Applicant shall have 10 business days to decide on a course of action and notify DTE, otherwise the application may be withdrawn.

If a Project modification is offered by DTE, the Applicant shall either withdraw the interconnection application or provide a modified application within 60 business days from the date the Applicant was notified by DTE, with up to 2 resubmissions during this time period to provide a modified application. After each submission of information, DTE will notify the applicant within 10 business days that the interconnection application is either accepted or rejected due to continuing deficiencies. After accepting the modified application, DTE will have 20 business days to reapply the screens to determine if the modified application mitigates or eliminates the issues that caused the failure of the screens. If the Applicant does not meet the timelines required, the application may be withdrawn.

When an Applicant changes from a non-exporting system to an exporting system, or from an exporting to a non-exporting system, the Applicant shall submit a new interconnection application.

Fast Track

The fast track is available to projects up to 5 MWac for consideration to connect to the 13.2 kV distribution system and 1 MW (level 4) for any distribution system less than 13.2 kV, Sub transmission (24KV, 40KV and greater) projects are not eligible for fast track. Projects using an acceptable method for limiting export as defined in these procedures technical requirements are eligible for fast track. An Applicant may choose to forgo the fast track for an eligible project and proceed directly to the study track. DTE will aggregate all existing and proposed generation on a site in determining fast track eligibility.

Within 10 business days of providing notice of an approved application, DTE will perform a study using the initial review screens in **Appendix H** to determine the suitability of the interconnection equipment and provide the results.

If the proposed interconnection passes the initial review screens, or if the proposed interconnection fails the screens but DTE determines that the DER may be interconnected consistent with safety, reliability, and power quality standards, DTE shall notify the Applicant and inform the Applicant whether the Project will proceed to Facilities Study or directly to Interconnection and Operating Agreement.

If the proposed interconnection fails any of the initial review screens, and DTE does not or cannot determine that the DER may be interconnected consistent with safety, reliability, and power quality standards, DTE shall notify the Applicant and provide the Applicant with the results of the application of the initial review screens. DTE shall provide the Applicant with the options to attend a customer options meeting, proceed to Supplemental Review, submit a project modification, or withdraw the application.
The Applicant shall have 10 business days to decide on a course of action and notify DTE, otherwise the application shall be withdrawn. After the application is accepted, the initial review screen process will be repeated.

Upon the Applicant's request, DTE and the Applicant shall schedule a customer options meeting between DTE and the Applicant to review possible facility modifications, screen analysis, and related results to determine what further steps are needed to permit the DER to be connected safely and reliably to the distribution system. The customer options meeting must take place within 30 business days of the date of notification. DTE shall provide the Applicant with the options of proceeding to Supplemental Review, proceeding to the Study Track, submitting a project modification, or withdrawing the application. The Applicant shall

have 20 business days to decide on a course of action and notify DTE, otherwise the application shall be withdrawn. The customer options meeting may take place in person or via telecommunications.

If a Project modification is offered by DTE, the Applicant shall either withdraw the interconnection application, or provide a modified application within 60 business days from the date the Applicant was notified by DTE, with up to 2 resubmissions during this time period to provide a modified application.

The application modifications must mitigate or eliminate the factors that caused the interconnection application to fail 1 or more of the initial review screens. After each submission of information, DTE will notify the applicant within 10 business day that the interconnection application is either accepted or rejected due to continuing deficiencies. After accepting the modified application, DTE will have 10 business days to reapply the screens to determine if the modified application mitigates or eliminates the issues that caused the failure of the screens. If the Applicant does not meet the timelines required, the application may be withdrawn.

Supplemental Review

An applicant shall submit payment of the supplemental review fee (**Appendix B**) within 20 business days of agreeing to a supplemental review. If payment of the fee has not been received by DTE within 25 business days, the application shall be withdrawn.

Within 30 business days after the applicant pays the applicable supplemental review fee, DTE will perform a study using the supplemental review screens in **Appendix I** and notify the applicant of the results.

If the proposed interconnection passes the supplemental review screens, or if the proposed interconnection fails the screens but DTE determines that the DER may be interconnected consistent with safety, reliability, and power quality standards, DTE shall notify the Applicant and inform the Applicant whether the Project will proceed to Facilities Study or directly to Interconnection and Operating Agreement.

If the proposed interconnection fails any of the supplemental review screens, and DTE does not or cannot determine that the DER may be interconnected consistent with safety, reliability, and power quality standards, DTE shall notify the Applicant and provide the Applicant with the results of the application of the supplemental review screens.
DTE shall provide the Applicant with the options to proceed to the Study Track or withdraw the application. The Applicant shall have 10 business days to decide on a course of action and notify DTE, otherwise the application shall be withdrawn.

Study Track

The study track is available to all Projects that are not eligible for the non-export track, or the fast track. A Project that is eligible for the fast track may also select to skip fast track and be evaluated in the study track directly. Projects that do not pass the initial review screens or supplemental review screens or are otherwise identified to require further study while proceeding through another track may also be evaluated in the study track. Projects requiring a Pre Application must complete the pre application process before proceeding to study track.

At the present time DTE only plans to conduct individual studies but reserves the right to define and implement an alternate study method.

DTE shall provide a study agreement to the Applicant within 10 business days after the interconnection application has been accepted and the study agreement will indicate the required fees as defined in **Appendix B**. If the following conditions apply:

- The project is ineligible for any other study track
- The project did not pass initial review screens in fast track
- The project did not pass supplemental study
- The customer selected study track during the customer options meeting
- The customer selected study track instead of fast track
- The Non-export track indicated additional study

If a project begins in another track and is moved to the study track for any other reason listed above, within 10 business days after the Applicant has notified DTE to proceed to the study track, DTE shall provide a study agreement to the Applicant.

Study Process

Upon receipt of a signed Study agreement and required payment. DTE will proceed to study each Project in the order in which the Projects were placed into the study track, taking into account withdrawn interconnection applications and electrically remote Projects. An electrically remote Project in an individual study may be studied on an expedited schedule relative to electrically coincident DERs. Electrically remote DERs will be studied in the order the interconnection applications were deemed complete. Projects that are on hold for missing data or other issues shall not delay the processing of any other application.

Upon request of the Applicant, a scoping meeting shall be scheduled to discuss the interconnection application and review existing fast track results, if any. The scoping meeting must take place within 20 business days after the interconnection application is considered complete by the electric utility or, if applicable, the fast track has been completed and the Applicant has elected to continue with the system impact study or facilities study. DTE will indicate if the project will proceed to System Impact Study, Facilities Study or will proceed directly to an Interconnection Agreement. The scoping meeting is limited to one hour and DTE may cover multiple projects with the Applicant in the same meeting.

If a Project in study is delayed due to an affected system issue, other Projects that were placed into the study track on a later date may continue to progress.

An Applicant that withdraws from the study may reapply with a new interconnection application including application fee.

A full study will begin in the System Impact Study and proceed to Facilities Study. DTE may indicate that a System Impact study is not needed, and a project can proceed directly to Facilities Study, or after reviewing the results of the System impact study determine that a Facilities Study is needed. If only a Facilities study is needed, the entry point into the process is indicated below in the Facility Study Agreement Phase.

The Study process, excluding affected system, holds waiting for data, company holidays and storm, is as follows:

System Impact Study Agreement (maximum 30 business days)

- DTE will provide a System Impact Study Agreement within 10 business days
- The applicant will have 20 business days to return the signed agreement with the required fee. If notice is not received by the end of this 20 business day period the application may be withdrawn by DTE.

System Impact Study Phase (maximum 60 business days)

- DTE will perform the System Impact study within 60 business days and provide written results to the Applicant at the completion of this phase and indicate if a Facilities Study is required and required study fees based on Appendix B.
- DTE may request additional data from the applicant within the first 20 business days of the study

First Decision Phase (maximum 85 business day)

- Within 15 business days of receiving the System Impact study report the Applicant shall choose to proceed to a facilities study if required by the System Impact Study, request a facilities study review meeting or withdraw.
- DTE will have up to 25 business days to conduct the review meeting and will present options based on the result of the System Impact study
- After the review meeting the Applicant will have up to 45 business days to withdraw the project, proceed to facilities study, if required, or proceed with execution of interconnection agreement, if applicable. If notice is not received by the end of this 45 business day period the application may be withdrawn by DTE.

Facilities Study Agreement (maximum 30 business days)

- DTE will provide a Facilities Study Agreement within 10 business days.
- The applicant will have 20 business days to return the signed agreement with the required fee.

Facilities Study Phase (maximum 80 Business Days)

- DTE will have 80 business days to complete the facilities study and provide written results to the Applicant at the completion of this phase.
- DTE shall also offer to hold a conference call with the Applicant to discuss the written results, to occur within 30 days of the end of the study phase to the extent feasible.

Second Decision Phase (maximum 55 Business Days)

- Within 10 days the Applicant shall choose to proceed with execution of interconnection agreements, request a facilities study review meeting or withdraw.
- DTE will have up to 25 business days to conduct the review meeting
- The Applicant will have up to 20 business days to proceed with execution of interconnection agreement after the review meeting. If notice is not received by the end of this 20 business day period the application may be withdrawn by DTE.

System Impact Study

DTE will provide the Applicant with a system impact study agreement within five business days of entering the study track either directly after an application is deemed complete or after a Project moves to the study track from another track. The Applicant shall return the completed system impact study agreement, provide any additional technical data requested by DTE, and pay the required fee as indicated on the Study agreement (**Appendix E**) within 20 business days. DTE may require generator dynamic model information to comply with MISO modelling requirements.
DTE may consider the application withdrawn if the system impact study agreement, payment, and required technical data are not returned within 20 business days.

The system impact study report will identify and describe the electric system impacts that would result if the proposed Project was interconnected without electric system modifications. It will also provide a non-binding, good faith list of facilities that are required as a result of the application and non-binding estimates of costs and time to construct these facilities. The system impact study may also indicate that additional study is needed during the Facilities study phase to determine the appropriate upgrades.

DTE will complete the system impact study and provide both a system impact study and, if necessary, a facilities study agreement within 60 business days of receipt of the signed system impact study agreement, payment of all applicable fees, and any necessary technical data.

DTE may request reasonable additional data from the Applicant within 20 business days of beginning the system impact study.
DTE and the Applicant shall work together to resolve the additional data request so that DTE will be able to complete the system impact study within the aforementioned 60 business day period.
If the Applicant does not provide the requested additional data in a timely manner, DTE will notify the Applicant that the system impact study is on hold and the date the hold started. DTE will resume work on the study when the additional data is received.

Within 15 business days of receiving the system impact study report, the Applicant shall notify DTE whether it elects to pursue a system impact study review meeting, proceed to Facilities Study, or withdraw the application. If the Applicant fails to notify DTE within 15 business days, DTE may consider the application to be withdrawn.

Upon request by Applicant, a system impact study review meeting shall be scheduled to review system impact study results and determine what further steps are needed to permit the Project

to be connected safely and reliably to the distribution system. The system impact study review meeting must take place within 25 business days of DTE receiving notification that the Applicant plans to attend a system impact study review meeting. At the meeting DTE will offer the Applicant to proceed to Facilities Study, proceed directly to Interconnection & Operating Agreement if the utility determines a Facilities study is not needed, or withdraw the application. If an applicant fails to notify DTE of its selection within 45 business days of the meeting, DTE may consider the application to be withdrawn.

Facilities Study

If a Project received a system impact study and it indicated a Facilities study was required, DTE will provide the Applicant with a facilities study agreement with the system impact study report. If no system impact study was performed, DTE will provide a facilities study agreement within 10 business days of proceeding to Facilities Study. The Applicant shall return the signed facilities study agreement and pay the required facilities study fee as indicated on the Facilities Study Agreement (**Appendix E**) within 20 business days. DTE may withdraw the application if the facilities study agreement and payment are not returned within 20 business days.

The facilities study report will specify and estimate the cost of the required equipment, engineering, procurement, and construction work, including overheads, needed to interconnect the Project, and an estimated timeline for the completion of construction.

DTE will complete the facilities study and provide a facilities study report to the Applicant within 80 business days of the receipt of the signed facilities study agreement and payment of the facilities study fee.

Within 10 business days of receiving a facilities study report from DTE, the Applicant shall notify DTE whether it elects to pursue a facilities study review meeting, proceed to an Interconnection & Operating Agreement, or withdraw the application. If the Applicant fails to notify DTE within 10 business days, DTE may consider the application to be withdrawn.

Upon request by Applicant, a facilities study review meeting shall be scheduled to review facilities study results and determine what further steps are needed to permit the Project to be connected safely and reliably to the distribution system. The facilities study review meeting must take place within 25 business days of DTE receiving notification that the Applicant plans to attend a facilities study review meeting. At the meeting DTE will offer the Applicant to proceed to Interconnection & Operating Agreement or withdraw the application. If an applicant fails to notify DTE of its selection within 20 business days of the meeting, DTE may withdraw the application.

Cost Allocation Methodology

In the case that two or more project agrees to share the costs identified during the facilities study per the Interconnection and Distributed Generation Standards established in Case No. 21117:

Rule 70. Costs for interconnection facilities and distribution upgrades must be classified into one of the following categories:
(a) Site-specific costs, which include, but are not limited to, costs of interconnection facilities and distribution upgrades that are caused by one DER, whether that DER is electrically co-incident with other DERs. These costs must be assigned to the cost-causing applicant.
(b) Shared interconnection facilities costs, which are costs caused by DERs which together necessitate the construction of interconnection facilities. The interconnection facilities costs that

should be shared must be allocated to each applicant based on a methodology described in the electric utility's interconnection procedures.

(c) Shared distribution upgrade costs, which are costs caused by electrically co-incident DERs that together necessitate a distribution upgrade. The distribution upgrade costs that should be shared must be allocated to each applicant based on a methodology described in the electric utility's interconnection procedures.

The decision to share costs must be made and mutually agreed to in writing during the overlapping study or decision period.
Shared interconnection facilities shall be split equally amongst Applicants whose Projects necessitate the shared interconnection facilities. Once an Applicant's Project interconnection facilities are in service, the upfront original cost to install those interconnection facilities can no longer be shared by future Applicants. Costs of ongoing ownership, maintenance, and future repair/replacement can still be shared by future applicants that share the interconnection facilities in accordance with interconnection agreements.

Shared distribution upgrade costs shall be allocated according to the impact of each applicant's generator on the limits exceeded for the shared distribution facilities. A simple example is shown below for a thermal constraint and the same methodology would be used for voltage, interrupting capability, or other constraints.

Limit Exceeded	**Distribution Upgrade Cost**	**Impact of Project A**	**Impact or Project B**
Loading on line X exceeded limit by 5 MVA	line X upgrade ($1M)	3 MVA	2 MVA
Cost Allocation		=(3/5*$1M)=$0.6M	=(2/5*$1M)=$0.4M

Distribution upgrade costs Applicants that have agreed to interconnection agreements will not be considered for cost allocation to subsequent applicants, unless requested and agreed to by all applicants affected.

Distribution upgrade costs and allocations of costs are subject to change due to the potential for an Applicant to withdraw up until an Applicant's Project is in service and costs are reconciled per the interconnection agreements. DTE shall endeavor to notify an Applicant as soon as possible after it becomes aware that an Applicant's cost for distribution upgrades is dependent on or changes due to any other Applicant withdrawing a Project or Projects.

Affected System Study Process

If during a System Impact Study or a Facilities Study DTE determines that another utility's system, or Bulk Electric System, may be affected by a proposed interconnection project, DTE shall notify the applicant and Affected System of such and place the Project in an on hold status in regards to all interconnection study timelines while an affected system study is completed. DTE shall send notification and information on the project to the affected system owner. While DTE will coordinate with the Affected System Owner, it is the applicant's responsibility to request that an affected system study be completed and respond to any associated costs or request for information from the Affected System Owner and for any scope, costs, and lead times of any upgrades required on the affected system. Once DTE receives the affected system study results from the affected system owner, the results will be incorporated into the DTE study

report, and the hold will be removed from the Project and the interconnection timelines will resume.

Interconnection and Operating Agreement

An interconnection agreement will be provided to the Applicant in this stage. An Applicant shall pay the actual cost of the interconnection facilities and distribution upgrades, subject to R 460.964 (8).

DTE will provide its interconnection agreement within 3 business days for level 1 and 2 projects that have no construction, 5 business days for level 1 and 2 projects with construction, of reaching this stage. The interconnection agreement may define modifications needed to address special operating conditions. When construction interconnection facilities or distribution upgrades is necessary, the interconnection agreement will contain a construction attachment that details the timelines for completion of activities and estimates of construction costs or a timetable when these requirements can be determined. The applicant and DTE will mutually agree on the timing of construction milestones and any operating or coordination that needs to be scheduled. The construction attachment to the interconnection agreement will include a payment schedule that corresponds to the milestones established.

The Applicant shall sign and return the interconnection agreement with payment, if applicable, within 20 business days of receiving the agreement. If this deadline is missed, the Applicant will be informed of the missed deadline and granted an extension of 15 business days. If the interconnection agreement and payment are not received during the 15-business-day extension, DTE may consider the interconnection application withdrawn.

DTE will countersign and provided a completed copy of the interconnection agreement within 10 business days of the Applicant returning a mutually agreed-upon and signed interconnection agreement.

The Interconnection agreement will also contain the terms for parallel operation authorization that the Applicant will agree to. DTE will sign the Parallel Operation Authorization after the Applicant has successfully completed commissioning and met all terms in the interconnection agreement and its attachments.

Inspection, Testing, and Commissioning

The Applicant is required to notify DTE when the installation of a Project and any required local code inspection and approval is complete. The Applicant is also required to complete any telecommunications, Cybersecurity, data exchange or remote control installation and complete any test reports, certification or configuration documents as defined in the Interconnection Agreement or Construction Agreement attachment prior to notification.

DTE will review the Applicant’s inspection, test reports, or configuration documents and communicate its intent to perform a witness or commissioning test, or waive its rights to perform a witness test and commissioning test, within 10 business days.

The commissioning testing required by DTE, may include but is not limited to, confirmation of installed equipment, functional testing, and verification of protection and control system settings. DTE will provide the utility settings and commissioning test requirements prior to witness testing. The Applicant is responsible for applying DTE requirements prior to the date of witness testing and may request temporary parallel authorization if needed to apply and confirm the requirements.

If DTE finds the Applicant's inspection, test reports, or configuration documents to be incomplete, insufficient, or unsatisfactory, DTE shall provide the reasons for doing so in writing and the Applicant shall have not less than 20 business days or a mutually agreed upon timeframe with DTE to implement corrections to those documents. The Applicant, after taking corrective action, shall request DTE to reconsider the inspection, test reports, or configuration documents.

Subsequent to the successful completion of the above requirements, DTE will do the following:

- If DTE intends to witness or perform a commissioning test, the tests must be performed within 10 business days for a level 1 project and within 20 business days for a level 2 project.

- If DTE waives its right to visit the site and inspect the Project or perform the commissioning tests, it will provide a written waiver to the Applicant within 10 days of receiving notice. The Applicant shall provide DTE with the completed commissioning test report within 20 business days of receipt of this waiver.

If DTE attempts to conduct the inspection and testing at the arranged time and is unable to access the Project or complete the testing, the Project must remain disconnected until the Applicant and DTE can complete the inspection and testing.

If DTE witnessed or performed commissioning tests and inspected the Project, within 5 business days of receipt of the completed commissioning test report, DTE will notify the Applicant it has accepted or rejected the commissioning test report and if it has found the site to be satisfactory. If the commissioning test is accepted and the site is found satisfactory, DTE will notify the Applicant, and the Project will proceed to Authorization to Operate in Parallel.

If DTE waived its right to witness or perform commissioning tests and inspect the Project, within 5 business days of receipt of the completed commissioning test report, DTE will notify the Applicant it has accepted or rejected the commissioning test report. If the commissioning test is accepted, DTE will notify the Applicant, and the Project will proceed to Authorization to Operate in Parallel.

If DTE rejects a commissioning test or finds a site unsatisfactory, it will provide its reasons for doing so in writing, and the Applicant has 20 business days to implement corrections. The Applicant, after taking corrective action, shall request DTE to reconsider its findings. Do note that the Applicant may be billed the actual cost of any re-inspections.

If the Applicant does not notify DTE that the Project is installed and ready to test, DTE may, in writing, query the status of the Project. If the Applicant does not provide a written response within 10 business days or no progress is evident, DTE may consider the Project withdrawn.

Authorization to Operate in Parallel

DTE will provide the Applicant with written authorization to operate in parallel with DTE within five business days of all of the following conditions being met:

- DTE notified the Applicant that the commissioning test and inspection, where applicable, are accepted.
- The Applicant complied with all applicable parallel operation requirements as set forth in these procedures and the applicable interconnection agreement.

- The Applicant complied with all applicable local, state, and federal requirements.
- DTE has received payment in full for all outstanding bills.

Upon satisfactory completion of all requirements, testing and commissioning, DTE shall issue a Parallel Operating Authorization that incorporates any ongoing requirements, terms or conditions that were defined in the interconnection agreement and construction agreement.

With this written authorization, the Project is considered approved for parallel operation, the Project may begin operating, and the Applicant is considered an interconnection customer.

The Applicant shall not operate its Project in parallel with DTE's distribution system without prior written permission to operate from DTE. Subject to reasonable timing and other conditions, including completion of conditions in the applicable interconnection agreement or these procedures, DTE will allow for reasonable, but limited, testing before written authorization has occurred.

Material Modification Process

In the event of a change to the Project design any time after receiving notification by DTE of a complete interconnection application, the Applicant will be required to submit a new interconnection application, including the associated fee, detailing the proposed changes to DTE for review. The Application Review section above details the process by which DTE will review this application. At such a time when the revised interconnection is deemed complete by DTE, DTE will determine whether the proposed changes constitute a Material Modification and, if so, whether any further restudy is required. If further restudy is required, the Applicant shall notify DTE whether it will withdraw the proposed changes or continue with the restudy, and the associated fee, within 10 business days of being notified of the determination or DTE may withdraw the application.

A Material Modification is a modification to the DER nameplate rating, electrical size of components, bill of materials, machine data, equipment configuration, or the interconnection site of the DER at any time after receiving notification by the electric utility of a complete interconnection application. Examples of modifications that are not material would be like-for-like equipment changes including inverters with the same nameplate rating and electrical characteristics.

All Material Modifications need to be reviewed by DTE to determine if they are acceptable without further or additional study as written above. Each Material Modification must be reviewed by DTE on a case-by-case basis. Regardless of the determination of material or non-material, modifications may trigger a request for updated generator modeling information or a dynamic model update from the Project to comply with MISO system and Dynamic modeling requirements.

A non-exhaustive list of example Material Modifications that may or may not require additional study are listed below.

Material Modifications that would be acceptable and typically would not require re-study:

- Inverter Changes
    - Replacement of the inverter with the exact same model, settings and configuration
    - Replacement of the inverter with a similar model where settings, configuration the DER capacity, Export Capacity and connections are unchanged.

- Small Transformer Changes (base rating remains unchanged)
    - Minor Impedance change (evaluated on a case by case basis, dependent on connection type and/or previous study results)
    - X/R Ratio change only
- Changes to collector system cable lengths (conductor type/size remains unchanged)
    - Small change in lengths (evaluated on a case by case basis, dependent on connection type and/or previous study results)
- Small relocation of the point of interconnection (evaluated on a case by case basis)

Material Modifications that would typically require re-study to determine acceptability:

- Inverter Changes (other than above) that are not for the same model and configuration due to failure
- Inverter changes or upgrades to add functionality or connections.
- Addition of energy storage
- Collector System Re-Design
    - System Voltage Change
    - Number of Transformation Levels change
- Transformer base rating or impedance change (other than above)
- Replacement of switchgear or any wiring or switchgear replacement that changes the one line of the customer site between the generator and the PCC.
- Collector system cable changes (other than above)
- Relocation of the point of interconnection (other than above)

If a Project must be restudied as a result of a Material Modification, and the Project can remain in the same track, all screens and studies that may need to be reperformed will be completed on an expedited study of the application with the proposed modification where possible. Timelines for the potential expedited studies if available will be communicated to the Applicant along with any associated study fees and study agreements. The timelines and fees will be determined on a case by case basis and determined based on the scope and scale of the modifications and extent of study required.

OPERATIONAL PROVISIONS

If a Contact List (**Appendix G**) is required, the Applicant is required to notify DTE prior to synchronizing to and prior to scheduled disconnection from the electric system.

The Project may not commence parallel operation until approval has been given by DTE. The completed installation is subject to inspection by DTE prior to approval. Preceding this inspection, all contractual agreements, payments, and obligations must be executed by the Applicant.

Disconnection

DTE may refuse to connect, or may disconnect, or revoke the Parallel Operating Authorization a project from the electric system if any of the following conditions apply:

a. Lack of written authorization from DTE to interconnect or fully executed Generator Interconnection and Operating Agreement
b. Termination of interconnection by mutual agreement
c. Noncompliance with technical or contractual requirements in the Generator Interconnection and Operating Agreement, after 30 business days of notification is provided to the Applicant of the technical or contractual deficiency that does not degrade the reliability of the distribution system, electric utility equipment, and electric customers'

equipment or presents a safety hazard.

d. Electric distribution system emergency
e. Routine maintenance, repairs, and modifications is required and performed in a reasonable time with prior notice.
f. Other material noncompliance with technical or contractual requirements in the Generator Interconnection and Operating Agreement.

DTE Electric may require disconnection of a Project from the distribution system for the above conditions, which may include but is not limited to the following examples:

a. When public safety is being jeopardized.
b. During voltage, frequency, or loading problems.
c. When abnormal sectionalizing or circuit configuration occurs on the DTE system.
d. During scheduled shutdown of DTE equipment that are necessary to facilitate maintenance or repairs. In the event there is demonstrated electrical interference (i.e. Voltage Flicker, Harmonic Distortion, etc.) to DTE customers, suspected to be caused by the Project, and such interference exceeds then current system standards, DTE reserves the right to install special test equipment as may be required to perform a disturbance analysis and monitor the operation and control of the Project to evaluate the quality of power produced by the Project. In the event that no standards exist, then the applicable tariffs and rules governing electric service shall apply. If the Project is the source of the interference, and that interference exceeds DTE standards or generally accepted industry standards, then it shall be the responsibility of the Applicant to eliminate the interference problem.
e. When either the Project or its associated synchronizing and protective equipment fails or is demonstrated by DTE to be improperly maintained, so as to present a hazard to the DTE system or its customers.
f. Whenever the Project is operating isolated (islanded) with other DTE customers, for whatever reason.
g. Export of energy by a non-export project until non export functionality can be suitably demonstrated. DTE will not provide payment for any energy exported to the electrical system by a non-Export project.

DTE may disconnect electric service in order disconnect a Project from the electric system, pursuant to R 460.136.

Maintenance and Testing

DTE reserves the right to test the relaying and control equipment that involves protection of the DTE electric system whenever DTE determines a reasonable need for such testing exists.

The Applicant is solely responsible for conducting and documenting periodic maintenance and testing on the generating equipment and its associated control, protective equipment, interrupting devices, and main isolation device, per manufacturer recommendations. DTE reserves the right to review the documentation of periodic maintenance and/or power quality information that the applicant has collected.

If protective relaying is required per the technical requirements, the Applicant is responsible for conducting and documenting periodic maintenance and testing every 4 years on relays and the associated interrupting devices, control schemes, and batteries, unless a written extension is provided by DTE. If testing is required, it shall be conducted in accordance with the test procedures provided by DTE as part of inspection testing. DTE reserves the right to review the protection settings at any time and provide changes to those settings as needed.

DTE reserves the right to witness the testing. The Applicant is responsible for maintaining written reports for the above tests for a period of four years. These written reports shall be made available to DTE upon request.

INTERCONNECTION PROCEDURES TECHNICAL REQUIREMENTS

The following discussion details the technical requirements for interconnection of Level 1 and 2 Projects. Many of these requirements may not be applicable to the majority of level 1 or 2 projects but are included herein for the small number of cases when they may be needed. Many of these requirements will vary based on the DER capacity and Export Capacity of the Project, generation type, voltage level, and mode of operation (Export or Non-Export). A few of the requirements will vary based on location of the interconnection (isolated load and available fault current).

Certain major component, as specified in this document, must be met to provide compatibility between the Project equipment and the DTE electric system, and to ensure that the safety and reliability of the electric system is not degraded by the interconnection.

DTE reserves the right to evaluate and apply newly developed protection and/or operation schemes at its discretion. All protective schemes and functions are evaluated for compliance to IEEE 1547-2018. In addition, DTE reserves the right to evaluate Projects on an ongoing basis as system conditions change, such as circuit loading, additional generation placed online, or if required to do so by the regional Transmission operator, reliability coordinator or Independent System Operator etc.

Major Component Design Requirements

The data requested for all major equipment and relaying proposed by the Applicant, must be submitted as part of the initial interconnection application for review and approval by DTE. DTE may request additional data be submitted during the interconnection process to clarify the operation of the Project facilities.

Once installed, the interconnection equipment must be reviewed and approved by DTE prior to being connected to the DTE electric system, and before parallel operation is allowed.

Data

The data that DTE requires to evaluate the proposed interconnection is documented on the generator interconnection application (**Appendix D**). A site plan and one- line diagram with details of the interconnection protection system, are required as part of the application data. The one-line diagram must be sealed by a professional engineer licensed in the state of Michigan. 3 line diagrams and protection configurations may be required depending on the DER connection type and location I the Applicant facility. The generator manufacturer data package should also be supplied including any supplemental equipment datasheets necessary to characterize the DER.

DTE may require the applicant to provide modelling information of the DER to comply with MISO reliability and system modeling requirements.

The Applicant may request DTE study the Project at a reduced power output (Export Capacity) below the DER Capacity. The Applicant must provide the export capacity and method used to reduce the power output as part of the application data for review and approval by DTE. DTE requires limited export relaying to trip the Project if the Export capacity is exceeded.

Isolating Transformers

If a transformer is utilized, the transformer shall meet the following requirements.

- The transformer shall comply with the current ANSI Standard C57.12.
- The transformer shall have voltage taps on the high and/or low voltage windings sufficient to assure satisfactory generator operation over the range of voltage variation expected on the DTE electric system.
- The proper selection and specification of transformer impedance is important relative to enabling the proposed Project to meet DTE's reactive power requirements (see "Reactive Power Capability and Voltage Control").
- The transformer utility and Project side winding connections shall be selected using the following table. The transformer may have multiple project side windings.

PCC Voltage	System Configuration	Transformer Winding Connection		Special Requirements
		Utility Side	Project Side	
40 kV	Grounded Wye	Delta	No Preference	
		Grounded Wye	Delta	See Note 1
Below 40 kV	Grounded Wye	Grounded Wye	Ungrounded Wye	See Note 2
			Grounded Wye	See Note 3
	Delta	Delta	No Preference	

Table – Three Phase Transformer Winding Connections

Note 1: Requires the Project to be connected to its own line exit.
Note 2: Additional transformers connected to the Project side transformer winding cannot in combination with each other be a source of zero sequence current. For example, an ungrounded wye to delta transformer with the neutrals of both ungrounded wye transformer windings connected. The connection of the neutrals would cause the series combination of the grounded wye to ungrounded wye transformer and the ungrounded wye to delta transformer to mimic a grounded wye to delta transformer which is a source of zero sequence current.
Note 3: Additional transformers connected to the Project side transformer winding cannot be a source of zero sequence current. For example, the transformer may not be connected Grounded Wye (utility side) – Delta (Project side).

Interrupting Device

A three-phase interrupting device is required between the Project and DTE. The interrupting device may be required to be located at the PCC depending on protective and operational requirements of the area. If required, the interrupting device shall meet the following requirements.

- Must be a recloser, circuit switcher, or breaker.
- Must be approved for use on the DTE electric system.

- Must comply with current relevant ANSI and/or IEEE Standards.
- Must be rated for the application.
- Must have adequate interrupting capability. DTE will provide maximum short circuit currents and X/R ratios for faults at the PCC upon request.

Isolation Device

A main isolation device, that is readily accessible, lockable and provides a visible break shall be located between DTE and the project DER when required by DTE operating procedures as determined by the operating voltage of the site.

An isolation device is required and should be placed at the PCC. It can be a pole top switch, load-break disconnect, etc., depending on the electrical system configuration. The isolation device shall meet the following requirements.

- Must be approved for use on the DTE electric system.
- Must comply with current relevant ANSI and/or IEEE Standards.
- Must have load break capability, unless used in series with a three-phase interrupting device. Must be rated for the application.
- Must be operable and accessible by DTE at all times (24 hours a day, 7 days a week). If the device is remotely operable, DTE shall have remote access to the device at all times.
- The isolation device will be used as a protective tagging point. The device must have visible open break provisions for padlocking in the open position, and it must be gang operated. If the device has automatic operation, the controls must be located remote from the device.
- The installation of the device shall meet OSHA, NEC, and NESC requirements for access and arc flash.
- Must be clearly marked to include signage per the National Electrical Code (NEC), as applicable.

Interconnection Facilities

The available system voltage, as well as equipment and operational constraints influence the chosen point of interconnection. DTE has the ultimate authority to determine the acceptability of a particular PCC.

Any new line or interconnection facilities required to connect the Project to the DTE's electric system will be constructed by DTE at the Applicant's expense. DTE may require one or more utility owned and controlled devices and supporting structures to allow for communication and control and proper operation of the electrical system. These will be included in the interconnection facilities.
DTE may require the new line construction to be terminated on a structure provided by the Applicant. Interconnection lines and facilities must be coordinated with DTE.

The applicant is responsible for securing any new Rights of Way for the project interconnection facilities or line extensions.

Termination Structure

The Applicant is responsible for ensuring that structural material strengths are adequate for all requirements. Upon written request, DTE will provide maximum dead-end line tension information. The structure shall adhere to the latest edition of the National Electrical Safety Code (NESC) as adopted by the commission and in accordance with DTE design standards.

Electrical clearances shall adhere to the latest edition of the NESC as adopted by the commission and according to DTE design standards and shall be coordinated with DTE.

The 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 and rated for the application.

Inverters

Certified inverter Projects must use inverter(s) that conform to the IEEE 1547.1-2020 standard. In order to show compliance, a certificate of compliance from an OSHA approved national recognized testing laboratory must be submitted as part of the application and the manufacturer must mark the equipment such that a field inspection can verify the certification. The certification of compliance must clearly state the inverter has been tested to the latest UL 1741 using IEEE 1547.1-2020 as the functional Source Requirement Document.

The inverters shall be certified to meet the following performance Categories.

1. Normal Operating Performance – Category B

   Abnormal Operating Performance – Category III ** The manufacturer is required to mark the abnormal operating category on the equipment.

If the requirements of this section are met, the inverter is deemed “certified” as defined within **Appendix C**.

Documentation of harmonics testing of the inverter to IEEE-519 standards and supporting harmonics tables shall be submitted to DTE.

Interconnection Protection

The interconnection relaying design requirements are intended to assure adequate protection of the DTE electric system. Any additional relaying which may be necessary to protect equipment at the Project is solely the responsibility of the Applicant to determine, design, and apply.

The relaying requirements will vary with the DER capacity rating of the Project, the type of generation being used, configuration of the Project, and the mode of operation (Export or Non-Export).

All relaying proposed by the Applicant to satisfy these requirements must be submitted for review and approved by DTE. DTE may request test records and verification of settings operation at any time.

Protective Relaying General Considerations

The installation of utility grade relays are required for all Project types. All relays must be equipped with targets or other visible indicators to indicate that the relay has operated.

If the protective system uses AC power as the control voltage, it must be designed to disconnect the generation from the DTE electric system if the AC control power is lost.
DTE will work with the Applicant regarding the system design for this requirement.

The protective system must be designed such that the Applicant is prevented from energizing the DTE electric system if that system is de-energized.

DTE may require a breaker failure detection scheme and alarming or other failsafe systems to identify and mitigate mis-operation of the protection system.

Capacity of the DER and Acceptable methods for power limiting or export control

DTE shall study interconnection of limited-export or non-exporting generating facilities and energy storage and allow those that meet the requirements in this section. The applicant must submit an interconnection application based on the total aggregate nameplate capacity (DER Capacity) of the site that will be defined as the maximum capacity and supply the maximum deliverable fault current of the DER(s). An export capacity may be supplied in the application for consideration by the Utility; however, all determinations of level and application of interconnection process will use the DER capacity. DTE will perform studies and screens based on the relaying or power control method being utilized and assess the risk of the export capacity method vs the DER capacity. Additionally, some screens and studies will apply other electrical and operating parameters of the DER. For example, screens and studies that evaluate protection fault current shall use full instantaneous fault rating of the device as fault current is not controlled through power limiting functions, only steady state power output. Similarly screens and studies may use the total power output in Apparent power (MVA) when considering the impacts of voltage control modes that may reduce the real power output.

If a Generating Facility uses any configuration or operating mode to limit the export of electrical power across the Point of Common Coupling, then power limited capacity shall be only the amount capable of being exported. To prevent impacts on system safety and reliability, DTE will assess the risk of the proposed method based on the DER capacity against the proposed export capacity and the method proposed by the applicant. The export capacity, if accepted, will be documented independently from the DER nameplate rating and DER capacity in the Interconnection as a condition of the Interconnection Agreement and Parallel Operation Authorization

When using an Export Capacity, the maximum DER Capacity in combination with aggregate DER shall not exceed the day-to-day thermal limit of any utility equipment or service equipment on the line section(s) back to the substation.

An Applicant is required to provide the export capacity in the application, which is either the DER Capacity or a lower amount defined below when using one of the following methods. The Applicant for tracks other than Non-Export track may not list the export capacity below 80% of the DER Capacity when using reverse/under power protective functions and power control systems to protect against inadvertent export.

Inadvertent Export for export limited systems shall not exceed any of the following: 200ms, the nameplate maximum of the DER. 110% of the Export Capacity, exceed the day-to-day thermal rating of any utility equipment or device serving the site. If the inadvertent export will exceed these ranges, the DER shall immediately cease to energize and then follow return to service criteria. Inadvertent export outside of these ranges including repetitive or frequent inadvertent export shall be subject to disconnection until the equipment can be repaired and brought back into compliance through verifiable testing.

The following methods may be accepted:

1. 32R Relay Reverse power

   This relay will be applied to non-export projects. The reverse power relay must be selected such that it can detect a power low in the DTE system of a small fraction of the overall Project DER capacity. The relay will trip a dedicated generation breaker, the generation prime mover, or a breaker identified by the applicant that can verifiably isolate the generation within the required timing. The relay will normally be set near its minimum (most sensitive) setting and will take into account the total metering accuracy of the protection system. By default, It will trip after a 1 second time delay. The delay will avoid unnecessary tripping for momentary conditions. More specific settings will be issued on a case-by-case basis and be documented in the Interconnection Agreement.

2. 32R Relay Reverse power - Power limiting

   This relay will be applied to limited export projects. The reverse power relay must be selected such that it can detect a power flow into the DTE system above the Project export capacity. The relay will trip a dedicated generation breaker, the generation prime mover, or a breaker identified by the applicant that can verifiably isolate the generation within the required timing. The relay will normally be set to have 102% of the export capacity and will take into account the total metering accuracy of the protection system. By default, it will trip after a 2 second time delay. The delay will avoid unnecessary tripping for momentary conditions. More specific settings will be issued on a case-by-case basis and be documented in the Interconnection Agreement.

3. 32U Relay – Under Power (Minimum Import)

   This relay will be applied to limited export projects. The Under-power relay must be selected such that it can detect a minimum amount of power flow from the DTE system. The relay will trip a dedicated generation breaker, the generation prime mover, or a breaker identified by the applicant that can verifiably isolate the generation within the required timing. The relay will normally be set near its minimum (most sensitive) setting and will take into account the total metering accuracy of the protection system. By default it will trip after a 2 second time delay. The delay will avoid unnecessary tripping for momentary conditions. More specific settings will be issued on a case by case basis and be documented in the Interconnection Agreement. Special consideration should be taken when selecting and setting and under-power function due to minimum operating quantities required for the function to operate correctly.

4. The nameplate rating of the DER, minus any auxiliary load, must be so small in comparison to its host facility's minimum load that the use of additional protective functions are not required to ensure that power is not exported to the distribution system. This option requires the DER capacity must be no greater than 10% of the applicant's verifiable minimum gross load over the past 12 months. The customer is responsible for disabling the DER for any times where load will fall below the value specified in the interconnection agreement, such as during a plant shutdown or maintenance activities.

5. A reduced output rating utilizing the power rating configuration setting may be used to ensure the DER does not generate power beyond a certain value lower than the nameplate rating. This adjustment to nameplate rating must show permanent modification of the DER output capability with vendor documentation and equipment labelling indicating the nameplate value has been changed. This nameplate change must be stable through firmware updates and not be user modifiable. An inverter settings compliance report is required upon commissioning and at any time upon request from the utility.

6. DERs may utilize a Nationally Recognized Testing Laboratory Certified Power Control System and inverter system has manufacturer secured firmware that disables end user settings modification post installation that allows power-limited export functions as defined in IEEE1547-2020.1 UL-1741 PCS CRD, UL1741 SC or NEC Section 705.12 or subsequent standards and that has a firmware configuration that is not end user modifiable. An inverter settings compliance report is required upon commissioning and at any time upon request from the utility.

   The applicant may propose alternative methods to ensure power is not continuously exported above a mutually agreed upon limit across the point of common coupling. The applicant must provide detailed documentation stating how the alternate method limits export and inadvertent export levels to levels approved by DTE. The applicant must list the export capacity as the mutually agreed upon limit in the application when using an alternative method. Review of the alternative method may result on the application being placed on hold to provide sufficient time to review the proposed method. DTE will evaluate the method to determine if it will meet criteria for safe and reliable operation that are compatible with the electrical system and operating practices.

The following process will be used to evaluate inverter based power control systems.

Power limiting process

1. Applicant applies for a system with an inverter(s) and lists a desired export limited capacity in addition to the DER nameplate and DER capacity. Power limiting is not applicable to discrete microinverters.
2. Applicant also selects an applicable inverter that implements either a reduced output rating or power limiting function.
3. DTE identifies that the project requires power limited export due to site restrictions, safety concerns, tariff requirements or regulatory compliance. Alternatively, power limited export is chosen as an option by the applicant.
4. Applicant provides one-line or three line diagram indicating equipment with power-limited export and associated measuring, metering and sensing devices.

5. DTE ensures that the selected inverter has power-limited export capability meeting the criteria in the acceptable methods for power limiting and export control.
6. DTE provides applicant the required power-limited export value in kW for each specified inverter.
7. DTE approves the application package and allows the applicant to construct the project and instructs applicant to provide necessary power-limited export documentation. The required documentation is as follows:
    a. Manufacturer supplied inverter settings compliance report. This report should include the inverter manufacture, inverter model, inverter unique identification number, a power-limited export value in kW, manufacturer contact information and the address that the inverter will be installed at.
    b. Photograph of the nameplate or LCD display on each specified inverter showing a unique identification number (such as serial number) that matches the compliance report
    c. Photograph of Inverter power-limited export value setting in kW as applicable to that inverter model.
8. Applicant obtains required documentation to prove that specific inverters at a given premise are limited to the DTE required limit and provides that documentation to DTE.
9. DTE verifies that all the provided documentation meets all the necessary requirements to implement the power-limited export and keeps a record of the inverter settings and compliance report
10. DTE may ask for validation of the settings at any time, and if settings have changed, the DER is subject to disconnection as a violation of the Interconnection Agreement and Parallel Operating Authorization.

Testing and certification requirements of DER telecommunications, cybersecurity, data exchange, and remote control operation

Based on the Project system impact, Size, Project design, exiting and proposed grid equipment, operational constraints, design standards, Project operational requirements, risk to critical infrastructure or other customers, compliance to program or tariff or other factors DTE shall undertake a review of necessary telecommunications, settings, configuration, cybersecurity, data exchange and remote control requirements and determine what if any requirements are appropriate for the project to safely and reliably connect to the electrical system These requirements will be detailed in the Construction Agreement attachment to the Interconnection Agreement and are a requirement for interconnection.

DTE may determine in an effort to expedite Project progress, and at its sole discretion, that no additional study or review is needed and provide a set scope of telecommunications, settings, configuration, cybersecurity, data exchange and remote control that is acceptable to the Utility. This may be provided as a standard package prior to any study to allow the Project to understand its responsibilities.

Notwithstanding Project and site specific requirements determined during study or review, the following will be true for all projects and requirements will be detailed in the Construction Agreement attachment to the Interconnection Agreement:

Projects exceeding 1MW and those required by study to SCADA must have utility SCADA monitoring utilizing a DTE specified point list, method of transport and protocols either through a DTE provided device or utilization of customer switchgear or breaker and relaying equipment as

agreed to by DTE.
Metering equipment, CTs, PTs and associated telecommunications will be provided and maintained by DTE. It is the customers responsibility to provide meter sockets, CT cabinets, support structures, conduit and wiring in compliance with DTE Service Installation Manual, Primary Services Design and all relevant and effective codes and procedures.
Study may indicate that projects of any size may require additional telecommunications, cybersecurity, data exchange, and remote control

Projects desiring market access will be subject to designs that are compliant with MISO or other market requirements.
Projects participating in Utility programs or Tariffs may be subject to additional requirements for testing, certification, telecommunications, cybersecurity, data exchange, and remote control as dictated by and in compliance with those programs or Tariffs.

Projects that have BES, NERC or FERC compliance requirements shall be notified of their responsibility and be subject to the current and on-going responsibilities entailed in those requirements as part of the interconnection agreement and the Authorization for Parallel Operation.
Interface between DTE and the project shall conform with DTE design and cybersecurity standards and be in compliance with the current IEEE1547 including the current version of IEEE 1547.3
DTE is not responsible for the Projects telecommunications to the project owner, operator or other third parties that the Project may be associated with. This would also include communications to and from market entities by the Project.

DTE will specify site specific design requirements, configurations, hardware and network architecture to ensure necessary isolation of metering and grid control networks from the public internet, customer networks and any other networks present at the Project site(s).

Momentary Paralleling

For situations where the Project will only be operated in parallel with DTE electric system for 100 milliseconds or less, as in a make-before-break automatic transfer scheme, no additional relaying is required. Such momentary paralleling requires a modern integrated Automatic Transfer Switch (ATS) system, which is incapable of paralleling the Project with the DTE electric system. The ATS must be tested and verified for proper operation at least every 4 years unless a written extension is provided by DTE. DTE may be present during this testing. DTE may request test records and verification of operation at any time.

Instrument Transformer Requirements

All relaying must be connected into instrument transformers. DTE may allow the use of Capacitive Voltage Sensors for select protective functions.

All current connections shall be connected into current transformers (CTs). All CTs shall be rated to provide no more than 5 amperes secondary current for all normal load conditions, and must be designed for relaying use, with an “accuracy class” of at least C50. Current

transformers with an accuracy class designation such as T50 are NOT acceptable. For three-phase systems, all three phases must be equipped with CTs.

All potential connections must be connected into voltage transformers (VTs). For single-phase connections, the VTs shall be provided such that the secondary voltage does not exceed 120 volts for normal operations. For three-phase connections, the VTs shall be provided such that the line-to-line voltage does not exceed 208 volts for normal operation, and both the primary and secondary of the VTs shall be connected for grounded-wye connections.

Direct Transfer Trip (DTT)

Direct Transfer Trip is required to prevent sustained isolated operation of the generation for conditions where voltage and frequency protective relaying at the Project may not otherwise operate. Direct Transfer Trip is generally not required for Projects that will operate in the Non-Export Mode since a more economic reverse power relay scheme can usually meet the requirements. For Export Projects, the need for DTT is determined based on the location of the PCC and generation type.

For synchronous and induction type projects, DTE requires DTT when the total generation within a protective zone is greater than 33% of the minimum Utility load that could be isolated along with the generation. In cases where it can be shown that self-excitation of the induction generator cannot occur when isolated from the DTE system, DTE may waive the requirement.

For inverter-type Projects, DTE requires DTT when the total generation within a protective zone is greater than 50% of the minimum Utility load that could be isolated along with the generation or when there is synchronous generation that can interact with the inverter based system. This prevents sustained isolated operation of the generation for conditions where the inverter anti-islanding may not otherwise trip the Project. Inverter based Projects shall be certified to comply with anti-islanding safety standards in addition to any DTT requirements.

Direct transfer trip adds to the cost and complexity of an interconnection. The Applicant will be responsible for all expenses associated with the installation, operation, and maintenance of the DTT system. A DTT transmitter, installed by DTE, is generally required for each Utility protective device whose operation could result in sustained isolated operation of the Project. At least one associated DTT receiver, that is supplied, owned, operated and maintained by DTE, is required at the Project. A data Communication Circuit is generally required at each transmitter and receiver location dependent on the DTT technology. Telemetry is required to monitor status of the DTT communication, even if telemetry would not otherwise have been required.

The Applicant shall provide a suitable location, approved by DTE, for the Applicant to install the DTT receiver and associated equipment. The Applicant shall provide the following connections and associated equipment to the location, which may include but is not limited to:

1. A 24, 48 V or 125 V DC power supply capable of providing an 8-hour backup. The Applicant shall coordinate with DTE to properly size the DC power supply.
2. A 120 V AC power supply for heating unconditioned (e.g. outdoor) locations and for use with AC/DC converters. The Applicant shall coordinate with DTE to properly size the AC power supply.
3. A control circuit or communication cable to allow the DTT receiver to trip and lockout the Project.

4. A control circuit for transferring telemetry and disturbance monitoring statuses (e.g. LOG, RTX) to the Project prior to being passed to the RTU using the Communication Interface.

5. An antenna cable for connection to an external antenna. DTE will supply the antenna cable.

6. A communication cable for connection to Communication Circuit equipment (e.g. Router/Switch).

7. A voice Communication Circuit, when cellular phone service is not available, for the commissioning and checkout of the metering, DTT, and RTU.

The above connections shall be connected to the DTT receiver by the Applicant where indicated by DTE.

Reverse Power Relaying for Non-Export

If Export Mode is not utilized, reverse power protection must be provided. The reverse power relaying will detect power flow from the Project into the DTE system, and operation of the reverse power relaying will separate the Project from the DTE system.

Automatic Reclosing

DTE employs automatic multiple-shot reclosing on most of the circuit breakers and circuit reclosers to increase the reliability of service to its customers. Automatic single- phase overhead reclosers are regularly installed on distribution circuits to isolate faulted segments of these circuits.

The Applicant is advised to consider the effects of Automatic Reclosing (both single-phase and three-phase) to assure that the Project's internal equipment will not be damaged. In addition to the risk of damage to the Project, an out-of-phase reclosing operation may also present a hazard to DTE equipment that may not be rated or built to withstand this type of reclosing.

DTE will determine relaying and control equipment (e.g. volt check relays) that needs to be installed to protect its own equipment from out-of-phase reclosing. Installation of this protection will be undertaken by DTE at the expense of the Applicant expense. DTE shall not be liable to the customer with respect to damage(s) to the Project arising as a result of Automatic Reclosing.

Single-Phase Sectionalizing

DTE also installs single-phase fuses and/or reclosers on its distribution circuits to increase the reliability of service to its customers. Three-phase generator installations may require replacement of fuses and/or single-phase reclosers with three-phase circuit breakers or circuit reclosers at the Applicant's expense.

Synchronous Projects

Three-phase or three single-phase over/under frequency (81O/U) relaying and under/overvoltage (27/59) relaying are required. The 27, 59 and 81O/U relays shall be connected to VTs located at the PCC, unless otherwise approved by DTE. VTs connected to the Project side of transformers without zero sequence continuity (e.g. ungrounded wye or delta winding connections) on a grounded distribution system is not allowed.

Transformers 15 MVA (self-cooled rating) or larger shall be equipped with differential (87) relaying thus requiring a three-phase interrupting device on the utility side of the isolation transformer.

Each Project must also be equipped with three-phase voltage-restrained overcurrent (51V) relays to detect faults on the DTE electric system. The (51V) shall be connected to VTs located on the generator branch or bus, unless otherwise approved by DTE. The (51V) relay shall be connected to CTs that monitor current on the generator branch, unless otherwise approved by DTE.

In order to minimize damage to both Project equipment and to the DTE electric system equipment for loss-of-synchronism (also called out-of-step), and to minimize disruptions to other DTE customers in the area, out-of-step relaying may also be required. The out-of-step relaying would usually be installed at the same location as the metering and would isolate the Project from the DTE electric system.

If the Project is connected to a grounded distribution system via one of the approved isolation transformer connections, ground fault detection for utility faults may be required at the discretion of DTE and will consist of a (59N) ground overvoltage relay or (51N) time overcurrent relay. The specific application of this relay will depend on the connection of the isolation transformer and the available ground fault current:

1. If a delta Utility side/grounded-wye Project side isolation transformer connection is used, a (59N) relay will be connected into the secondary of a set of three-phase VTs, which will be connected grounded-wye primary, with the secondary connected delta with one corner of the delta left open or grounded-wye depending on the relay input requirements. The primary windings of the VTs will be connected to the Utility side of the isolation transformer.

2. If a grounded-wye Utility side/grounded-wye Project side isolation transformer connection is used, a (51N) relay will be connected into either a CT located on the Utility side isolation transformer neutral or three phase CTs located on the Utility side of the isolation transformer depending on the relay input requirements. A (59N) relay will be required, in place of the (51N) relay, if the Project does not provide an adequate quantity of ground fault current as determined by DTE. The (59N) relay will be connected into the secondary of a set of three-phase VTs, which will be connected grounded-wye primary, with the secondary connected delta with one corner of the delta left open or grounded-wye depending on the relay input requirements. The primary windings of the VTs will be connected to the Utility side of the isolation transformer.

3. If a grounded-wye Utility side/delta Project side isolation transformer connection is used, a (51N) relay will be connected into either a CT located on the Utility side isolation transformer neutral connection or three phase CTs located on the Utility side of the isolation transformer depending on the relay input requirements.

In some instances, additional (51N) or (59N) relaying may be required for situations where DTE owns an isolation transformer.

Induction Projects

Three-phase or three single-phase over/under frequency (81O/U) relaying and under/overvoltage (27/59) relaying are required. The 27, 59 and 81O/U relays shall be connected to VTs located at the PCC, unless otherwise approved by DTE. VTs connected to the Project side of transformers without zero sequence continuity (e.g. ungrounded wye or delta winding connections) on a grounded distribution system is not allowed.

If the Project is connected to a grounded distribution system via one of the approved isolation transformer connections specified above, ground fault detection for utility faults may be required at the discretion of DTE, and will consist of a (59N) ground overvoltage relay.

Transformers 15 MVA (self-cooled rating) or larger shall be equipped with differential (87) relaying thus requiring a three-phase interrupting device on the utility side of the isolation transformer.

Communication based protection, like line differential (87L) relaying, is required to detect phase and ground faults on the DTE electric system. In cases where it can be shown that self-excitation of the induction generator cannot occur when isolated from the DTE system, DTE may waive this requirement. The relaying shall be connected to CTs and VTS located at the PCC, unless otherwise specified by DTE.

If the Project is connected to a grounded distribution system via one of the approved isolation transformer connections, ground fault detection for utility faults may be required at the discretion of DTE and will consist of a (59N) ground overvoltage relay or (51N) time overcurrent relay. In cases where it can be shown that self-excitation of the induction generator cannot occur when isolated from the DTE system, DTE may waive the requirement. The specific application of this relay will depend on the connection of the isolation transformer and the available ground fault current.

1. If a delta Utility side/grounded-wye Project side isolation transformer connection is used, a (59N) relay will be connected into the secondary of a set of three-phase VTs, which will be connected grounded-wye primary, with the secondary connected delta with one corner of the delta left open or grounded-wye depending on the relay input requirements. The primary windings of the VTs will be connected to the Utility side of the isolation transformer.

2. If a grounded-wye Utility side/grounded-wye Project side isolation transformer connection is used, a (51N) relay will be connected into either a CT located on the Utility side isolation transformer neutral or three phase CTs located on the Utility side of the isolation transformer depending on the relay input requirements. A (59N) relay will be required, in place of the (51N) relay, if the Project does not provide an adequate quantity of ground fault current as determined by DTE. The (59N) relay will be connected into the secondary of a set of three-phase VTs, which will be connected grounded-wye primary, with the secondary connected delta with one corner of the delta left open or grounded-wye depending on the relay input requirements. The primary windings of the VTs will be connected to the Utility side of the isolation transformer.

3. If a grounded-wye Utility side/delta Project side isolation transformer connection is used, a (51N) relay will be connected into either a CT located on the Utility side isolation transformer

neutral connection or three phase CTs located on the Utility side of the isolation transformer depending on the relay input requirements.

In some instances, additional (51N) or (59N) relaying maybe required for situations where DTE owns an isolation transformer.

Inverter Projects

To expedite processing, Inverters used in projects should appear on the California Energy Commission's list for certified equipment (https://www.energy.ca.gov/programs-and-topics/programs/solar-equipment-lists). Use of an inverter that is not on the CEC list requires the submission in the application of the appropriate UL1741 certification document for the current active supplement version that matches the exact model being utilized and additional supporting information to accurately represent the inverter in the application. Failure to produce the UL certification or discrepancies in the documentation may result in the application being placed on hold while DTE reviews the provided documentation.

Three-phase or three single-phase over/under frequency (81O/U) relaying and under/overvoltage (27/59) relaying are required. The 27, 59 and 81O/U relays shall be connected to VTs located at the PCC, unless otherwise approved by DTE. VTs connected to the Project side of transformers without zero sequence continuity (e.g., ungrounded wye or delta winding connections) on a grounded distribution system is not allowed.

Transformers 15 MVA (self-cooled rating) or larger shall be equipped with differential (87) relaying thus requiring a three-phase interrupting device on the utility side of the isolation transformer.

If the Project is connected to a grounded distribution system, ground fault detection for utility faults is required and will consist of a (59N) ground overvoltage relay. The (59N) relay will be connected into the secondary of a set of three-phase VTs, which will be connected grounded-wye primary, with the secondary connected delta with one corner of the delta left open or grounded-wye depending on the relay input requirements. The 59N relay shall be connected to VTs located at the PCC, unless otherwise approved by DTE. VTs connected to the Project side of transformers without zero sequence continuity (e.g. ungrounded wye or delta winding connections) is not allowed.

In some instances, additional (59N) relaying may be required for situations where DTE owns an isolation transformer.

Interconnection Protection Settings

Relay Setting Criteria

The relay settings as detailed in this section will apply in the vast majority of applications. DTE will issue relay settings for each individual Project that will address the settings for these protective functions. All voltages will be adjusted for the specific VT ratio, and all currents will be adjusted for the specific CT ratio. The trip times and thresholds of the over/under voltage and frequency relays may vary depending on Ride Through requirements.

Undervoltage Relays

Two steps of undervoltage relaying are required when Ride Through is enabled. For the first overvoltage set point, the undervoltage relays will normally be set to trip at 88% of the nominal primary voltage at the relay location, and must reset from a trip condition if the voltage increases to 90% of the nominal primary voltage at the relay location. In order to accommodate variations in this criterion, the trip point of the relays shall be adjustable over a range of 70% of the nominal voltage to 90% of the nominal voltage. The trip time shall not exceed 1.0 seconds at 90% of the relay setting. When Ride Through is enabled, the trip time shall be 5.0 seconds at 90% of the relay setting.

For the second undervoltage set point, the undervoltage relays will normally be set to trip at 70% of the nominal primary voltage at the relay location and must reset from a trip condition if the voltage increases to 72% of the nominal primary voltage at the relay location. In order to accommodate variations in this criterion, the trip point of the relays shall be adjustable over a range of 50% of the nominal voltage to 90% of the nominal voltage. The trip time shall be 1.0 second at 90% of the relay setting.

Overvoltage Relays

Two steps of overvoltage relaying are required. For the first overvoltage set point, the overvoltage relays will normally be set to trip at 110% of the nominal primary voltage at the relay location, and must reset from a trip condition if the voltage decreases to 108% of the nominal primary voltage at the relay location. In order to accommodate variations in this criterion, the trip point of the relays shall be adjustable over a range of 105% of the nominal voltage to 120% of the nominal voltage. The trip time shall not exceed 1.0 seconds at 110% of the relay setting.

For the second overvoltage set point, the overvoltage relays will normally be set to trip at 120% of the nominal primary voltage at the relay location, and must reset from a trip condition if the voltage decreases to 118% of the nominal primary voltage at the relay location. In order to accommodate variations in this criterion, the trip point of the relays shall be adjustable over a range of 115% of the nominal voltage to 140% of the nominal voltage. The trip time shall be instantaneous (relay operating time not to exceed 0.02 seconds at 110% of the trip setting).

Underfrequency Relays

Two steps of underfrequency relaying are required when Ride Through is enabled. For the first underfrequency setpoint, the underfrequency relay will normally be set for a trip point of 58.5 Hz and must trip instantaneously within 0.2 seconds. When Ride Through is enabled, the trip time shall be 300 seconds unless otherwise specified. Relays with an inverse time characteristic (where the trip time changes

with respect to the applied frequency) are not acceptable. These relays must respond reliably for applied source voltages as low as 70% of the nominal voltage.

For the second underfrequency set point, the underfrequency relays will normally be set for a trip point of 57.0 Hz and must trip instantaneously within 0.2 seconds. Relays with an inverse time characteristic (where the trip time changes with respect to the applied frequency) are not acceptable. These relays must respond reliably for applied source voltages as low as 70% of the nominal voltage.

Overfrequency Relays

Two steps of overfrequency relaying are required when Ride Through is enabled. For the first overfrequency set point, the overfrequency relay will normally be set for a trip point of 60.5 Hz, and must trip instantaneously within 0.2 seconds. When Ride Through is enabled, the trip time shall be 300 seconds unless otherwise specified. Relays with an inverse time characteristic are not acceptable. These relays must respond reliably for applied source voltages as low as 70% of the nominal voltage.

For the second overfrequency set point, the overfrequency relay will normally be set for a trip point of 62.0 Hz and must trip instantaneously within 0.2 seconds. Relays with an inverse time characteristic are not acceptable. These relays must respond reliably for applied source voltages as low as 70% of the nominal voltage.

51V Relays – Voltage Restrained Overcurrent Relays

For synchronous Project applications, the (51V) relays must be set to detect any phase faults that may occur between the Project and the nearest three-phase fault clearing device on the DTE system. Since these faults may take up to 1-second to detect and isolate, the appropriate saturated direct-axis reactance of the Project will be used depending on its time constants. The CT ratios and specific relay settings will be determined via a fault study performed by DTE. The settings of this device will consider the relay manufacturer's recommended practice for the type of Project and prime mover (mechanical energy source) and will be determined by DTE for the specific system application.

59N Relay – Ground Fault Detection

This relay will be applied to detect ground faults on the DTE system when the Project is connected to a grounded Utility system and not capable of providing an adequate quantity of ground fault current for a 51N relay. This relay will be set for a 10% shift (10 multiples of pickup) in the apparent power system neutral. For an ungrounded-wye transformer winding with a single 120 V secondary VT, the setting will usually be 12 Volts. For a delta transformer winding with broken delta 120 V secondary VTs, the setting will usually be 20 Volts. The time delay will normally be 1 second.

51N Relay – Ground Fault Detection

This relay will be applied to detect ground faults on the DTE system when the Project is connected to a grounded Utility system and capable of providing an adequate quantity of ground fault current. This relay will be set to detect faults on the directly connected Utility system, and the timing will be set to comply with Utility practice for overcurrent relay

coordination. The CT ratio and specific relay setting will be determined via a fault study performed by DTE.

32 Relay – Reverse Power

This relay will be applied to Non-Export projects. The reverse power relay must be selected such that it can detect a power flow into the DTE system. The relay will normally be set near its minimum (most sensitive) setting and will trip after a 1 second time delay. The delay will avoid unnecessary tripping for momentary conditions.

This relay will be applied to limited export projects. The reverse power relay must be selected such that it can detect a power flow into the DTE system above the maximum Project export capacity. The relay will normally be set to have 102% of the maximum export Project capacity and will trip after a 5 second time delay. The delay will avoid unnecessary tripping for momentary conditions.

32U Relay – Under Power (Min Import)

This relay will be applied to limited export projects. The under-power relay must be selected such that it can detect a minimum amount of power flow from the DTE system. The relay will normally be set near its minimum (most sensitive) setting and will trip after a 5 second time delay. The delay will avoid unnecessary tripping for momentary conditions. Special consideration should be taken when selecting and setting an under-power function due to minimum operating quantities required for the function to operate correctly.

Inverter Setting Criteria

DTE will provide inverter settings to the Project Developer. The Project Developer will be responsible for setting the inverters. The settings may include but are not limited to the following:

- Protective Functions – Under/Over Frequency and Voltage Functions
- Voltage and Frequency Ride Through – Operational Ranges and Modes
- Dynamic Voltage Support – Ranges, Behavior (e.g., reactive-current injection)
- Voltage and Frequency Support – SPF, Volt-Var, Watt-War, Volt-Watt, etc.
- Frequency Control – Frequency-droop (Freq-Watt)
- Return to service criteria and ramp rate control
- Power limiting, export or import controls and thresholds

DTE may request changes to settings, that impact the safety and reliability of the distribution electric system. DTE and the Project shall work together to implement any proposed setting changes.

Installation Approval

The Applicant must provide DTE with 10 business days of advanced written notice of when the Project will be ready for inspection, testing and approval.

Prior to final approval for Parallel Operation, DTE specified inverter, control or relay calibration settings shall be applied, and a commissioning test must be performed on the

Project relaying and control equipment that involves the protection of the DTE electric system as per the commissioning attachment of the interconnection agreement. The commissioning test must be witnessed by DTE and can be performed by DTE at the Applicant's request. Within 5 business days from receipt of the completed commissioning test report, DTE will notify the Applicant of its approval or disapproval of the interconnection. If DTE does not approve the interconnection, DTE will notify the Applicant of the necessary corrective actions required for approval. The Applicant, after taking corrective action, may request DTE to reconsider the interconnection request.

In the event that revisions are necessary to the Applicant's submitted design and the Applicant submits revised design drawings to DTE, DTE shall either approve, in writing, the Applicant's revised design drawings as resubmitted, or return them to the Applicant with a clear statement as to why they were not approved. Where appropriate, DTE will indicate required changes on the engineering drawings.

In the event the Applicant proposes a revision to DTE's approved relaying and control equipment used to protect the DTE electric system and submits a description and engineering design drawings of the proposed changes, DTE shall either approve the Applicant's amended design drawings or return them to the Applicant with a clear statement as to why they were not approved. Where appropriate, DTE will indicate required changes on the engineering drawings.

Telemetry, Disturbance and Power Quality Monitoring Requirements

Telemetry, disturbance and power quality monitoring is required in all cases for Projects with aggregate nameplate of greater than 1MW or, when indicated by study, or when DTT is required. For Projects that will operate in the Non- Export Mode, the requirement for telemetry, disturbance, and power quality monitoring will be determined on a case-by-case basis as part of the study process.

Telemetry is the collection of operational information from the electric grid. Telemetry can include data such as voltage, amperage, power, and the status of equipment such as circuit breakers and switches. In addition to monitoring the grid, Telemetering equipment also allows to DTE Electric to operate and control the electric grid such as opening and closing circuit breakers or switches. Telemetry is required for DTE Electric to safely and reliably monitor and operate the electric grid.

Interconnection facilities that are rated below 150kW and are classified as a level 1 & 2 may not require telemetering. The communications requirement for a level 1 & 2 facility may only be for revenue metering. Facilities that supply 150kW or above and are classified as level 3, 4, and 5, are required to have a Remote Terminal Unit (RTU). The RTU aggregates data collected from the interconnection facility and communicates with DTE Electric's Supervisory Control and Data Acquisition (SCADA) system via a telecommunication backhaul network. The Interconnection applicant must provide the necessary communication for connections to the DTE Electric RTU and metering equipment.

At the Interconnection applicant's expense, DTE Electric will purchase, configure, install, and commission the RTU. The size and point count of the RTU is determined based on the DER capacity as well as the number of data points to be monitored. DTE Electric will own, operate, maintain, repair, control, alter, replace, and upgrade the RTU. Alternatively DTE may provide an interconnection gateway cabinet with specification included in the construction agreement for the pad, conduit and power supply needs.

An interior location suitable for floor or wall mounting the RTU is required. The location should be reasonably close to the origin of telemetering signals or data concentrator. A control room or relay house is acceptable as long as the temperature range is within 0C to 70C. The HVAC requirements for fiber optic terminal equipment are more stringent than what is required for RTU equipment. The below outlines required specifications for the RTU:

1. Cable access can be either through the top or bottom of the RTU cabinet or enclosure.
2. Floor space for standard 8-foot tall, 19” free-standing rack.
3. Wall space for a single door enclosure that is 24 inches wide by 16 inches deep by 40 inches high. The wall mount cabinet weighs 60 pounds and is mounted with a 5/16” or 3/8” inch bolt through mounting tabs at each corner.
4. A 120 VAC 15 Amp convenience power source to the RTU cabinet. This source will utilize a dedicated breaker labeled “DTE-RTU”. A 4-foot coil is to be left at the RTU location and will be terminated by DTE Electric inside the RTU cabinet.
5. Station DC power 10A @ 48VDC or 5A @ 125VDC (not shared with other equipment) run to the RTU cabinet for RTU power. The circuit breaker shall label “DTE-RTU”. If DC power is not available, a 120 VAC circuit may be usedas long as this circuit is sourced from an Uninterruptible Power System with a minimum of 8-hour backup.
6. One stranded AWG #8 conductor will be connected to station ground and run to the RTU cabinet by the customer.
7. The customer will run all data signal cables for physical I/O points to the RTU cabinet or to a near-by (6 feet or less) interface cabinet for termination. Data cables must be shielded with shield grounded at RTU end only. Twisted-pair stranded wire between AWG#16 and AWG#22 or twisted-pair solid wire between AWG#18 and AWG#24 may be used. Cables containing 6, 12, 25 and 32 pairs are typical. A 10-foot coil is to be left at the RTU location and will be terminated by DTE Electric inside the RTU cabinet.
8. All analog quantities will be represented by a + / – 1 milliamp or a 4 to 20 milliamp current loop. The current loop may be shared as long as there are no grounds and it is not driven beyond the manufacturers specified limits. Physical status points will be presented by a dry contact available at the interface cabinet. All status points will utilize the Normally Open contacts of the customer provided isolation relay. The RTU will provide the contact wetting voltage.
9. The customer shall provide data communication cables for virtual I/O points directly to the RTU cabinet for termination. Typical data communication cables include standard CAT V (Ethernet) cables, Industrial Ethernet Cable, or Industrial RS-485 Cables such as Belden 3108A or equivalent.
10. Communication between the customer data concentrator and the DTE Electric RTU shall be via appropriate protocol. Other data communication protocols shall be evaluated on a case by case basis

When required, telemetry, disturbance monitoring, and power quality monitoring will be provided at the Applicant's expense. In addition to other telemetry costs, a one-time charge will be assessed to the Applicant for equipment and software installed at the DTE System Control Center to process the data signals.

Telemetry

Telemetry enables DTE to operate the electric system safely and reliably under both normal and emergency conditions. DTE measures its internal load plus losses (generation) on a real time basis via an extensive telemetry system. This system sums all energy flowing into the DTE electric system from Projects interconnected to the system and from interconnections with other utilities. During system disturbances when portions of the electrical systems are out of service, it is essential to know if a Project is online or offline to determine the proper action to correct the problem. Time saved during restoration activities translates to fewer outages and outages of shorter duration for the DTE customers.

Facility Rating	DER Capacity	Telemetry Requirements
level 1	<= 20kW	No RTU. Revenue Metering required; generation meter recommended, may be required for specific programs. Telemetry may be needed based on study.
level 2	>20kW <= 150kW	No RTU. Revenue Metering required; generation meter recommended, may be required for specific programs. Telemetry may be needed based on study.
level 3	>150kW <= 550kW	Revenue Metering required; generation meter strongly recommended, may be required for specific programs. Telemetry may be needed based on study. If RTU is required: i. Real and Reactive Power ii. Voltage iii. Relaying Status iv. Breaker Status If DTT is required: i. Disturbance Monitoring may be necessary ii. Loss-of-guard (LOG) alarm iii. Receive-trip relay (RTX) iv. Lockout relay
level 4	>550kW <= 1MW	Revenue Metering required; generation meter required. Telemetry may be needed based on study. If RTU is required: i. Real and Reactive Power ii. Voltage iii. Relaying Status iv. Breaker Status If DTT is required: v. Disturbance Monitoring may be necessary vi. Loss-of-guard (LOG) alarm vii. Receive-trip relay (RTX) viii. Lockout relay
level 5	>1MW	Revenue Metering required; generation meter required. RTU is required: I. Real and Reactive Power II. Voltage III. Relaying Status IV. Breaker Status If DTT is required: ix. Disturbance Monitoring may be necessary x. Loss-of-guard (LOG) alarm xi. Receive-trip relay (RTX) xii. Lockout relay

Disturbance Monitoring

Disturbance monitoring allows DTE to evaluate the performance of the overall protective system for all faults on the electric system. It is critical that sufficient monitoring of the protective system is in place to determine its response.

Remote Terminal Unit (RTU)

Telemetry and disturbance monitoring require the installation of a Remote Terminal Unit (RTU), that is supplied, owned, operated, and maintained by DTE. A data Communication Circuit is required for DTE to remotely communicate with the RTU. The Applicant shall provide a suitable location, approved by DTE, for the Applicant to install the RTU and associated equipment. The

Applicant shall provide the following external connections and associated equipment to the RTU location, which may include but is not limited to:

1. A 24, 48 V or 125 V DC power supply capable of providing an 8-hour backup. The Applicant shall coordinate with DTE to properly size the DC power supply.

2. A 120 V AC power supply for heating unconditioned (e.g., outdoor) locations and for use with AC/DC converters. The Applicant shall coordinate with DTE to properly size the AC power supply.

3. A control circuit or Communication Interface cable for receiving telemetry and disturbance monitoring statuses.

4. A control circuit or Communication Interface cable to allow the RTU to remotely trip the Project, when remote tripping is required by DTE.

5. An antenna cable for connection to an external antenna. DTE will supply the antenna cable.

6. A communication cable for connection to the Communication Circuit equipment (e.g. Router/Switch).

7. A communication cable for receiving telemetry from DTE metering at the PCC.

8. A voice Communication Circuit, when cellular phone service is not available, for the commissioning and checkout of the metering, DTT and RTU.

9. In some cases where wireless connections are not available or are unreliable, a mast for connection to DTE's wireless communications network may be required.

The above connections shall be connected to the RTU by the Applicant where indicated by DTE in the Interconnection Technical Requirements

When telemetry is required, the following telemetry values will be monitored on the RTU, unless otherwise specified by DTE:

1. Real and reactive power flow, voltage, etc. from the DTE metering at the PCC.

2. The status (normal/fail) of protective relay Communication Channels. A status indication of "FAIL" indicates the Communication Channel used for relaying is unable to perform its protective function. For example, the direct transfer trip receiver loss of guard (LOG) auxiliary relay.

3. The status (open/closed) of each main interrupting device, each generating interrupting device, and each tie/transfer device used to change the configuration of the Project.

4. If the Project is composed of multiple inverters, a single logical (OR) status of the individual inverter "On/Off" states, indicating all inverters are offline or any one or more inverters are online, is permissible). An "On" status would be indicated if any individual inverter is online.

5. The status indicating battery failure of the DC uninterruptible power supplies providing power to the DTT and RTU equipment.

6. The status of the DTE relays indicating under voltage of the 120V AC power supplies providing power to the DTT and RTU equipment.

The RTU will be equipped with “sequence of events” recording when disturbance monitoring is required. The Applicant shall provide the following disturbance monitoring statuses, unless otherwise specified, to be monitored on the RTU:

1. The trip status of an instantaneous relay to act as a ground fault detector for faults on the DTE electric system. This relay shall be connected into the same sensing source as the ground fault protective relay required by DTE.

2. The status of each interrupting device, which is initiated by the interconnection relaying schemes required by DTE.

3. The status indicating operation of the over/under voltage (27/59) relays.

4. The status indicating operation of the under/over frequency (81O/U)relays.

5. The status indicating operation of the ground fault detection (59N and/or 51N) relays.

6. The status indicating operation of voltage restrained overcurrent (51V) relays.

7. The status indicating operation of the reverse power (32R) relays.

8. The status of the following relays, associated to each individual Direct Transfer Trip receiver, which may include but is not limited to:

    i. Loss-of-guard relay (LOG).
    ii. Receive-trip relay (RTX).
    iii. Lockout relay.

The statuses indicated in the above telemetry items 2 through 5 and disturbance monitoring items shall be provided by the Applicant using one of the following methods specified by DTE:

1. Wiring individual contacts directly to a terminal block near the RTU, or

2. Using a Communication Interface to exchange data with the RTU, or

3. Other communication provisions, acceptable to DTE, to remotely access the multi-functional device such that the operation of the individual functions may be evaluated separately.

Power Quality Monitoring

Power quality monitoring allows DTE to evaluate the quality of power produced by the Project during events that cause an electrical disturbance to DTE customers. The power quality monitoring shall be connected to the DTE metering CTs and VTs located at the PCC. A data Communication Circuit is required for remote access to the power quality monitoring equipment. The Applicant shall provide a suitable location, unless otherwise specified by DTE, located within five feet from the PCC metering, for DTE to install the utility owned, operated

and maintained power quality monitoring equipment. DTE will connect the CT and VT circuits from the PCC metering to the power quality monitoring equipment.

Miscellaneous Operational Requirements

Miscellaneous requirements include synchronizing, ramp rates, reclose blocking, remote trip capability, reactive power capability and voltage control, frequency control, standby power, and system stability limitations.

Operating in Parallel

The Applicant will be solely responsible for the required synchronizing equipment and for properly synchronizing the Project with the DTE electric system. Voltage fluctuation at the PCC during synchronizing shall be limited per IEEE 1547-2018.

The Project must be capable of controlling the output of active power (ramp rates) after synchronization to avoid issues on the DTE system, which includes but is not limited to voltage fluctuations, harmonics, or oscillations. The Project shall, upon request by DTE, modify the active power output characteristics to prevent such issues after synchronization. Inverter based Projects connected to the DTE system shall be certified, to be capable of normal and soft ramp rates.

The Project must be designed to prevent the Project from energizing into a de-energized Utility line. The Project's circuit breaker or contactor must be blocked from closing in on a de-energized circuit.

If the Project has shown an unsatisfactory response to requests to separate the generation from the DTE electric system, DTE reserves the right to disconnect the Project. For Projects where telemetry is required, the Applicant shall provide DTE the capability to remotely disconnect the Project if specified in the construction agreement. To provide this functionality, the Project may be required to provide a Communication Interface as defined within these requirements.

Voltage and Frequency Ride Through

Voltage and frequency ride through are generally not required for synchronous and induction Projects. Certified inverter based Projects are required to meet ride through requirements by implementing the inverter setting criteria defined within these procedures. Non-certified inverter Projects will be reviewed on a case by case basis depending on the available ride through capability.

For inverter based Projects where telemetry is required, the Applicant shall provide DTE the capability to remotely issue ride through settings, including the ability to read information required to manage ride through settings. To provide the functionality, the Applicant shall provide a Communication Interface as defined within these requirements.

All under/over voltage and under/over frequency protective functions installed by the Applicant or DTE are required to coordinate with ride through requirements.

Reactive Power Capability and Voltage Control

The Project shall be designed to be capable of maintaining a continuous rated power output for the Export portion of the Project, at a power factor within the range of 0.9 (inject) to 0.97 (absorb) for synchronous, non-synchronous and induction Projects and 0.9 (inject) to 0.9 (absorb) for inverter based Projects. This power factor range standard shall be dynamic and can be met using, for example, power electronics designed to supply this level of reactive capability (considering any limitations due to voltage level, real power output, etc.).

Projects that interconnect within customer-owned facilities must be designed to maintain the above dynamic power factor range for the Export portion of the power delivery.

The Applicant shall control voltage at the PCC in accordance with instructions (e.g. voltage or reactive power schedule) provided by DTE. Inverter based Projects shall be certified, to be capable of controlling the voltage level at the Export portion of the Project using the control modes specified in the following table. The Applicant may request measurement data from the DTE metering in order to control the voltage at the PCC.

Control Mode
Specified Power Factor (SPF)
Voltage-Reactive Power (Volt-VAr)
Active Power- Reactive Power (Watt-Var)
Constant Reactive Power
Voltage-Active Power (Volt-Watt)

For inverter based Projects where telemetry is required, the Project shall provide DTE the capability to remotely issue instructions for voltage control, including the ability to read information required to operate the Project. To provide the functionality, the Applicant shall provide a Communication Interface as defined within these requirements. For non-inverter based projects, the need will be reviewed on a case-by-case basis.

DTE existing rate schedules, incorporated herein by reference, contain power factor adjustments based on the power factor of the metered load at these facilities.

Frequency Control

Inverter based Projects shall be certified, to be capable of controlling frequency using the control mode(s) specified in the following table. Non-Export projects are subject to the requirement.

Control Mode
Frequency-Watt

The control modes shall respond to frequency measurements at the inverter terminals. DTE shall provide and specify the control modes and settings applicable to the inverter based Project.

For inverter based Projects where telemetry is required, the Project shall provide DTE the capability to remotely issue instructions for frequency control, including the ability to read information required to operate the Project. To provide the functionality, the Applicant shall

provide a Communication Interface as defined within these requirements. For non-inverter based projects, the need will be reviewed on a case-by-case basis.

Standby Power

Standby power will be provided under the terms of an approved rate set forth in DTE Standard Rules and Regulations. The Applicant should be aware that to qualify for Standby Rates, a separate meter must be installed at the generator.

System Stability and Site Limitations

Many locations on DTE's electrical grid has a stiffness ratio of 1, this means that electrical coincidence projects may be spread over a larger area of the grid than a grid with a higher stiffness ratio.

The Stiffness Ratio is the combined three-phase short circuit capability of the Project and the utility system divided by the short circuit capability of the Project measured at the PCC. A stability study may be required for Projects with a Stiffness Ratio of less than 40. Five times the generator rated kVA will be used as a proxy for short circuit current contribution for induction generators. For synchronous Projects, with a Stiffness Ratio of less than 40, DTE requires special generator trip schemes or loss of synchronism (out-of-step) relay protection. If the apparent voltage flicker from a loss-of-synchronism condition exceeds 5%, an out-of-step relay will be required. This type of protection is typically applied at the PCC and trips the entire Project off-line, if instability is detected, to protect the DTE electric system and its customers. If the Applicant chooses not to provide for mitigation of unacceptable voltage flicker (above five percent), DTE may disallow the interconnection of the Project or require a new dedicated interconnection at the Applicant's expense.

The Applicant is responsible for evaluating the consequences of unstable generator operation or voltage transients on Project equipment and determining, designing, and applying any relaying which may be necessary to protect that equipment. This type of protection is typically applied on individual generators to protect the Project facilities.

DTE will determine if operation of the Project will create objectionable voltage flicker and/or disturbances to other DTE customers and develop any required mitigation measures at the Applicant's expense.

Revenue Metering Requirements

DTE will own, operate, and maintain the billing metering equipment at the Applicant's expense.

Non-Export Projects

A DTE bi-directional meter will be installed that only records energy deliveries to the Project. Generation metering will be used for DTE operations purposes.

Export Projects

The billing metering may need to be replaced. A dedicated data Communication Circuit is required to allow remote access to the billing meter by DTE. If telemetry is required, the

billing metering will be connected to the RTU as part of the installation. The Applicant shall provide a suitable location, approved by DTE, for DTE's owned, operated, and maintained billing metering. The Applicant shall provide DTE access to the premises at all times to install, turn on, disconnect, inspect, test, read, repair, or remove the metering equipment. The Applicant may, at its option, have a representative witness this work.

The metering installations shall be constructed in accordance with the practices, which normally apply to the construction of metering installations for commercial, industrial, or other customers with demand recording equipment. At a minimum two meters will be required; one at the PCC, and one at the generator. For Projects with multiple generators, metering of each generator may be required. When practical, multiple generators may be metered at a common point provided the metered quantity represents only the gross generator output.

DTE shall supply to the Applicant all required metering equipment and the standard detailed specifications and requirements relating to the location, construction, and access of the metering installation and will provide consultation pertaining to the meter installation as required. DTE will endeavor to coordinate the delivery of these materials with the Applicant's installation schedule during normal scheduled business hours.

The Applicant shall provide a mounting surface for the meters, recorders, connection cabinets, a housing for the instrument transformers that meets DTE safety standards, a conduit for the conductors between the instrument transformer secondary windings and the meter connection cabinets, and a conduit for the communication links, if required. All of this equipment must meet DTE specifications and requirements as specified in the SIM manual.

The responsibility for the installation of the equipment is shared between DTE and the Applicant, with the Applicant generally installing all of the equipment on its side of the PCC, including instrument transformers, cabinets, conduits, and mounting surfaces.
DTE, shall install the meters, recorders, and communication circuits. DTE will endeavor to coordinate the installation of these items with the Applicant's schedule during normal scheduled business hours.

Projects that participate in utility or market programs must additionally meet the metering requirements of those programs including any requirements for real time telemetry without conflict with the DTE revenue and generation metering.

Where applicable, separate metering of station power may be required to accurately meter the generation facility load when the Project is off-line.

Additional metering may be required by specific programs or by market participation,

Participation in FERC jurisdiction or MISO-managed programs and other aggregation programs

An applicant who does not install a generation meter may not be eligible for participation in FERC Jurisdiction or MISO-managed programs or other wholesale aggregation programs. Eligibility will be determined by the relevant requirements and is not within DTE Electric's control. Applicants are urged to consider this before determining the configuration of their system. DTE Electric will provide the generation meter if the applicant determines they want to participate in these programs at a future date.

Communication Requirements

Communication Interface

A Communication Interface allows for the exchange of data between the DTE RTU (or alternate) and the Project interface equipment. The data may include but is not limited to generator monitoring and control points, disturbance monitoring, and telemetry. When required, the Applicant shall provide an interface capable of exchanging data with the DTE RTU over one of the following protocols using the associated transports and physical layers, as defined by DTE on a case-by-case basis. The Project shall provide a single communication cable to a location near the RTU panel or gateway cabinet.

Protocol	Transport	Physical Layer
IEEE Std 2030.5 (SEP2)	TCP/IP	Ethernet
IEEE Std 1815 (DNP3)	TCP/IP	Ethernet
Sunspec Modbus	TCP/IP	Ethernet
	N/A	RS-485

Table - Approved Protocols / Transport / Physical Layer

DTE will provide the necessary interface information (e.g. data mapping) containing the required monitoring and control functionality. The Applicant and DTE shall work together to implement the Communication Interface.

Communication Circuits

Data Communication Circuits allow for the remote exchange of data between DTE and equipment located at the Project. Telemetry, disturbance monitoring, power quality monitoring, DTT, metering and pilot relaying generally require the use of data Communication Circuits. The Applicant is responsible for all costs including but not limited to materials, installation, operating, telecommunication, maintenance, cancellation fees and monthly charges for the data Communication Circuits.

DTE will determine the quantity and type (e.g. cellular, fiber, radio) of the data Communication Circuits required for the application. DTE will determine the requirements for the data communication circuits based on the parameters of the project including the location on the system, proximity to other utility assets and the protection, telemetry and control requirements. DTE will provide one or more options to the Applicant Which may include utility owned circuits or acceptable leased data communication circuits In the cases that the Applicant may be required by DTE to order and acquire the leased data Communication Circuits. DTE will provide information (e.g. costs, availability) regarding leased data Communication Circuits once made available by the telecommunication provider. DTE is not responsible for any delays caused by the telecommunication provider in providing such information or increased interconnection costs.

Data Communication Circuits require the installation of equipment at the Project that is accessible to DTE and the telecommunication provider. The Applicant shall provide a suitable location, approved by DTE, for the Applicant and/or telecommunication provider to install any necessary Communication Circuit equipment and sufficient space for any DTE equipment, risers, antennas, or supporting infrastructure as specified in the construction agreement or design. A review of each installation shall be made to determine the location and space requirements most agreeable to DTE and the Applicant. DTE will provide the utility information

necessary for proper installation of the equipment. The required equipment will vary based on the type of Communication Circuit. For wireless applications, the required equipment may include but is not limited to coaxial cables, conduits, antennas, surge arresters, cabinets, AC and DC power sources and mounting structures. Wired connections may require the Applicant to install equipment that may include but is not limited to backboards, splice boxes, patch panels, wire, fiber, AC and DC power sources, interface converters, cabinets, conduits, raceways and mounting structures. The Applicant and DTE shall work together to install the data Communication Circuit.

DTE personnel require the use of cellular phone service while performing checkout of the metering, DTT, RTU, and relaying. The Applicant must provide an alternative voice communication method, approved by DTE, when cellular phone service is not available. All copper and fiber Communication Circuits must be properly protected as detailed in IEEE Std. 487 and IEEE Std 1590, respectively.

EV interconnection / Vehicle to Grid

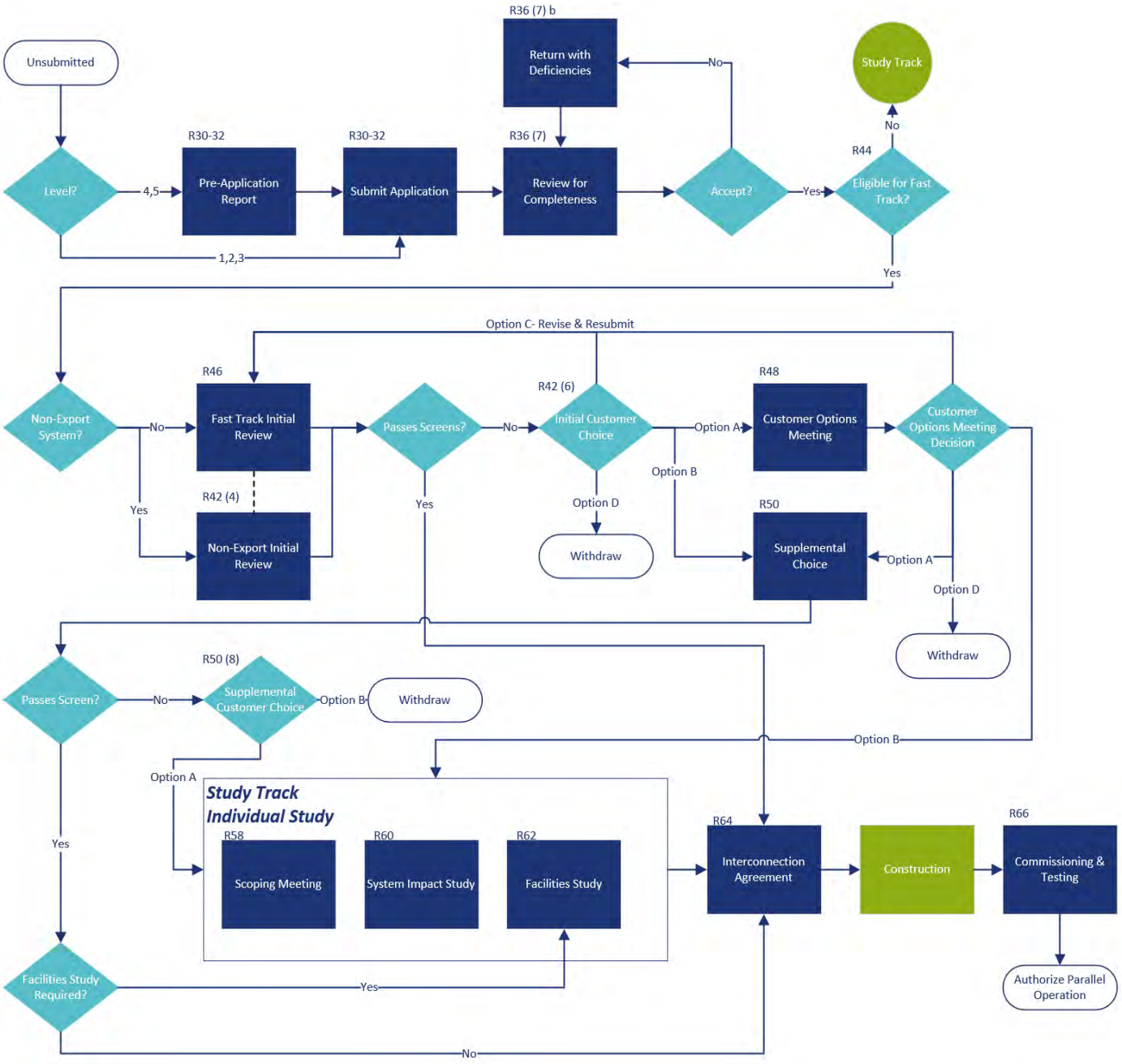
EV systems that are capable of parallel operation with the grid shall require an interconnection and the nameplate of the inverter will be used for purposes of determining the DER capacity unless limited by an acceptable means of power limiting as defined in these procedures. EV interconnection shall follow the standard interconnection procedures and requirements.

DTE defines Vehicle to Grid as any EV system capable of paralleling with electrical system even if momentarily. DTE considers Vehicle to Home, if parallel operation is possible, to be indistinguishable from Vehicle to Grid for purposes of requiring an interconnection application. Automatic transfer-trip or similar non-export technology is required to avoid paralleling with the grid.

EV or EVSE Systems that are incapable in any way of operating a source of potential parallel to the grid and use an appropriate isolation means utilizing open transition, shall not require an interconnection and will be considered similar to an isolated backup generator. These systems may be required to provide information on their configuration if they are present with other DER at the site or to qualify for programs.

Back feed from an EV charger operating bi-directionally into a grid outage is strictly prohibited for safety reasons.

APPENDIX A: INTERCONNECTION PROCESS FLOW DIAGRAM



APPENDIX B: COSTS

Interconnection Table – Applicant Costs Levels 1 and 2

Combined Rider 18 Interconnection Table – Applicant Costs

	Application
Level 1	$50
Level 2	$50

Non-Rider 18, Certified DERs, Interconnection Table – Applicant Costs

	Non-Export Track*	Fast Track Initial Review*	Fast Track Supplemental Review	Study Track
Level 1	$100 + $1/kWac	$100 + $1/kWac	$1,000	$300
Level 2	$100 + $1/kWac	$100 + $1/kWac	$1,000	$300

* When System Impact Study or Facilities Study are necessary for Non-Export, or Fast Track projects, the studies will follow the respective costs in the Study Track row and the Interconnection Table – Study Costs below.

Non-Rider 18, Non-Certified DERs, Interconnection Table – Applicant Cost

See Interconnection Procedures for Level 3,4 and 5

Interconnection Table – Study Costs

	System Impact Study	Facilities Study
Level 1	$0*	$1,000*
Level 2	$0*	$2,500*

*For level 1 and 2 projects system impact and facilities studies are combined

When they are determined to be necessary the following supplemental study fees will be clearly indicated on the System Impact study agreement or Facilities study agreement as part of the total fee to be paid for that study phase.

Interconnection Table – Additional Study Costs by Type

Reinspection fee	$100
Telecommunications study	$1,500

APPENDIX C: PROCEDURE DEFINITIONS

AC: means alternating current at 60 Hertz.

Affected system: means another electric utility's distribution system, a municipal electric utility's distribution system, the transmission system, or transmission system- connected generation which may be affected by the proposed interconnection.

Alternative electric supplier: means that term as defined in section 10g of 1939 PA 3, MCL 460.10g.

Applicant: means the person or entity submitting an interconnection application, a legacy net metering program application, or a distributed generation program application. An applicant is not required to be an existing customer of an electric utility. An electric utility is considered an applicant when it submits an interconnection application for a DER that is not a temporary DER or a substation backup energy storage device.

Application: means an interconnection application, a legacy net metering program application, or a distributed generation program application.

Area network: means a location on the distribution system served by multiple transformers interconnected in an electrical network circuit.

Business day: means Monday through Friday, starting at 12:00:00 a.m. and ending at 11:59:59 p.m., excluding electric utility holidays and any day where electric service is interrupted for 10% or more of an electric utility's customers.

Calendar day: means every day, including Saturdays, Sundays, and holidays.

Certified: means an inverter-based system has met acceptable safety and reliability standards by a nationally recognized testing laboratory in conformance with IEEE 1547.1-2020 and the UL 1741 September 28, 2021 edition except that prior to commercial availability, inverter-based systems which conform to the UL 1741SA September 7, 2016 edition are acceptable.

Commission: means the Michigan Public Service Commission.

Commissioning test: means the test and verification procedure that is performed on a device or combination of devices forming a system to confirm that the device or system, as designed, delivered, and installed, meets the interconnection and interoperability requirements of IEEE 1547-2018 and IEEE 1547.1-2020. A commissioning test must include visual inspections and may include, as applicable, an operability and functional performance test and functional tests to verify interoperability of a combination of devices forming a system.

Conforming: means the information in an interconnection application is consistent with the general principles of distribution system operation and DER characteristics.

Customer: means a person or entity who receives electric service from an electric utility's distribution system or a person who participates in a legacy net metering or distributed generation program through an alternative electric supplier or electric utility.

DC: means "direct current."

Distributed energy resource: or “DER” means a source of electric power and its associated facilities that is connected to a distribution system. DER includes both generators and energy storage devices capable of exporting active power to a distribution system.

DER Capacity: The aggregate capacity of the site in real power (W) using the nameplate rating in AC.

Distributed generation program: means the distributed generation program approved by the commission and included in an electric utility’s tariff pursuant to section 6a(14) of 1939 PA 3, MCL 460.6a, or established in an alternative electric supplier distributed generation program plan.

Distribution system: means the structures, equipment, and facilities owned and operated by an electric utility to deliver electricity to end users, not including transmission and generation facilities that are subject to the jurisdiction of the federal energy regulatory commission.

Distribution upgrades: mean the additions, modifications, or improvements to the distribution system necessary to accommodate a DER’s connection to the distribution system.

Electric utility: means any person or entity whose rates are regulated by the commission for selling electricity to retail customers in this state.

Electrically coincident: means that 2 or more proposed DERs associated with pending interconnection applications have operating characteristics and nameplate capacities which require that distribution upgrades will be necessary if the DERs are installed in electrical proximity with each other on a distribution system.

Electrically remote: means a proposed DER is not electrically coincident with a DER that is associated with a pending interconnection application.

Eligible electric generator: means a methane digester or renewable energy system with a generation capacity limited to 110% of the customer’s electricity consumption for the previous 12 months.

Energy storage device: means a device that captures energy produced at one time, stores that energy for a period of time, and delivers that energy as electricity for use at a future time. For purposes of these rules, an energy storage device may be considered a DER.

Export capacity: means the amount of power that can be transferred from the DER to the distribution system. Export capacity is either the nameplate rating or a lower amount if limited using an acceptable means that is defined in an electric utility’s interconnection procedures.

Facilities study: means a study to specify and estimate the cost of the equipment, engineering, procurement, and construction work if distribution upgrades or interconnection facilities are required.

Fast track: means the procedure used for evaluating a proposed interconnection that makes use of screening processes, as described in R 460.944 to R 460.950.

Grid network: means a configuration of a distribution system or an area of a distribution system in which each customer is supplied electric energy at the secondary voltage by more than 1 transformer.

High voltage distribution: means those parts of a distribution system that operate within a voltage range specified in the electric utility’s interconnection procedures. For purposes of these rules, the term “subtransmission” means the same as high voltage distribution.

IEEE: means Institute of Electrical and Electronics Engineers.

IEEE 1547: means “IEEE Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces,”

IEEE 1547.1 means IEEE “Standard Conformance Test Procedures for Equipment Interconnecting Distributed Energy Resources with Electric Power Systems and Associated Interfaces”

Inadvertent export: means unscheduled export of active power from a DER, exceeding a specified magnitude and for a limited duration, due to fluctuations in load- following behavior.

Initial review: means the fast track initial review screens described in R 460.946.

Interconnection: means the process undertaken by an electric utility to construct the electrical facilities necessary to connect a DER with a distribution system so that parallel operation can occur.

Interconnection agreement: means an agreement containing the terms and conditions governing the electrical interconnection between the electric utility and the applicant or interconnection customer. Where construction of interconnection facilities or distribution upgrades are necessary, the agreement, or amendments, shall specify estimated timelines, cost estimates, and payment milestones for construction of facilities and distribution upgrades to interconnect a DER into the distribution system, and shall identify design, controls, settings, procurement, installation, and construction requirements associated with installation of the DER. Standard level 1, 2, and 3 interconnection agreements and level 4 and 5 interconnection agreements are types of interconnection agreements.

Interconnection coordinator: means a person or persons designated by the electric utility who shall serve as the point of contact from which general information on the application process and on the affected system or systems can be obtained through informal request by the applicant or interconnection customer.

Interconnection customer: means the person or entity, which may include the electric utility, responsible for ensuring a DER is operated and maintained in compliance with all local, state, and federal laws, as well as with all rules, standards, and interconnection procedures. An electric utility is not considered an interconnection customer for temporary DER or a substation backup energy storage device project.

Interconnection facilities: mean any equipment required for the sole purpose of connecting a DER with a distribution system.

Interconnection procedures: means the requirements that govern project interconnection adopted by each electric utility and approved by the commission.

Interconnection study agreement: means an agreement between an applicant and an electric utility for the electric utility to study a proposed DER.

kW: means kilowatt.

kWac: means the electric power, in kilowatts, associated with the alternating current output of a DER at unity power factor.

kWh: means kilowatt-hours.

Legacy net metering program: means the true net metering or modified net metering programs in place prior to commission approval of a distributed generation program tariff pursuant to section 6a(14) of 1939 PA 3, MCL 460.6a, and prior to the establishment of an alternative electric supplier distributed generation plan.

Level 1: means a certified project of 20 kWac or less.

Level 2: means a certified project of greater than 20 kWac and not more than 150 kWac.

Level 3: means a project of 150 kWac or less that is not certified, or a project greater than 150 kWac and not more than 550 kWac.

Level 4: means a project of greater than 550 kWac and not more than 1 MWac.

Level 5: means a project of greater than 1 MWac.

Level 4 and 5 interconnection agreement: means an interconnection agreement applicable to level 4 and 5 interconnection applications.

Limited export: means the exporting capability of a DER whose export capacity is limited by means specified in an electric utility's interconnection procedures.

Low voltage distribution: means those parts of a distribution system that operate with a voltage range specified in the electric utility's interconnection procedures.

Mainline: means a conductor that serves as the three-phase backbone of a low voltage distribution circuit.

Material modification: means a modification to the DER nameplate rating, DER export capacity, electrical size of components, bill of materials, machine data, equipment configuration, or the interconnection site of the DER at any time after receiving notification by the electric utility of a complete interconnection application. Replacing a component with another component that has near-identical characteristics does not constitute a material modification when agreed to by the electric utility. For the proposed modification to be considered material, it shall have been reviewed and been determined to have or anticipated to have a material impact on 1 or more of the following:

The cost, timing, or design of any equipment located between the point of common coupling and the DER.

The cost, timing, or design of any other application.

The electric utility's distribution system or an affected system.

The safety or reliability of the distribution system.

Methane digester: means a renewable energy system that uses animal or agricultural waste for the production of fuel gas that can be burned for the generation of electricity or steam.

MW: means megawatt.

MWac: means the electric power, in megawatts, associated with the alternating current output of a DER at unity power factor.

Nameplate rating: means the sum total of maximum rated power output of all a DER's constituent generating units and energy storage units as identified on the manufacturer nameplate, regardless of whether it is limited by any approved means. Nameplate rating includes all of the following:

Nominal voltage (V).
Current (A).
Maximum active power (kWac).
Apparent power (kVA).
Reactive power (kvar).

Nationally recognized testing laboratory: means any testing laboratory recognized by the accreditation program of the United States Department of Labor Occupational Safety and Health Administration.

Network protector: means those devices associated with a secondary network used to automatically disconnect a transformer when reverse power flow occurs.

Non-export: An installed electric generation project which operates in parallel with the electric utility with a relay protection scheme and isolating device preventing energy flow back to the utility.

Non-export track: means the procedure for evaluating a proposed interconnection that will not inject electric energy into an electric utility's distribution system.

Parallel operation: means the operation, for longer than 100 milliseconds, of a DER while connected to the energized distribution system.

Point of common coupling (PCC): means the point where the DER connects with the electric utility's distribution system.

Power control system: means systems or devices that electronically limit or control steady state currents to a programmable limit.

Project: Electrical generating equipment and associated facilities that are not owned or operated by an electric utility.

Radial supply: means a configuration of a distribution system or an area of a distribution system in which each customer can only be supplied electric energy by 1 substation transformer and distribution line at a time.

Readily available: means no creation of data is required, and little or no computation or analysis of data is required.

Renewable energy system: Term as defined in section 11(i) of 2008 PA 295, MCL 460.1011(i).

Secondary network: means those areas of a distribution system that operate at a secondary voltage level and are networked.

Site: means a contiguous site, regardless of the number of meters at that site. A site that would be contiguous but for the presence of a street, road, or highway is considered to be contiguous for the purposes of these rules.

Spot network: means a location on the distribution system that uses 2 or more inter-tied transformers to supply an electrical network circuit, such as a network circuit in a large building.

Standard level 1, 2, and 3 interconnection agreement: means the statewide interconnection agreement approved by the commission and applicable to levels 1, 2 and 3 interconnection applications.

A cover sheet including modifications to address any special operating conditions may be added.

Study track: The procedure used for evaluating a proposed interconnection utilizing a system impact study and facilities study "Supplemental review" means the fast track supplemental review screens described in R 460.950.

Supplemental review: The fast track supplemental review screens.

System impact study: means a study to identify and describe the impacts to the electric utility's distribution system that would occur if the proposed DER were interconnected exactly as proposed and without any modifications to the electric utility's distribution system. A system impact study also identifies affected systems.

Temporary DER: means a DER that is installed on the distribution system by the electric utility with the intention of not operating at the site permanently.

UL: means underwriters laboratory.

UL 1741: means the September 28, 2021 edition of "Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources,"

UL 1741 CRD for PCS: means the Certification Requirement Decision for Power Control Systems for the standard titled Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources, March 8, 2019.

APPENDIX D: INTERCONNECTION APPLICATION

[INSERT APPLICATION]

APPENDIX E: SYSTEM IMPACT STUDY AND FACILITIES STUDY AGREEMENTS

APPENDIX F: INTERCONNECTION AND PARALLEL OPERATING AGREEMENT

[INSERT INTERCONNECTION AND PARALLEL OPERATING AGREEMENT]

APPENDIX G: CONTACT LIST

APPENDIX H: INITIAL REVIEW SCREENS

Application Review Screens will be utilized during the application process and are used to inform applicants of an application deficiency or inconsistency or may indicate a critical issue that would prevent compatibility with the DTE Electrical System These screens include review of the one-line and three-line diagrams for compliance with DTE's SIM and consistency between the site plan, equipment information and application submission materials and a review of the customer information and contact information for accuracy

Design and Safety Screens will be utilized throughout the process if conditions are noted that will introduce safety or design incompatibilities or if other process such as method of service are required before the interconnection can continue.

Additional screens for specific program participation will be contained in program specific procedures.

The initial review screens are all of the following:

i. The entire proposed DER, including all aggregated site generation and point or points of interconnection, must be located within the electric utility's service territory.
ii. For interconnection of a proposed DER to a radial distribution circuit, the aggregated generation, including the proposed DER, on the circuit may not exceed 15% of the line section annual peak load as most recently measured or calculated if measured data is not available. A line section is that portion DTE's distribution system connected to a customer bounded by automatic sectionalizing devices or the end of the distribution line. The electric utility shall consider 100% of applicable loading, if available, instead of 15% of line section peak load for level 1 and 2 DER, except in situations where the distribution circuit has high penetration of DER and where addition of the DER creates voltage or operability issues. This screen does not apply to level 1 and level 2 non-export DER applications, except in situations where the distribution circuit has high penetration of DER and addition of the non-export DER creates voltage or operability issues.
iii. For interconnection of a proposed DER to the load side of network protectors, the proposed DER must utilize an inverter-based equipment package and, together with the aggregated other inverter-based DERs, may not exceed the smaller of 5% of a network's maximum load or 50 kWac. The DER must not provide reverse power flow into the network protector under any conditions.
iv. The proposed DER, in aggregation with other DERs on the distribution circuit, may not contribute more than 10% to the distribution circuit's maximum fault current at the point on the primary voltage nearest the proposed point of common coupling. This screen does not apply to level 1 applications, except in situations where the addition of the DER would render the protection scheme inoperable and to be modified to be able to continue to operate as designed.
v. The proposed DER, in aggregate with other DERs on the distribution circuit, may not cause any distribution protective devices and equipment or interconnection customer equipment on the system to exceed 87.5% of the short circuit interrupting capability. An interconnection may not be proposed for a circuit that already exceeds 87.5% of the short circuit interrupting capability. Distribution protective devices and equipment include, but are not limited to, substation breakers, fuse cutouts, and line reclosers. This screen does not apply to level 1 applications except in situations where the addition of the DER would require the interrupting equipment to be modified to not improperly operate.
vi. If the type of electrical service provided to the applicant, including line configuration and the transformer winding and connection limits the potential of the DER creating over-voltages on the electric utility's distribution system due to a loss of ground during the operating time of any anti-islanding function or during any fault condition. Projects implementing 3 phase ganged isolation that operate on ground detection, loss of phase detection, open phase

detection or 3V0 protection and isolating may be reviewed to determine if they pass the screening.

Primary Distribution Line Type	Type of Interconnection to Primary Distribution Line	Result
3-phase, 3 wire	3-phase or single phase, phase-to-phase	Pass screen
3-phase, 4 wire	3-phase or single-phase, line-to-neutral	Pass screen
3-phase, 4 wire	3-phase or single phase, phase-to-phase	Fail screen

vii. If the proposed DER is to be interconnected on single-phase shared secondary, the aggregate generation capacity on the shared secondary, including the proposed DER, may not exceed 20 kWac or 65% of the transformer nameplate rating.

viii. If the proposed DER is single-phase and is to be interconnected on a center tap neutral of a 240 volt service, its addition may not create an imbalance between the 2 sides of the 240 volt service of more than 20% of the nameplate rating of the service transformer.

ix. If the proposed DER is single-phase and is to be interconnected to a 3-phase service, its nameplate rating may not exceed 10% of the service transformer nameplate rating.

x. If the proposed DER's point of common coupling is behind a line voltage regulator, the aggregate DER on the line section plus the proposed DER's nameplate rating must be less than 250 kWac or the regulator rating, whichever is less. This screen does not include substation voltage regulators.

xi. The total aggregate nameplate of generation at the site including the proposed project shall not exceed 5 MWac on 13.2KV and 1MWac on 4.8KV

xii. The aggregate DER on the line section plus the proposed DER nameplate shall not exceed the day to day thermal limit of any distribution system component that serves the project or exceed the rated fault current limit of DTE equipment.

xiii. The project follows the DTE Service Installation Manual (SIM), Primary Service, Method Of Service (MOS) requirements and meets all requirements of electrical service.

xiv. High voltage resonance screen. If the project is located on a delta ungrounded line, there must not be a single phase protective device upstream of the DER and any capacitors on the same line section.

xv. A three phase project must not have a single phase operating and isolation device at the POC/PCC

xvi. If the project intends to operate as an islanded microgrid, it must implement a single open break isolation wholly contained within the Applicant's service, such as an Auto Transfer Switch, implement mechanical interlocks that do not allow parallel operation or implement a hardware breaker controlled by DTE approved relaying. The microgrid must not rely on software based controls to manage power flow at the Point of Common Coupling during island operation. The microgrid must also implement open transition return to grid and follow return to service criteria or have appropriate synchronization relaying and controls approved by DTE for closed transition and provide SCADA points to DTE for required relaying.

xvii. If the application is a subdivided premise in a master planned clustered development where the aggregate DER Capacity of the clustered development exceeds the interconnection level the application has applied for, the application will be evaluated with the context of the development's aggregate planned DER capacity.

xviii. If the project is located within a section of a circuit that is identified as an area that has an operational jumpering or loop scheme, the addition of the DER does not render the jumpering or loop scheme inoperable due to loading or voltage violations.

APPENDIX I: SUPPLEMENTAL REVIEW SCREENS

The supplemental review screens are all of the following:

Minimum load screen. Where 12 months of line section minimum load data, including onsite load but not station service load served by the proposed DER, are available, can be calculated, can be estimated from existing data, or can be determined from a power flow model, the aggregate DER capacity on the line section must be less than 100% of the minimum load for all line sections bounded by automatic sectionalizing devices upstream of the proposed DER. If minimum load data are not available, or cannot be calculated, estimated, or determined, DTE shall include the reason or reasons that it is unable to calculate, estimate, or determine minimum load in its supplemental review results notification. All of the following must be applied:

(i) The type of generation used by the proposed DER will be considered when calculating, estimating, or determining circuit or line section minimum load relevant for the application of the minimum load screen specified in this subdivision. Solar photovoltaic generation systems with no energy storage must use daytime minimum load. All other generation must use absolute minimum load unless an operating schedule is provided.
(ii) When this screen is being applied to a DER that serves some station service load, only the net injection of electric energy into the electric utility's distribution system may be considered as part of the aggregate generation.
(iii) The electric utility shall not consider as part of the aggregate generation, for purposes of this supplemental screen, DER capacity known to be already reflected in the minimum load data.

Voltage and power quality screen. In aggregate with existing generation on the line section, all of the following conditions must be met:

(i) The voltage regulation on the line section can be maintained in compliance with relevant requirements under all system conditions.
(ii) The voltage fluctuation is within acceptable limits as defined by the IEEE Standard 1453-2015, IEEE Recommended Practice for the Analysis of Fluctuating Installations on Power Systems.

ii.

Safety and reliability screen. The location of the proposed DER and the DER capacity on the line section may not create impacts to safety or reliability that require application of the study track to address. DTE shall consider all of the following when determining potential impacts to safety and reliability in applying this screen:

(i) Whether the line section has significant minimum loading levels dominated by a small number of customers, such as several large commercial customers.
(ii) Whether the loading along the line section is uniform.
(iii) Whether the proposed DER is located less than 0.5 electrical circuit miles for less than 5 kV or less than 2.5 electrical circuit miles for greater than 5 kV from the substation. In addition, the day to day rating of the line section from the substation to the point of common coupling.
(iv) If the proposed interconnection will connect to a power line or feeder cable
(v) Whether the proposed DER incorporates a time delay function to prevent reconnection of the DER to the distribution system until distribution system voltage and frequency are within normal limits for a prescribed time.
(vi) Whether operational flexibility is reduced by the proposed DER, such that transfer of the line section or sections of the DER to a neighboring distribution circuit or substation may trigger overloads, power quality issues, or voltage issues.
(vii) Whether the proposed DER employs equipment or systems certified by a recognized standards organization to address technical issues including, but not limited to, islanding, reverse power flow, or voltage quality.
(viii) Whether the proposed project will increase existing power quality issues on the circuit.
(ix) Whether voltage regulators, or load tap changers are adversely impacted or risk being

damaged by reverse power flow from over excitation, excessive operation or improper regulation behavior leading to their failure or power quality and voltage impacts to other customers.

(x) Whether the service at the premise is able to operate safely with the additional generation provided by the project.

(xi) Whether the service or transformer could experience a overload or out of range voltage when there are other existing projects on the same service transformer.

(xii) Whether there is a risk of islanding screen to determine if additional protection, communications or operating devices are required to prevent unintentional islanding

APPENDIX J: VOLTAGE RANGES

Voltage Class	Nominal Voltage (V)
Secondary	120/240
	120/208
	240
	277/480
	480
Distribution	4,800
	8,320
	13,200
Sub transmission	24,000
	41,570 (40KV)

APPENDIX K: COMPANY HOLIDAYS

New Year's Day (observed)
Martin Luther King Day
Good Friday
Memorial Day
Independence Day
Labor Day
Thanksgiving
Day after Thanksgiving
Christmas Eve (observed)
Christmas Day (observed)
New Year's Eve (observed)