



Generator Interconnection
Business Practices Manual
BPM-015-r10
Effective Date: OCT-31-2014

Manual No. 015

Business Practices Manual

Generator Interconnection



Disclaimer

This document is prepared for informational purposes only to support the application of the provisions of the Open Access Transmission, Energy and Operating Reserve Markets Tariff (Tariff) of the Midcontinent Independent System Operator, Inc. (MISO) and the services provided under the Tariff. MISO may revise or terminate this document at any time at its discretion without notice. However, every effort will be made by MISO to update this document and inform its users of changes as soon as practicable. Nevertheless, it is the user's responsibility to ensure you are using the most recent version posted on MISO website. In the event of a conflict between this document and the Tariff, the Tariff will control, and nothing in this document shall be interpreted to contradict, amend or supersede the Tariff.

This Business Practices Manual (BPM) contains information to augment the filed and accepted Tariff of MISO. In all cases the Tariff is the governing document and not the BPM. Additionally, if not otherwise defined herein, all capitalized terms in this BPM have the meaning as defined in the Tariff.

Time Zone

In 2006, Central Indiana, where MISO offices are located, began observing Daylight Savings Time. However, MISO, its systems, and the Midwest Markets, will continue to do business in Eastern Standard Time year-round.

Revision History

Document Number	Reason for Issue	Revised by:	Effective Date
BPM-015-r10	Revised Backfill procedures	C. Craven	OCT-31-2014
BPM-015-r9	Revised to add language regarding MISO-PJM Coordination of GI Projects. Also updated Table of Contents. Annual Review completed.	S. Turner	JAN-17-2014
BPM-015-r8	Annual Review completed. Revised Midwest ISO to Midcontinent Independent System Operator, Inc.	P. Muncy	AUG-20-2013
BPM-015-r7	Revised to reflect the November 1 st , 2011 filing of the modifications to the Generator Interconnection Procedures and Agreement.	E. Lavery	NOV-13-2012
BPM-015-r6	Annual Review completed	E. Lavery	SEP-11-2012
BPM-015-r5	MISO Rebranding Changes	E. Nicholson	MAR-21-2011
BP-015-r5	Revised to reflect the sixth M2 milestone option and separate deliverability analysis into its own subsection.	E. Lavery	MAR-21-2011
BPM-015-r4	Revised to reflect July 15 th filing for Shared Network Upgrades	E. Lavery	JUL-16-2010
BPM-015-r3	Revised to reflect numbering protocol	E. Lavery	JAN-01-2010
TP-BPM-004-r2	Revised to reflect the Open Access Transmission, Energy and Operating Reserve Markets Tariff for the Midwest ISO, Inc. (Tariff) relating to implementation of the Day-Ahead and Real-Time Energy and Ancillary Services Markets and to integrate proposed changes to the Balancing Authority Agreement.	E. Lavery	JAN-06-2009
TP-BPM-004-r1	Revised to reflect the June 25 th , 2008 filing of the modifications to the Generator Interconnection Procedures and Agreement.	J. Doner	AUG-25-2008



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1. Introduction

This introduction to the Midcontinent Independent System Operator, Inc. (MISO) *Business Practices Manual (BPM) for Generator Interconnection* includes basic information about this BPM and the other MISO BPMs. The first section (Section 0) of this Introduction provides information about MISO BPMs in general. The second section (Section 0) is an introduction to this BPM in particular. The third section (Section 0) identifies other documents in addition to the BPMs, which can be used by the reader as references when reading this BPM.

Purpose of the MISO Business Practices Manuals

The BPMs developed by MISO provide background information, guidelines, business rules, and processes established by MISO for the operation and administration of MISO markets, provisions of transmission reliability services, and compliance with MISO settlements, billing, and accounting requirements. A complete list of MISO BPMs is available for reference through MISO's website. All definitions in this document are as provided in the MISO Tariff, the NERC Glossary of Terms Used in Reliability Standards, or are as defined by this document.

Purpose of this Business Practices Manual

This *BPM for Generator Interconnection* contains the business practices of MISO in implementing Attachment X of its Open Access Transmission, Energy and Operating Reserves Markets Tariff (Tariff). These practices are intended to supplement the Tariff, and to the extent that there is a conflict between the Tariff and these practices, the Tariff controls.

MISO prepares and maintains this *BPM for Generator Interconnection* as it relates to the reliable operation of MISO's region of authority. This BPM conforms and complies with the Agreement of Transmission Owners to Organize MISO, Federal Energy Regulatory Commission (FERC) Order 2000, MISO's Tariff, North American Electric Reliability Corporation (NERC) (the Electric Reliability Organization (ERO)) operating policies, and the applicable Regional Entities' reliability principles, guidelines, and standards and is designed to facilitate administration of efficient Energy and Operating Reserve Markets.



References

Other reference information related to this BPM includes:

- BPM 001 Market Registration
- BPM 004 FTR and ARR
- BPM 010 Network and Commercial Model
- BPM 020 Transmission Planning
- Agreement of the Transmission Facilities Owners to Organize the Midcontinent Independent System Operator, Inc., a Delaware Non-Stock Corporation (MISO Agreement)
- The Tariff
- Attachment X (Generator Interconnection Procedures and Agreement) of the Tariff

2. Generator Interconnection Process Overview

The Generator Interconnection Process is divided into four phases:

- Pre-Queue (represented by yellow in the diagram)
- Application Review (green)
- System Planning & Analysis (light blue)
- Definitive Planning (purple)

An overview of the process is shown in Figure 2.1. The process incorporates interaction between generator Interconnection Customers and MISO and uses milestone achievement as a method of moving Interconnection Requests (IRs) through the queue. Milestones (represented by black diamonds in the diagram) serve as control checkpoints where MISO assesses IRs based on pre-defined criteria. Milestone achievement is a key determinant in how an IR is progressing through the process. (The other key determinant is transmission availability, which is discussed under “Feasibility Study” in Section 4.2.4.) Milestones may be technical (such as a stability model) or business-related (such as proof of Site Control).

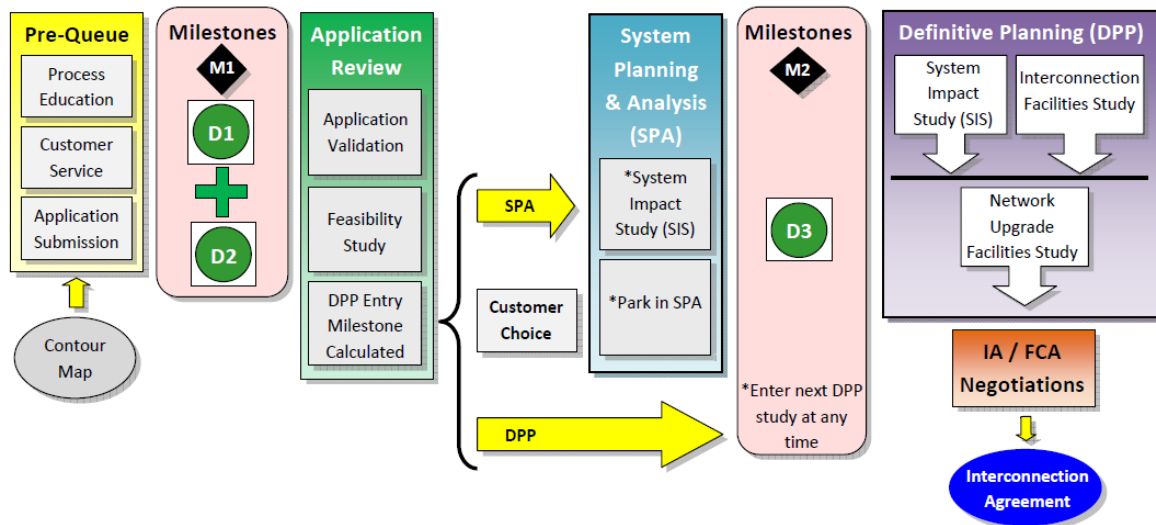


Figure 2.1 Generator Interconnection Process Overview

3. Pre-Queue Phase

The Pre-Queue Phase is designed to provide the Interconnection Customers an overview of the process, timeline, and expectations pertaining to the output of the Generator Interconnection process. The goal of the Pre-Queue Phase is to provide various channels for communication between Interconnection Customer and MISO so that the Interconnection Customers is well informed about the queue process and requirements in every phase of the process. Figure 3.1 outlines the steps involved in the Pre-Queue Phase.

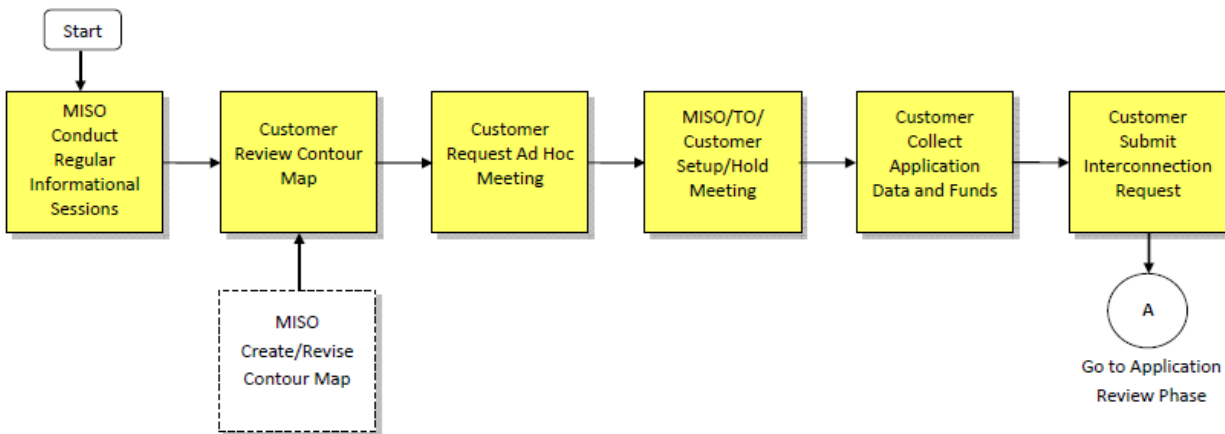


Figure 3.1 Overview of Pre-Queue Phase

3.1. Resources Available

Prior to entering the queue, an Interconnection Customer can utilize various resources available to familiarize themselves with the Tariff, queue processing and milestones in the process. The MISO website will have online training programs, learning tools, contour maps indicating incremental transfer capability on the system, and other informational material. These programs are provided to help educate Interconnection Customers about the queue rules, process steps and requirements in each phase, to prepare them for successful completion of the MISO Generator Interconnection process. Additionally, Interconnection Customers can participate in the periodically scheduled information sessions or request a meeting to discuss specific issues.

3.1.1. Contour Map

MISO will post a contour map presenting an indicative estimate of the transmission capacity based on a relative pattern of incremental injection capability under first contingency conditions in the MISO footprint. The intent of this contour map is to provide Interconnection Customers an indication of the time it would take to study and eventually connect their project at the desired location. Generally an area with a large concentration of Interconnection Requests will have a low or negative incremental transfer capability. Therefore, studies would take longer to mitigate constraints and construction would take longer to build new transmission, thereby prolonging the overall time to interconnect a project in that area. Note that the purpose of the contour map is to provide guidance to an Interconnection Customer for making an informed decision. The map should not be treated as a substitute for studies. There may be other complex and physical limitations on the Transmission System which will be revealed only after detailed planning and engineering studies.

Once the Base Case for the Definitive Planning Phase System Impact Study is finalized, the updated assumptions will be used to refresh the contour map. The contour map will be developed for the near term and out year scenario. The contour map represents the incremental injection capacity at each bus in the MISO footprint under N-1 condition. The following steps are involved in developing the contour map:

- The power flow model developed for the current System Impact studies will be used for the purpose of this analysis.
- A transfer of 10,000 MW (subject to change in future as the network topology changes) is simulated from each bus in each MISO Local Balancing Authority to the whole MISO footprint and a First Contingency Incremental Transfer Capability (FCITC) analysis is performed using a load flow software tool. A distribution factor cutoff of three (3%) is used for the purpose of this analysis. This gives the incremental injection capacity at each bus.
- The injection capacity at each bus is decremented by the existing and queued generation at the bus to obtain the net injection capacity that is available. For this purpose, the nameplate rating of the generation (Pmax) is considered.
- The net injection capacity at each bus is mapped to the GIS coordinates and the information is fed into the PowerWorld Corporation's PowerWorld Simulator tool to generate the contour map.
- A sample contour map is shown in Appendix A of this BPM.

3.1.1.1. Ongoing Efforts

MISO will continue to review the process and business practices for potential improvements on an ongoing basis. To address the transmission limitations in highly constrained areas, MISO will coordinate the transmission projects to accommodate the queued requests. MISO will continue to coordinate the Generator Interconnection process with the other planning activities outside the queue to provide the Interconnection Customer with more cost-efficient and timely solutions to their Interconnection Request.

3.2. Regularly Scheduled Information Sessions

MISO conducts on the road workshops on a quarterly basis for Interconnection Customers with a desire to participate and become familiar with the interconnection process and/or ask questions. All workshops are open to any potential or existing Interconnection Customers, Transmission Owners, Affected Systems, and other RTOs/ISOs wishing to learn about the MISO Generator Interconnection process. The workshops will address topics such as milestones in the process, study timelines, Interconnection Customer inputs, requirements to enter each phase, estimated costs, Interconnection Customer responsibilities, etc. The schedule for all workshops will be posted in advance on the MISO website, at the Generator Interconnection page.

The workshops will be conducted in either the Carmel, IN or St. Paul, MN MISO offices and will move based on an alternating schedule or at the request of the potential participants. Depending on interest and requests in the queue, locations may be revised in the future to include locations outside MISO offices.

3.3. Ad Hoc Information Sessions

Interconnection Customer can request an ad hoc information session with MISO and likely affected Transmission Owners in the following circumstances:

- i. Interconnection Customer has identified a site location for a potential project
- ii. Interconnection Customer has questions unique to his situation
- iii. Interconnection Customer wants to get a better understanding of the available Points of Interconnection near their project site and any known issues on the local Transmission System
- iv. If Interconnection Customer's questions or concerns were not addressed in the monthly update calls or during the on-the-road workshops



In order to request an ad hoc information session, the Interconnection Customer will submit an online request. The request will entail filling out a form which would include a tentative agenda for the meeting and specific questions. MISO will review the request for a meeting and decide which Transmission Owners to invite for the meeting. Within five (5) Business Days of receiving the request, MISO will send an email notification to Interconnection Customer with earliest available dates/times for the meeting, which will be scheduled within thirty (30) Calendar Days of receiving the request, unless another date is agreed upon by MISO and Interconnection Customer. An example of the template form to request a meeting is included in Appendix B of this manual.

MISO may review the following information in the meeting with the Interconnection Customer:

- i. Contour map details in the area
- ii. Existing loadings on the transmission outlet from the project site
- iii. General stability and short circuit issues in the area
- iv. General voltage issues including the ride through capabilities of the Generating Facility
- v. General power quality issues including voltage flicker and harmonics
- vi. General local and regional reliability issues
- vii. Results of any previously completed study at or near the same location
- viii. Estimated timing of request proceeding to the Definitive Planning Phase
- ix. Estimated in-service date for the Interconnection Request
- x. Any other existing information which could be helpful for the Interconnection Customer

4. Application Review Phase

The Application Review Phase, as depicted in Figure 4.1, will include preliminary work required before a study can begin, in the following two areas: application screening and Feasibility Study. During information review, MISO will communicate with the Interconnection Customer to verify the information provided in the application and clarify any ambiguity. The Feasibility Study results can be used by the customer to help them determine which path their Interconnection Request will take through the Generator Interconnection process.

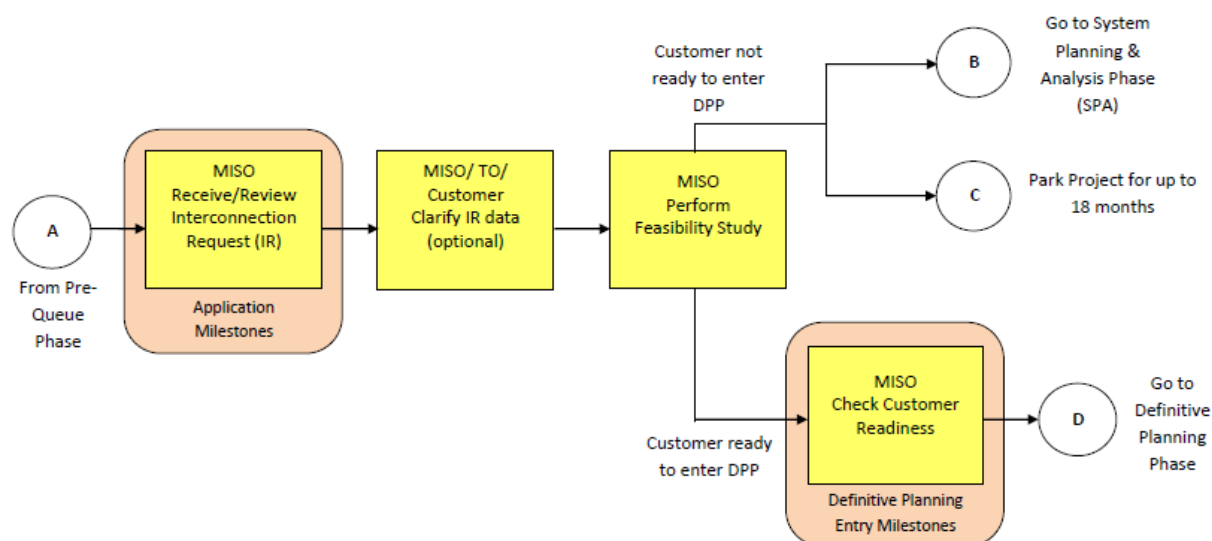


Figure 4.1 Overview of Application Review Phase

4.1. Scoping Meeting

Upon receiving a new Interconnection Request, MISO will review the information and data provided to verify that the Interconnection Request is complete and valid. MISO will send an acknowledgement of receiving a valid application or a request for additional information to the Interconnection Customer within five (5) Business Days of receiving the application. An Interconnection Request will not be accepted until all required sections are completed in the Application. The Interconnection Customer must provide any additional information requested to constitute a valid request at least fourteen (14) Calendar Days prior to the start of the next Feasibility Study. Within ten (10) Business Days after the receipt of a valid Interconnection Request MISO will provide a summary of the request to the Interconnection Customers and likely affected Transmission Owners. If the Interconnection Customer or Transmission Owner

has questions or concerns about the information in the summary they can request MISO to schedule a Scoping Meeting or conference call. If requested, a Scoping Meeting or conference call will be scheduled no later than thirty (30) Calendar Days from the receipt date of the valid Interconnection Request, unless another date is agreed upon by MISO and Interconnection Customer. For those Interconnection Customer's that require a Scoping Meeting, Interconnection Customer needs to submit their Interconnection Request far enough in advance of the Feasibility Study start date to assure that the Interconnection Request will have the necessary time to be deemed valid, which is at least fourteen (14) Calendar Days prior to the Feasibility Study start date. The following items can be discussed in the Scoping Meeting as appropriate:

- i. Consider a reasonable number of alternative interconnection options to determine potential feasible Points of Interconnection.
- ii. General Facility loadings
- iii. General stability and short circuit issues in the area
- iv. General voltage issues including the ride through capabilities of the Generating Facility
- v. General power quality issues including voltage flicker and harmonics
- vi. General local and regional reliability issues

The Interconnection Customer may as a result of the Scoping Meeting modify its Point of Interconnection and one or more of the alternative Points of Interconnection submitted. The Interconnection Customer will have five (5) Business Days from the date of the Scoping Meeting to submit the modified Point of Interconnection(s) to MISO.

4.2. Initial Screening

All Interconnection Requests will go through a set of screenings before they can be placed in the appropriate study phase. This screening will include verifying the application submitted has the required technical information, met the necessary milestones, and study deposits.

4.2.1. Application Milestones (M1)

The Interconnection Customer must meet the requirements of milestone (M1) in order for the application to be determined valid by MISO. The application milestones will include *all of* the following:

- Technical Milestones:

Generic Stability Model	Simplified stability model that approximately mimics the dynamics behavior of the Generating Facility
Point of Interconnection (POI)	Location of the POI. The information provided should be descriptive enough to locate the POI in a power flow model
Impedance from collective substation to POI	Impedance of the radial line from generator substation (GSU) to the POI
Technical data to run studies	Other technical data (as applicable) required to run studies such as sequence impedances, Generating Facility reactance, saturation curves, etc.
One-line diagram	Diagram of the Generating Facility clearly showing the Interconnection Facilities and POI
Generation output (MW)	Gross and NET MW output of the Generating Facility under Summer and Winter conditions
Step-up transformer data	Specifications of the Generating Facility Step-up transformer

- Non-Technical Milestones:

Application	Interconnection Request that is fully completed and correct in the form of Appendix 1 to the Generator Interconnection Procedures*
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**The Interconnection Customer must submit one application for each site. Additionally, multiple Interconnection Requests can be submitted for a single site (each application will require a separate deposit in this case).*

<p>Proof of Site Control</p>	<p>Documentation demonstrating ownership, leasehold interest in, or a right to develop a site for the purpose of constructing a Generating Facility, including demonstration that there is sufficient land area equal to at least fifty percent (50%) of that required to support the size and type of Generating Facility proposed. Alternatively, Interconnection Customer may pay an additional \$100,000 deposit, in lieu of Site Control, which is refundable upon future demonstration of Site Control up to ten (10) Business Days after the start of the Definitive Planning Phase or withdrawal from the queue before the start of the Definitive Planning Phase. If an Interconnection Customer is required by a state regulatory body to take two POIs through the study process proof of Site Control is not required for the second Interconnection Request.</p>
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- Financial Milestones:

There are no financial milestones attached to the milestone (M1) submission. (However there are study deposits D1 and D2 which occur at the same time; please refer to Section 4.2.5).

4.2.2. Definitive Planning Phase Entry Milestones (M2)

The requirements for the Definitive Planning Phase (DPP) entry milestones (M2) are comprised of the items that follow. At the M2 milestone submission stage, the Interconnection Customer must meet *all* of the technical milestones, plus the Site Control milestone, plus *the DPP entry milestone* in the form of a cash deposit or an irrevocable letter of credit. If an Interconnection Customer is required by a state regulatory body to take two POIs through the study process satisfaction of the non-technical milestones is not required for the second Interconnection Request. All technical and non-technical milestones and study deposits must be received by MISO no later than thirty (30) Business Days prior to the start of the next Definitive Planning Phase cycle.



- Technical Milestones:

Detailed stability model	Actual stability model representing dynamics of the Generating Facility
Definitive Point of Interconnection	POI before entering the Definitive Planning Phase.
Definitive one-line diagram	Diagram before entering the Definitive Planning Phase.
Definitive generation output (MW)	Generation output before entering the Definitive Planning Phase.

- Non-Technical Milestones:

Proof of Site Control	Re-validation of Site Control demonstrated at M1 milestone submission; deposit submitted in-lieu of Site Control at M1 becomes non-refundable if Site Control is not demonstrated by the tenth (10 th) Business Days after the start of the Definitive Planning Phase Demonstration of site control when the Interconnection Customer is providing the site for the Transmission Owner Interconnection Facilities and Network Upgrades at the POI is required before entering the DPP.
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DPP Entry Milestone*	The Interconnection Customers will provide either a cash deposit or an irrevocable letter of credit based on the formula of ten percent (10%) of (the sum of the number of feasibility constraints by voltage level times the constant dollar amount per voltage level added to the total gross MW requested times the current Schedule 7 Yearly MISO Drive-Through and Out Rate). (The maximum DPP entry milestone will be capped at \$10,000 per gross MW requested while the minimum DPP entry milestone will be \$2,000 per gross MW requested.).
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**M2 cash deposit or irrevocable letter of credit would be fully refundable upon submission of the first GIA milestone payment or partially refunded upon Withdrawal. For detail on Letter of Credit requirements see Section 4.2.3.*

Additionally, there is a D3 study deposit which occurs at the same time; please refer to Section 4.2.5.

When all M2 milestones and the D3 deposit are received and validated a project will be placed in the Definitive Planning Phase.

4.2.3. Letter of Credit Requirements

The Letter of Credit should clearly specify the “Issuer,” the “Account Party”, “Beneficiary (MISO),” the term for which the Letter of Credit will remain open, and the dollar amount available. It should also include a statement as to the instructions and terms for funds disbursement. The party issuing the Letter of Credit must have a minimum corporate debt rating of “A-” by S&P, “A3” by Moody’s, and “A-” by Fitch. All costs associated with obtaining the Letter of Credit will be the responsibility of the Interconnection Customer. If the Letter of Credit option is chosen to fulfill the DPP entry milestone it would need to remain open until submission of the first GIA milestone payment or withdrawal.

4.2.4. Feasibility Study

A Feasibility Study will be performed for all Interconnection Requests as an initial screening. The intent of the Feasibility Study is to test the system readiness for an interconnection. An Interconnection Request has to be determined to be valid at least fourteen (14) Calendar Days prior to the start of the Feasibility Study. The Feasibility Study will determine the number of constraints on the transmission system for the purpose of calculating a portion of the DPP entry milestone. The Feasibility Study will evaluate up to three Points of Interconnection at the request of Interconnection Customer. An Interconnection Customer’s request to evaluate one site at two different voltage levels will be considered two Points of Interconnection. Based on the results of the Feasibility Study, the Interconnection Customer will then select a single Point of Interconnection for the remainder of the process. The Interconnection Customer must notify MISO about their POI selection and any decrease in generating capacity (Pmax) within thirty (30) Calendar Days prior to the start of the next Definitive Planning Phase. A Feasibility Study will be performed three times during each Definitive Planning cycle and MISO will use Reasonable Efforts to complete the study within ten (10) Business Days. MISO will provide the Interconnection Customer with the results of the Feasibility Study within five (5) Business Days of completion.

If the Interconnection Customer provides the M2 milestones and D3 deposit the project will enter the Definitive Planning Phase, where system impact and facilities studies will be conducted. If the Interconnection Customer elects not to meet the M2 milestones and D3 deposit they will be placed into the System Planning and Analysis phase (SPA).

The Feasibility Study considers all in-service generators, projects with signed permanent GIAs and the projects in queue that are being studied in the DPP . Network Upgrades required for queued projects may be included to the extent they are known. The power flow model will include the existing MISO Transmission Expansion Plans (MTEP) in Appendix A. A linear power flow analysis will be performed on the near term summer peak and a shoulder-peak condition case with appropriate generation dispatch as defined in Section 6.1.1.1.1. The results will be screened based on the worst loading and the number of unique constraints caused by the studied Generating Facility. A distribution factor of five percent (5%) will be used to identify the constraints. After the feasibility study is posted if the Interconnection Customer chooses to reduce the gross MW size of their project there will be no changes made to the original DPP entry milestone calculation. Requests by Interconnection Customers to reduce the gross MW size of a project must be provided no later than thirty (30) Calendar Days prior to the start of the next Definitive Planning Phase. The second and third Feasibility Study in a single Definitive Planning Phase study will take into account all Definitive Planning Phase projects identified through the first and second Feasibility Studies respectively. The following table is used to calculate the Feasibility portion of the DPP Entry Milestone:

Table 4.1 Feasibility Study Constant Amounts

Voltage (kV)	Cost (\$) (10% of per mile new construction cost)
345	350,000
230	200,000
161	130,000
138	130,000
115	130,000
69	125,000

The Feasibility Study results report will show the results of the (M2) DPP entry milestone calculation which provides three potential paths a project may take, which are depicted in Figure 4.1.

Path B: System Planning & Analysis Phase

Projects are routed through Path B of the System Planning & Analysis phase when the Interconnection Customer does not meet the M2 milestone requirements and submits a SPA study scope. The Interconnection Customer will provide a SPA study scope indicating a study path of the Interconnection Customer's choosing. At any time during the SPA cycle the Interconnection Customer may provide the M2 milestones and D3 deposit to enter the next DPP study.

Path C: Interconnection Customer Not Ready

If the Interconnection Customer is not ready (unable to meet the M2 milestones and/or D3 deposits) to proceed to the Definitive Planning Phase and does not provide a SPA study scope, the Interconnection Customers can choose to defer entering any study for up to eighteen (18) months ("park" the project) from their last completed Interconnection Study. To the extent the Interconnection Customer meets the M2/D3 requirements by the next scheduled DPP deadline their project would be included in that DPP cycle. A SPA study scope may also be provided during this time to enter a SPA study. The Interconnection Customer must provide the appropriate milestones and study deposits by the eighteen (18) month deadline, or the Interconnection Customer's request will be withdrawn.

Path D: Definitive Planning Studies

When the Interconnection Customer submits the milestones (M2) and study deposit (D3) at least thirty (30) Business Days prior to the start of the Definitive Planning Phase the Interconnection Request will be placed on Path D. The project will enter into the DPP System Impact Study which is performed concurrently with the interconnection facilities portion of the Facilities Study.

4.2.5. Study Deposits and Refunds

Study deposits are those deposits from the Interconnection Customer that are put towards the cost of performing the interconnection studies. As depicted in Figure 4.2, there are three study-related deposits required for an Interconnection Request to proceed through the process:

- D1 – Application fee, which will cover the costs of performing the Feasibility Study.
- D2 – System Impact Study deposit, which will cover the costs of performing the System Planning and Analysis study or applied to part of Definitive Planning studies for those projects that proceed directly to the Definitive Planning Phase.
- D3 – Definitive Planning deposit, which will cover all remaining Definitive Planning study costs and as applicable potential restudy costs.



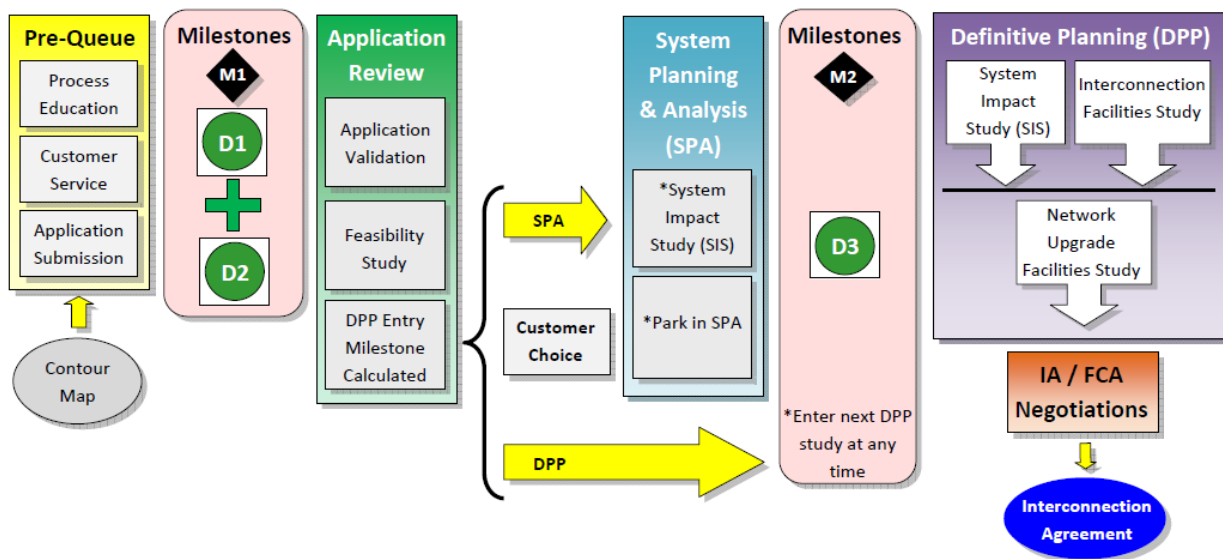
Additional studies available for projects:

Deliverability Only Study

- Deposit for a deliverability only study – The study funding deposit for an Interconnection Request to change ER Interconnection Service to NR Interconnection Service for a Generating Facility in Commercial Operation or with an executed GIA shall be \$35,000. The D1 deposit is also required at the time of application for a deliverability only study request.

Optional Interconnection Study

- The Interconnection Customer can request an Optional Interconnection Study for their project solely to get additional information/results to help them in making business decisions on their project. Request for a study can be made on a stand alone basis or in parallel with an ongoing Interconnection Study. The studies will be performed based on the assumptions outlined by the Interconnection Customer. Results of such informational studies will be non-binding. Interconnection Customer can request an Optional Interconnection Study by submitting GIP Appendix 5 along with a \$60,000 study funding deposit.



Ref	Description	Refund	<6 MW	≥6 but ≤ 20 MW	> 20 but ≤ 50 MW	> 50 but ≤ 100 MW	> 100 but ≤ 200 MW	> 200 but ≤ 500 MW	> 500 but < 1000 MW	≥ 1000 MW
D1	Application Fee/Fund FeS	No	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000
D2	Fund System Impact Study (SIS)	Yes	\$10,000	\$20,000	\$30,000	\$60,000	\$60,000	\$60,000	\$90,000	\$120,000
D3	Fund DPP and Restudies	Partial	\$40,000	\$100,000	\$150,000	\$210,000	\$260,000	\$360,000	\$440,000	\$520,000

*FeS = Feasibility Study

Figure 4.2 Application Fee and Study Deposits

Deposit D1

The amount of the application fee (D1) is \$5,000 for all project sizes and to study up to three Points of Interconnections, which is used to offset the cost of the Feasibility Study and other Pre-Queue expenses, which is non-refundable. After the Feasibility Study the Interconnection Customer will have to select a single POI, unless they are required by a state regulatory body to take two POIs through the study process, in which case they will have to submit study deposits for each POI.

Deposit D2

Deposit amounts to fund the System Planning & Analysis or applied to part of Definitive Planning studies for those projects that proceed directly to the Definitive Planning Phase will be the same for projects in a certain MW range (i.e. < 6, 7-20 ...), which are shown in Figure 4.2. The amount of the study deposit is representative of the expected costs associated with completing the study for projects in those ranges.

Unused portions of the D2 deposits are refundable under the following conditions:

- i. Unused balance is returned to Interconnection Customer if Interconnection Customer withdraws
- ii. If Interconnection Customer withdraws during Group Study, Interconnection Customer is responsible for their share of the Group Study costs
- iii. Unused balance is held by MISO if Interconnection Customer proceeds to Definitive Planning Phase

Deposit D3

Deposit amounts to fund Definitive Planning Studies (D3), including the Facilities Study, and if necessary any restudies, which will also be the same for projects in a certain MW range, refer to Figure 4.2. D3 deposits represent two times the expected amount needed to fund Definitive Planning studies, where the additional deposit amount will be utilized to offset restudy costs for later-queued projects should a project withdraw during or after the Definitive Planning Phase, which would result in restudy for later-queued projects. The following rules will determine the refund of D3 deposit under various situations:

- i. Refund amount for a withdrawn or terminated project under the Definitive Planning Phase will be calculated as follows:
Refund = Deposit – the project's share in actual study cost – estimated restudy cost due to withdrawal/termination
- ii. If a project enters suspension under the Definitive Planning Phase, any unused deposit after deducting the cost of the DPP studies and any restudies triggered by such suspension, will be refunded upon Commercial Operation.
- iii. For an active project, any unused study deposit from the Definitive Planning Phase will be refunded upon Commercial Operation

4.3. Determination of Project Linkages and Potential Grouping

MISO may perform a power flow analysis and use in-house post processing tools to determine project grouping. Each project will be dispatched against the generation in the MISO footprint and a distribution factor cut-off of five percent (5%) will be used for the purpose of this analysis. All projects contributing to any common constraint will be grouped together for study. Additionally the following guidelines will be used to form a study group:

- i. Group Studies will not be limited by size. Upgrades for Group Studies will be determined in incremental blocks of MW capacity. The size of each block will depend on the factors such as the constrained area, transmission voltage, Right of Way availability, room for expansion in the existing substations etc. The blocks of MW (sub-groups) will be selected based on the queue position, the impact of Generation Interconnection Requests on the limiting constraints, loading on the limiting constraint, available study work and engineering judgment.
- ii. Other factors such as number/type of projects, queue position, electrical proximity of the Point of Interconnections as determined in the Feasibility Study, etc. will be considered when defining a study group

This analysis may be performed separately on projects in System Planning & Analysis and the Definitive Planning Phase.

4.4. Queue Position

The Initial Queue Position for Interconnection Requests will be based on the date and time their application was deemed valid by MISO. The Initial Queue Position will be used to determine the order for the Feasibility Study. Projects entering the SPA will retain their Initial Queue Position and projects entering the DPP will be assigned a new DPP Queue Position based on the date and time that they satisfy all requirements to enter the DPP that replaces their Initial Queue Position. MISO will record the dates milestones are received for each project. Within a study group, the queue positions for projects will be determined based on the date they met the last milestone in the process. The queue position will be used to determine the cost responsibility of Network Upgrades for a project, except if the project was part of a Group Study, in which case cost responsibility will be determined according to Section 6.1.1.1.8 of this Business Practices Manual.

5. System Planning and Analysis Phase

A System Planning & Analysis Study Scope form must be submitted no later than thirty (30) Calendar Days prior to the start of the next System Planning & Analysis phase. Interconnection Customers must submit a completed System Planning & Analysis Study Scope form no later than eighteen (18) months after the completion of an Interconnection Study including the Feasibility Study or the System Planning & Analysis System Impact Study. Interconnection Requests are not required to complete the System Impact Study in the System Planning & Analysis Phase.

If an Interconnection Customer elects to complete a System Impact Study in the System Planning & Analysis Phase, the study will be conducted based on the Interconnection Customer's submitted System Planning & Analysis Study Scope form. MISO will use Reasonable Efforts to complete the System Planning & Analysis SIS within six (6) months. MISO will hold a kick-off meeting or conference call to discuss the study scope. The agenda for the kick-off meeting will include but not be limited to the discussion on Base Case selection, queued generation addition, transmission project addition, number of study scenarios to run, order of the analyses, monitored area, contingencies, known issues in the region or local area, study schedule etc. MISO will provide periodic updates to the Interconnection Customer on the progress of the study. Frequency of such updates will depend on the size and complexities of the study and a schedule for the updates will be established with mutual agreement in the kick-off meeting.

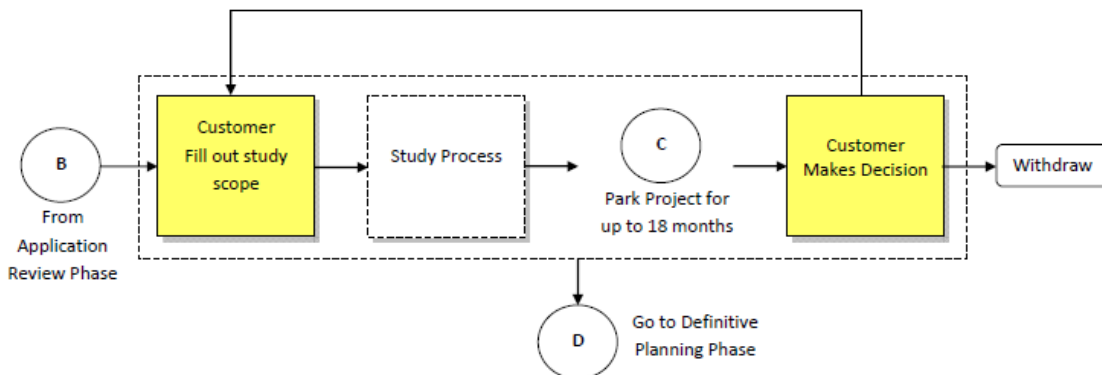


Figure 5.1 Overview of System Planning and Analysis Phase¹

¹ Process diagram for dashed boxes are located in Appendix C.

The System Impact Study will generally include the following steps:

- i. The Interconnection Customer will provide a System Planning & Analysis Study Scope form at least thirty (30) Calendar Days prior to the System Planning & Analysis Study start date.
- ii. MISO will review the scope and form group studies based on similar scope, geographic location, and electrical proximity.
- iii. MISO will form a study ad hoc group which will include Interconnection Customers, Consultant and Transmission Owners that are potentially impacted by the proposed interconnections including any Affected Systems.
- iv. MISO will schedule a kick-off meeting and send the proposed scope out to the meeting participants prior to the meeting.
- v. The study scope will be finalized in the kick-off meeting.
- vi. The appropriate base model for the study horizon will be selected from Model on Demand (MOD) and any additional changes (projects in MOD) in the study region will be applied in accordance with the requested scope of the study. The ad hoc group will review the models and recommend changes to the model by providing a complete Model Review Form. The study will not start until the completed Model Review Form is returned by the Interconnection Customer. Failure of the Interconnection Customer to provide the completed Interconnection Study Model Review Form within sixty (60) days will change the project status to “park” according to Section 4.2.4 - *Path C*. Interconnection Customer must submit a completed System Planning & Analysis Study Scope form no later than eighteen (18) months after the completion of the previous submission of the System Planning & Analysis Study Scope form. Transmission Owners must submit any additional changes to MOD for including them in the study model. Such changes will also include the detailed representation of the lower voltage (distribution or sub-transmission) facilities, if required in the study model, to adequately assess the impact of new Generating Facility and is not already in MOD.
- vii. The ad hoc group will provide any additions or changes to the MTEP contingency file during the Model Review period. This file will also include contingencies in Affected Systems and the lower voltage contingencies as appropriate for the study. Similarly, all potentially impacted MISO facilities and transmission/distribution facilities in the neighboring systems will be monitored for the impacts caused by the proposed Generating Facility(ies)

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- viii. MISO or designated consultant will build the study models from MOD and a preliminary analysis will be performed.
 - ix. The results of the preliminary analysis will be shared with the ad hoc group for review and comments. Mitigation will be identified if included in the requested Study Scope option requested by the Interconnection Customer.
 - x. MISO will perform the remaining analyses as requested in the System Planning & Analysis Study Scope and prepare a draft report with all results included.
 - xi. The draft report will be shared with the ad hoc group for review and comments. The ad hoc group will have ten (10) Business Days to provide any comments. At the request of the Interconnection Customer, Transmission Owner, or Transmission Provider a meeting may be scheduled within ten (10) Business Days of the draft report to present the study results to the ad hoc group. All ad hoc group members will be invited to the meeting. MISO will address all comments to the extent possible and a final report will be prepared.
 - xii. The final report will be posted on the MISO website.

Study Scope

The Study Scope options include three (3) pre-defined and one customizable scope option, alternatively scope selection may be combined by selecting a pre-defined scope and adding selections from the custom scope options.

- i. Regular Generator Interconnection System Impact Study
- ii. Planning Horizon Study
- iii. Operating Horizon Study
- iv. Custom scope

5.1. Regular Generator Interconnection System Impact Study

If a Regular Generator Interconnection System Impact Study is requested through the SPA Study Scope this study will be completed in accordance with Section 6.1. If pre-defined scope options are combined with custom scope selections changes will be discussed in the kick off call and made to the scope of the System Impact Study.

5.2. Planning and Operating Horizon Studies

The Planning and Operating Horizon Studies have two options available for analysis including determining the available injection capacity and determining the upgrades for requested service:

- i. Determine available injection capacity
- ii. Determine upgrades for requested service

A System Impact Study (SIS) will be conducted based on the SPA Study Scope selection made. The study scope for both the Planning and Operating Horizon Studies will only determine steady state limits unless otherwise requested by the Interconnection Customer by selecting additional custom scope options.

5.2.1. Power Flow Analysis

5.2.1.1. Determine available injection capability

A linear analysis will be performed for all NERC/ERO defined events to determine the available injection capacity at the POI. MISO will determine, with input from the ad hoc group, the monitored element and contingency list, as well as study criteria (reflecting the NERC/ERO, the Transmission Owners', and other applicable criteria). A separate ad hoc study group will be formed and chaired by MISO for each study. Facilities in the Affected System that may be impacted by the interconnection will also be monitored. For any identified significantly affected facility, the study will determine the maximum output where no constraint exists. A preliminary indication of the upgrades/cost to mitigate the constraints for full power will not be included, please refer to Section 5.2.1.2.

A post-project case (post case) will be created by adding the study generator(s) and associated interconnection facilities to the Base Case. The study generator(s) shall be turned on at their expected output level described in Section 6.1.1.1.1, and dispatched against other MISO units across MISO's footprint. The post case will undergo a DC screen using the either DC Contingency Analysis by Monitored Elements or First Contingency Incremental Transfer Capability (FCITC) function in MUST. The distribution factors will be calculated using Monitored Sensitivity function in MUST. All monitored element and contingency pairs which are overloaded (worst case loading) in the post case using DC analysis and which have a distribution factor greater than five percent (5%) will be reported.

5.2.1.2. Determine upgrades for requested service

If upgrades for the requested service are requested in the SPA study scope selection, MISO will check the MTEP appendices and discuss with the impacted Transmission Owner(s) to determine if there already exists a planned project which will alleviate the constraint. If there is no such planned or proposed project, MISO will work with the impacted Transmission Owner(s) and Interconnection Customers to identify a prudent transmission upgrade based on Good Utility Practices. A Network Upgrade cost estimate will be provided. The Interconnection Customer will be solely responsible for the cost of the transmission upgrade according to the

applicable Tariff provisions. For the case of a Group Study, the individual share of a transmission upgrade will be treated according to Section 6.1.1.1.8.

5.2.1.3. Base Case Assumptions

For the Planning Horizon study please refer to Section 6.1.1.1.1. In addition other projects that have entered the Definitive Planning Phase before the Planning Horizon study start-date will be added to the Base Case. Note that during the course of the study, additional projects may obtain a DPP Queue Position. Impact of such projects (and their upgrades) on study results will be assessed in the Definitive Planning Phase.

For the Operating Horizon study the latest Model on Demand (MOD) monthly base case will be used as a starting point for analysis. The case will then be updated to represent one year from the request date unless defined differently in the SPA Study Scope. The following may be added to the Base Case if the expected in service date is within the study horizon:

- i. Projects in the queue that have a DPP Queue Position and known Network Upgrades
- ii. MTEP Appendix A projects that are not already in the model

5.2.1.3.1. Load Levels and Generation Dispatch

Please refer to Section 6.1.1.1.1.1 pertaining to the Planning Horizon Study.

The Operating Horizon Study will only consider the available MOD monthly base model. All existing generators and higher-queued generators will be modeled if the expected in service date is within the identified study timeframe.

5.2.1.3.2. Generation to Include

Please refer to Section 0 pertaining to the Planning and Operating Horizon Study. In addition, other queued generation projects will be considered based on Interconnection Customer input in the SPA Study Scope.

The Operating Horizon Study will only include generation with expected in service dates within the identified study timeframe.

5.2.2. Criteria Used to Determine Constraints

Refer to Section 6.1.1.1.6. Analysis pertaining to Network Resource Interconnection Service will not be completed as part of a Planning or Operating Horizon Study.

5.3. Custom Scope

The custom study scope allows the Interconnection Customer to tailor a study in a way most beneficial to them. The following selections are available:

- i. Timeframe
- ii. Transmission modeled
- iii. Generation modeled
- iv. Study scenarios and analyses
- v. Study generator dynamic model
- vi. Outages
- vii. Deliverables

5.3.1. Timeframe

The options for timeframe refer to the base topology and generation that would be assumed for the study.

- i. Near term: Model on Demand base case
- ii. Planning Horizon: Transmission Access Planning five year out model
- iii. Longer term (10+ years): Transmission Access Planning ten year out model
- iv. Other (specify)

5.3.2. Transmission Modeled

The transmission modeled will determine the topology of the study. The transmission will be added through the timeframe selected from Section 5.3.1

- i. Existing system: in service facilities
- ii. MTEP A
- iii. MTEP B
- iv. MTEP C (specify)
- v. Custom inclusions/exclusions (specify): this could include inclusions/exclusions of other generator projects network upgrades

5.3.3. Generation modeled

Generation modeled can range from broad selections such as all in-service generation to Interconnection Customer selected interconnection projects by providing specific project numbers.

- i. In-service generation
- ii. Signed GIA

- iii. Requests in Definitive Planning Phase: projects with Definitive Planning Phase queue positions
- iv. Higher-queued requests: other projects with prior Initial queue positions
- v. Provisional GIAs: projects with limited operation of the plant that still require network upgrade identification through a normally queued System Impact Study
- vi. Custom inclusions/exclusions (specify): project specific selections

5.3.4. Study Scenarios and Analyses

Study Scenarios and Analyses provide options for the type of analysis desired. This ranges from a regular Generator Interconnection System Impact Study to a Deliverability only study.

5.3.4.1. Injection (ERIS) evaluation

Similar to the ERIS portion of a Generation Interconnection System Impact Study, please refer to Section 5.1 of this BPM.

- i. Shoulder-peak steady-state
- ii. Summer peak steady-state
- iii. Stability
- iv. Short-circuit
- v. Typical (all of the above)

If Injection (ERIS) evaluation and Short-circuit is selected, only the Short-circuit study will be completed instead of the entire ERIS evaluation. An Interconnection Customer is only required to select Injection (ERIS) evaluation (4.1 on the SPA study scope form) or Typical (4e on the SPA study scope form) if all ERIS analyses are requested.

5.3.4.2. Deliverability (NRIS) evaluation

Please refer to Section 6.1.1.1.7 of this Business Practice Manual.

5.3.4.3. Transmission Service Request (TSR) evaluation

A TSR evaluation will be completed, taking into consideration any other scope options selected.

- i. Specify sink, MW amount

The study will be completed using the study methodology in Section 5, Long-term Transmission Service Requests of BPM 020, Transmission Planning with the following exceptions:

- i. An ad hoc study group for SPA study will be used
- ii. A summer peak scenario will only be evaluated

-
- iii. A Facility Study will not be offered however planning level estimates to mitigate the constraints will be determined
 - iv. A redispatch options will not be offered
 - v. Short-term AFC analysis will not be provided

5.3.4.4. Net Zero evaluation

Similar to the ERIS portion of a Generation Interconnection System Impact Study in Section 5.1, an ER Interconnection Service allows an Interconnection customer to alter the characteristics of an existing generating facility. This restricted Interconnection Service allows an Interconnection Customer to increase the gross generating capability at the same Point of Interconnection of an existing generating facility without increasing the existing facility's capacity at the Point of Interconnection. The study will be completed with a shoulder-peak scenario will only.

A Facility Study will not be offered however planning level estimates to mitigate the constraints will be determined

5.3.5. Study Generator Dynamic Model

A stability study will be completed with either:

- i. Manufacturer model provided by the Interconnection Customer
- ii. Generic model signed off on by the Interconnection Customer

Please refer to Section 6.1.2 of this Business Practice Manual pertaining to the Stability Studies.

5.3.6. Outages

5.3.6.1. System Intact

A system condition as defined in the applicable NERC Transmission System Planning Performance (TPL) requirements in effect; consisting of a system intact (N-0 or no contingencies) scenario.

5.3.6.2. Planned Outages (specify)

Individual planned outages should be specified. Outage options may include generation, transmission, and a specific timeframe. Outage reports are available on OASIS and require a digital certificate.

<https://www.oasis.oati.com/cgi-bin/webplus.dll?script=/woa/woa-planned-outages-report.html&Provider=MISO>

5.3.7. Deliverables

A System Impact Study report including study assumptions and constraints will be provided to the ad hoc group. Additional deliverables will be completed if one of the following deliverables is selected.

- i. Required system improvements & cost to accommodate requested service
- ii. Amount of service available without additional upgrades
- iii. Interconnection facilities for reactive compensation: for wind generators provide detailed information including collector system, transformers and voltage control
- iv. Availability of Transmission Service: the availability of Transmission Service will correspond to the Transmission Service Request evaluation provided as an option under Study Scenarios and Analyses (Section 5.3.4.3).

5.3.7.1. Required System Improvements & Cost

If a scope selection is made to determine upgrades for the requested service, MISO will check the MTEP appendices and discuss with the impacted Transmission Owner(s) to determine if there already exists a planned project which will alleviate the constraint. If there is no such planned or proposed project, MISO will work with the impacted Transmission Owner(s) and Interconnection Customers to identify a prudent transmission upgrade based on Good Utility Practices. A planning level cost estimate will be provided. The Interconnection Customer will be solely responsible for the cost of the transmission upgrade according to the applicable Tariff provisions. For the case of a Group Study, the individual share of a transmission upgrade will be treated according to Section 6.1.1.1.8.

5.3.7.2. Amount of Service Available without Additional Upgrades

A post-project case (post case) will be created by adding the study generator(s) and associated interconnection facilities to the Base Case. The study generator(s) shall be turned on at their expected output level described in Section 0, and dispatched against other MISO units across MISO's footprint. The post case will undergo a DC screen using the either DC Contingency Analysis by Monitored Elements or First Contingency Incremental Transfer Capability (FCITC) function in MUST. The distribution factors will be calculated using Monitored Sensitivity function in MUST. All monitored element and contingency pairs which are overloaded (worst case loading) in the post case using DC analysis and which have a distribution factor greater than five percent (5%) will be reported with the available injection capability before the monitored element becomes overloaded.

5.3.7.3. Interconnection Facilities for Reactive Compensation

To complete this deliverable for Interconnection Requests, the Interconnection Customer is required to provide detailed information including generating facilities' static and dynamic reactive capability, interconnection radial line (if any) and generator step-up transformer parameters. For wind and solar Interconnection Requests, the Interconnection Customer is required to provide additional information including collector system, transformers and control mode(s) and protection schemes.

A steady state voltage analysis and stability analysis will be performed. Voltage stability analysis will be performed if requested by the Interconnection Customer or the ad hoc group. The steady state and dynamic reactive compensation needed at the plant site will be calculated. Section 6.1.1.2 provides an overview of the analysis performed.

Steady state system voltage analysis:

- i. Under a broad spectrum of system conditions as defined in the applicable NERC Transmission System Planning Performance (TPL) requirements in effect;; generally consisting of system intact (N-0 or no contingencies), single contingencies, and multi-element contingencies.
- ii. Point of Interconnection Voltage or Reactive Schedule

The stability study will include the evaluation of system dynamic performance under selected NERC category A, B, C and D events. The stability study will determine the impact of the new Generating Facility on transient stability performance of the system under various local and regional disturbances, by adhering to the applicable NERC criteria and compliance standards and the Transmission Owners criteria.

5.3.7.4. Availability of Transmission Service

The results of the study will include:

- i. List of constraints with corresponding DF
- ii. Transmission Service level available without upgrades
- iii. Upgrades and cost estimates

6. Definitive Planning Phase

All Definitive Planning entry milestones (M2) and study deposits (D3) must be met no later than thirty (30) Calendar Days prior to the start of the next Definitive Planning phase. These milestones and deposits have been described in Section 4.2.2 and 4.2.5 respectively. MISO will conduct two Definitive Planning Phase studies every year and will primarily have three stages: a System Impact Study Phase, a Facilities Study Phase, and preparation and execution of Generator Interconnection Agreement Phase (and Facilities Construction Agreements, if and when applicable). MISO will utilize Reasonable Efforts to complete the DPP System Impact Study and the Interconnection Facilities Study in one hundred eighty (180) calendar days.

An overview of the Definitive Planning Phase is shown in Figure 6.1.

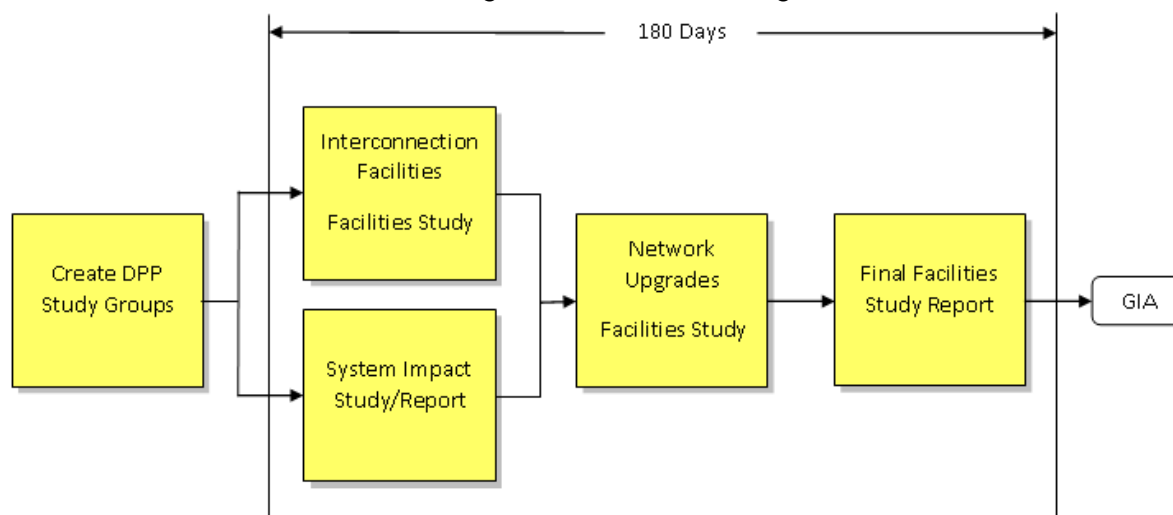


Figure 6.1 Overview of Definitive Planning Phase

6.1. Generator Interconnection System Impact Study

A System Impact Study (SIS) will be conducted which will include thermal analysis, short circuit analysis, transient and voltage stability analysis. The study may also include system protection, and loss analyses depending on the recommendation from the ad hoc group. SIS results will include a preliminary indication of the planning level estimate of cost and length of time that would be necessary to implement any Network Upgrades identified in the analysis. The Network

Upgrades may be identified to accommodate a group of generators together, wherever applicable.

6.1.1. Steady State Analysis

The Steady State Analysis will include the evaluation of system performance under both normal and contingency conditions in accordance with Reliability TPL Standards. The Steady State Analysis will generally include the following analyses:

- i. Thermal analysis
- ii. Voltage analysis
- iii. Power factor requirement analysis for wind turbine generator
- iv. Prior outage analysis

6.1.1.1. Thermal analysis

Steady State Thermal analysis will be performed by adhering to all applicable standards as discussed in 6.1.1.1.2. A new ad hoc study group will be formed and chaired by MISO for each study. MISO will determine, with input from the ad hoc group, the monitored element and contingency list and other study assumptions. Based on the recommendations and input received from the ad hoc group, facilities in the Affected System that could potentially be impacted by the interconnection, will also be monitored. For any identified significantly affected facility, the study will determine the following:

- i) maximum output where no constraint exists and
- ii) upgrades and cost required to mitigate the constraints for full power output.

A post-project case (post case) will be created by adding the study generator(s) and associated interconnection facilities to the Base Case. The study generator(s) shall be turned on at their expected output level described in Section 0 and dispatched against other MISO units across MISO's footprint. The post case will undergo a DC screen to identify monitored element and contingency pairs which are significantly loaded (e.g. ninety percent (90%) or more). The loadings will be recorded for the post and Base Cases and distribution factors will be calculated by using the Monitored Sensitivity function in PSS MUST. All monitored element and contingency pairs which are overloaded (worst case loading) in the post case using AC analysis and which have a distribution factor five percent (5%) or greater will be reported.

To mitigate a constraint, MISO will check the MTEP appendices and discuss with the impacted Transmission Owner(s) to determine if there already exists a planned project which will alleviate the constraint. If there is no such planned or proposed project, MISO will work with the impacted

Transmission Owner(s) and Interconnection Customers to identify a prudent transmission upgrade based on Good Utility Practices. A Network Upgrade cost estimate will be provided by the Transmission Owner. The Interconnection Customer will be solely responsible for the cost of the transmission upgrade according to the applicable Tariff provisions. For the case of a Group Study, the individual share of a transmission upgrade will be treated according to Section 6.1.1.1.8

6.1.1.1.1. Base Case Assumptions

The Base Case for a System Impact Study in the new DPP study will be the post case from the previous DPP study. The Base Case will be updated to include only those projects in the queue that have a DPP Queue Position with their associated Network Upgrades and have completed a Facilities Study. Any MTEP Appendix A projects that are not already in the model will be added to the Base Case.

6.1.1.1.1.1. Load Levels and Generation Dispatch

The following Base Cases will be created for power flow analysis under near-term and out-year scenarios

- i. Summer peak load conditions with the new Generating Facility (ies) dispatched at their expected output level. Wind turbine generators will be dispatched at twenty percent (20%) of their nameplate rating.
- ii. Shoulder-peak load conditions with the new Generating Facility (ies) dispatched at their expected output level. Wind turbine generators will be dispatched at one hundred percent (100%) of their nameplate rating.
- iii. Any other seasonal model with appropriate load and generation dispatch level, if required to adequately assess the system reliability in the region, may replace one or more of the cases listed above.

All existing generators and higher-queued (i.e. generators with DPP Queue Position) generators will be modeled, preferably dispatched to their expected output level. Existing, higher queued, and study generation will be dispatched against other MISO units across the MISO footprint. To the extent the generators cannot be dispatched, the deliverability algorithm will take their impact into account when performing the contingency analysis. All preexisting and higher queued Network Resource (NR) and Energy Resource (ER) units may be dispatched at their expected output level under each load level condition being studied.

6.1.1.1.1.2. Generation to Include

The System Impact Study Base Case will include the following queued generation projects in the region:

- i. All projects with a Interconnection Agreement.
- ii. All projects and their associated Network Upgrades that have a DPP Queue Position and have completed a Facilities Study.
- iii. All queued projects on the Affected System (in the Generator Interconnection queue of the other Transmission or Distribution Providers) with an executed Interconnection Agreement.

6.1.1.1.2. Applicable Reliability Criteria

FAC-002-1 standard requires a reliability impact assessment of new generating facility, on the transmission system, to be undertaken and results coordinated with Transmission Owners, Load Serving Entities, Transmission Providers other Affected Systems. To ensure compliance with NERC reliability standard FAC 002-1, all applicable Regional, subregional, Power Pool and individual system planning criteria will be used to ensure that the assessment includes steady state, short circuit, and dynamic studies as necessary to evaluate system performance under both normal and contingency conditions in accordance with reliability TPL standards.

All applicable NERC TPL and FAC standards can be referenced at the following link:

http://www.nerc.com/docs/standards/rs/Reliability_Standards_Complete_Set.pdf

6.1.1.1.3. Cascading Outage Conditions

Based on the ad hoc group's recommendation, there may be a need to run selected NERC/ERO Category C events that could cause potential cascading outage conditions. Under such Category C outage conditions, the thermal loading on the transmission equipment will be monitored such that any loading greater than one hundred twenty-five percent (125%) will be flagged for further review. After taking appropriate NERC/ERO/Regional action, including the controlled reduction of generation, load and curtailing firm transfers, if the transmission facility is still overloaded, then additional upgrades may be required to alleviate the condition.

6.1.1.1.4. Prior Outage Conditions

Based on the ad hoc group's recommendation, and in compliance with 6.1.1.1.2, contingency analysis in the local area will be performed for selected prior outage conditions. The purpose of this review is to identify operating restrictions or additional Network Upgrades to prevent unreliable operating conditions under prior outage conditions. In the event that Special Protection Systems (SPS) or an operating plan cannot be developed to prevent cascading uncontrolled outages, either a permanent reduction in generation (i.e., a relay scheme that trips the synchronizing breaker past a certain MW level) or a Network Upgrade may be identified.

The output of this study will be an appendix to the Interconnection System Impact Study report. Also, the results of this study may be included in the operating sections of the appendices to the Interconnection and Operating Agreement.

6.1.1.1.5. Permissible Software Tools

Siemens PTI's PSS/E and PSS MUST software for power system studies will be used to perform the studies. MISO will use in-house software tools in conjunction with PSS/E and PSS MUST to generate and post-process the study results. MISO may consider using other industry accepted power system analysis software tools with similar capabilities.

6.1.1.1.6. Criteria Used to Determine Constraints

In order to obtain any type of Interconnection Service, all generators must mitigate injection constraints identified in the study. A constraint is identified as an injection constraint if:

- The generator has a larger than twenty percent (20%) sensitivity factor on the overloaded facilities under post contingent condition (see NERC TPL) or five percent (5%) sensitivity factor under system intact condition, or
- The overloaded facility or the overload-causing contingency is at generator's outlet, or
- The megawatt impact due to the generator is greater than or equal to twenty percent (20%) of the applicable rating (normal or emergency) of the overloaded facility, or
- Impacts on Affected Systems would be classified as Injection constraints based on the Affected Systems' criteria
- Any other applicable Transmission Owner FERC filed Local Planning Criteria.

Further, the Generating Facilities requesting Network Resource Interconnection Service must mitigate constraints under system intact and single contingency conditions, by using the deliverability algorithm, if the generator impact (incremental flow caused by the generator) is equal to or greater than five percent (5%) of the net injected power into the grid.

Mitigations for a NERC TPL multiple contingency events will be determined in accordance with reliability criteria identified in 6.1.1.1.2. Engineering judgment may be used for special cases.

6.1.1.1.7. Deliverability Analysis

For the purpose of Deliverability Analysis, impacts of higher queued or pre-existing requests for Energy Resource Interconnection Service (ERIS) will not be considered unless they have a confirmed firm transmission service reservation associated with the generator. In that case, only the level of firm transmission service will be modeled in the Base Case when studying a lower queued project for deliverability. Network Resource Interconnection Service (NRIS) will be evaluated at one hundred percent (100%) of the requested capability of the Interconnection Request. The NRIS will be granted for the amount for which a generator commits to build the Network Upgrades, up to the requested capability of the Interconnection Request, as identified through the deliverability analysis. The Interconnection Customer must choose the NRIS level prior to the start of the Network Upgrade Facility Studies phase. Once the Interconnection Customer chooses a NRIS MW level, that MW amount will be used in the Network Upgrade Facilities Study and be included in the GIA. The Interconnection Customer will not be allowed to downgrade the Interconnection Service after the start of the Network Upgrade Facilities Study.

The methodology for deliverability analysis can be found in a whitepaper posted on the MISO website.

<https://www.misoenergy.org/Planning/GeneratorInterconnection/Pages/ActiveStudyReportsandPolicyStatements.aspx>

6.1.1.1.8. Network Upgrade Cost Allocation

The Network Upgrades cost for a set of projects (one or more sub-groups or entire group with identified Network Upgrades) will be allocated based on the MW impact from each project on the constrained facilities in the Post Case. With all such projects in the Base Case, all thermal constraints will be identified and a distribution factor from each project on each constraint will be obtained. Finally, the cost will be allocated based on the pro rata share of the MW contribution on all constraints from each project.

The following table provides a simplistic example of the cost allocation methodology described in this section.

Table 6.1 Example of Project Cost Allocation Methodology

Constraint	MW contribution from Project x	MW contribution from Project y	MW contribution from Project z
c1	x1	y1	z1
c2	x2	y2	z2
c3	x3	y3	z3
cn	Xn	Yn	Zn
Total MW contribution on constrained facilities from project x equals: $X = x1+x2+x3+...+xn$			
Total MW contribution on constrained facilities from project y equals: $Y = y1+y2+y3+...+yn$			
Total MW contribution on constrained facilities from project z equals: $Z = z1+z2+z3+...+zn$			
Total MW flowing on all constraints from Group Study projects = $X+Y+Z$			
Project x's share on the total NU cost = $X/(X+Y+Z)$ Project y's share on the total NU cost = $Y/(X+Y+Z)$ Project z's share on the total NU cost = $Z/(X+Y+Z)$			

Note that the allocation is applicable to the Network Upgrade cost only; each project will be responsible for the cost of Interconnection Facilities required to connect to the Transmission System. In order to save time and effort a more simplistic approach can be used for the purpose of cost allocation as long as the new method is acceptable to all parties and does not delay the study process.

6.1.1.1.9. Shared Network Upgrade Cost Allocation Eligibility

The Shared Network Upgrades are the Network Upgrades funded by an Interconnection Customer that are or will be in-service prior to the Commercial Operation date submitted by the Interconnection Request under study, or are otherwise far enough along that it is not practical to bring the Interconnection Request under study into an MPFCA for the upgrade.

As part of the System Impact Study MISO will review the proposed configuration of the study generators and perform a test, if required, to determine their eligibility for cost sharing. The set of Shared Network Upgrades included in the test will be all GIP facilities identified after July 15, 2010 and in-service for a period of less than five years.

If a generator meets any of the following two criteria, it will share the cost of the Shared Network Upgrade without any further tests:

1. The generator connects to the Shared Network Upgrades
2. The generator connects to a substation where the Shared Network Upgrade(s) terminates

For all other generators that do not meet the above criteria, further analysis will be performed to measure their use of and benefit from the Network Upgrades previously identified and funded by other generators. The intent of the test is to determine if the new generators under study are benefiting from a Network Upgrade previously identified for a different generator and should share in the cost of that Network Upgrade.

A power flow analysis will be performed to calculate the impacts of the study generators on the Shared Network Upgrades under system-intact conditions. The following two screening criteria will be used to make the decision

1. If the impact of the Interconnection Request on a generator funded Network Upgrade is greater than 5MW AND is greater than one percent (1%) of the facility rating, the following additional screening will be performed
2. If the impact of the Interconnection Request on a generator funded Network Upgrade is greater than five percent (5%) of the facility rating OR the power transfer distribution factor (PTDF) is greater than twenty percent (20%), the generator will share the cost of the Network Upgrade, now designated as a Shared Network Upgrade.

The flowchart in Figure 6.2 visually describes the whole methodology for determining the eligibility for cost sharing. The Shared Network Upgrades the new generator is responsible for will be listed in Appendix A of their GIA.

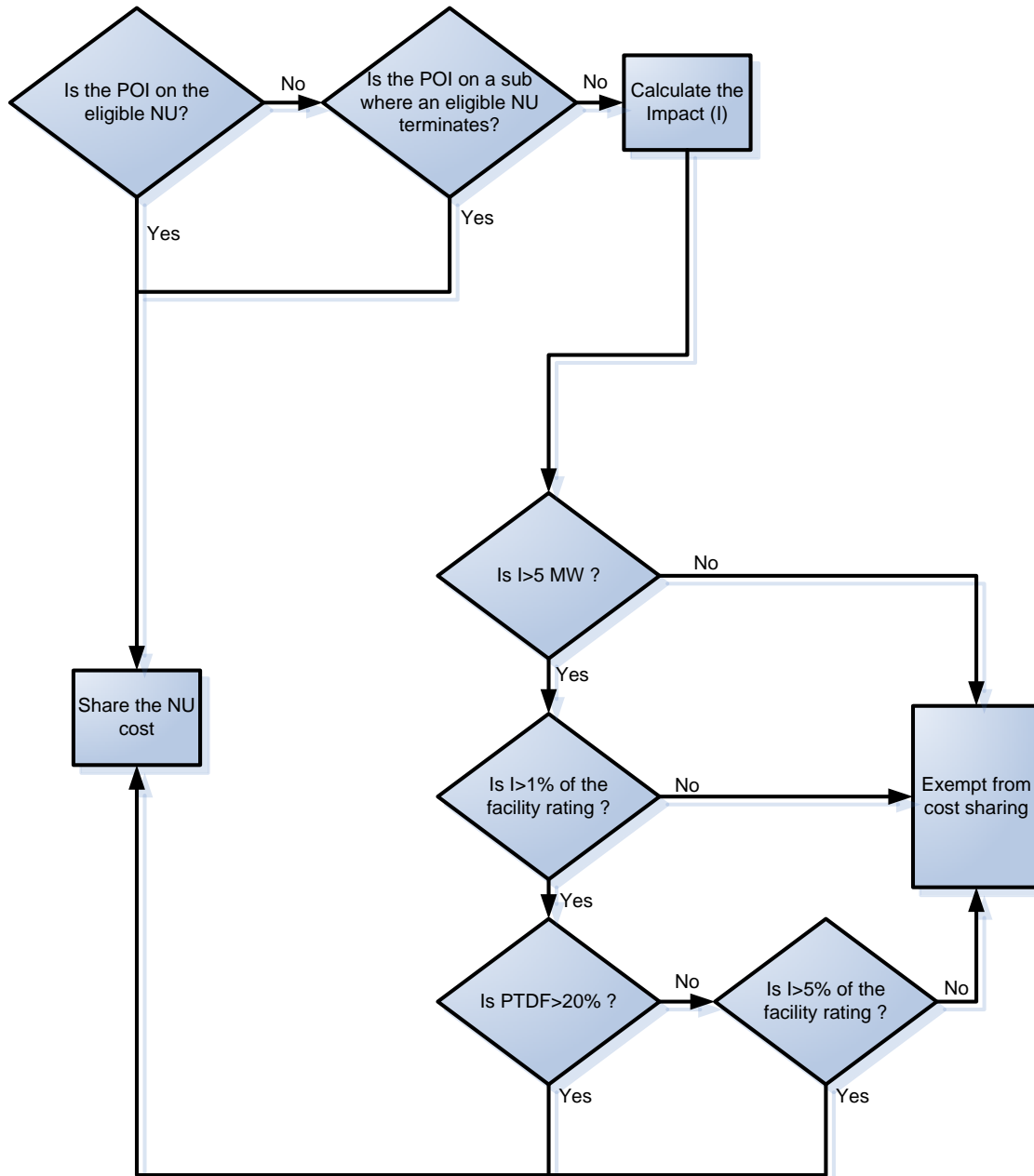


Figure 6.2 Flowchart describing the methodology to identify the Late Comer projects

6.1.1.2. Steady State Voltage Analysis

Voltage analysis will be performed on the selected contingencies generated from the DC screen or contingencies deemed relevant to the analysis. Bus voltages outside of the defined limits (based on the Local Balancing Authority criteria) in the post case will be recorded and compared to the Base Case values. Bus voltages will be considered voltage constraints if, for a given contingency, the bus voltage is outside of the allowed voltage range for the post case and is at least 0.01 p.u. worse than the Base Case voltage for the same contingency.

6.1.1.3. Power Factor Requirement Analysis for Wind Turbine Generator

The power factor analysis will be performed to determine the power factor requirements for a wind turbine generator according to FERC Order 661-A. For the purpose of this analysis, the reactive power limits for a wind turbine generator will be set at 0.95 leading power factor at the Point of Interconnection and voltages will be monitored in the local area under N-1 conditions. If the wind plant causes a criteria violation, the Local Balancing Authority's power factor requirements may apply. Further analysis will be performed to determine if modeling the wind turbine generator at its inherent reactive power capability at the POI, as provided by Interconnection Customer, would resolve the issue. If no voltage criteria violation is observed, the wind turbine generator will not be subject to any power factor requirements. However, the wind turbine generator shall be required to maintain the voltage schedule, at the POI, based on the Transmission Owner's criteria.

6.1.2. Short Circuit and Stability Analysis

Short circuit analysis will generally include determining the fault current contribution from the new Generating Facility and its Network Upgrades under three-phase fault and single line to ground fault conditions. The study will identify any circuit breaker that would need to be replaced to accommodate fault currents from the proposed Generating Facility.

The stability study will include the evaluation of the impact of the new Generating Facility on transient stability performance of the system by adhering to the reliability standards under 6.1.1.1.2.

For wind turbine generators LVRT analysis would be done according to FERC Orders 661 and 661-a.

6.1.2.1. Base Case Assumptions

6.1.2.1.1. Load Levels

The Stability Study will be performed using a season and load level that traditionally represents most limiting conditions for system stability in the region.

6.1.2.1.2. Generation to Include

Refer to Section 6.1.1.1.1.2.

For the short circuit analysis, queued generation will be added only in the area close to where the proposed generation is being added. Since the fault current contribution from a generator decays quickly the deeper you go into the system, the network changes electrically remote from the POI may be ignored for the purpose of short circuit analysis.

6.1.2.2. Applicable Reliability Criteria

Refer to Section **Error! Reference source not found.**

6.1.2.3. Permissible Software Tools

Siemens PTI's PSS/E software for power system studies will be used to perform the studies. MISO may use the in-house software tools/scripts or regionally accepted software programs to generate the results with PSS/E and post-process them. MISO may consider using other industry accepted power system analysis software tools with similar capabilities.

For short circuit analysis, PSS/E, Aspen, CAPE or any other industry accepted software tools with similar capabilities may be used.

6.1.2.4. Criteria Used to Determine Stability and Short Circuit Constraints

Stability Study

All conditions/disturbances leading to the Generating Facility or system instability in compliance with the applicable reliability standards in 6.1.1.1.2 will be documented as a constraint. If there is regional or Transmission Owner's FERC filed planning criteria for transient period voltages or post transient voltage recovery, it will be monitored and any violation caused by the proposed interconnection will be flagged as a constraint.

Short Circuit Study

All breakers over-dutied (underrated) after the addition of the proposed Generating Facility will be flagged.

6.1.2.5. Mitigation Used to Resolve Stability Constraints

MISO will coordinate and seek feedback from the adhoc group to identify and implement appropriate mitigation recommendations, for observed criteria violation in 6.1.2.4. This mitigation may include, but not limited to, the transmission reinforcement, faster breakers, new breakers, additional static or dynamic reactive support, an operating guide or special protection scheme depending on the type of disturbance causing the constraint.

6.1.3. Mitigation Verification

Sensitivity analyses will be performed by modeling Network Upgrades identified in all System Impact Study analyses to verify that the recommended mitigation does not cause any new reliability violations. If it is determined that the coordinated and recommended mitigation plan causes further reliability violations on the transmission system, then the Interconnection Customer will be provided various alternatives as follows.

- i. Interconnection Customer can agree to fund these additional upgrades and proceed to the Facilities phase of the Generator Interconnection Process
- ii. Interconnection Customer can proceed with the alternative mitigation plan that does not cause reliability violations

6.1.4. Backfilling

6.1.4.1. Eligibility

To be eligible as a backfill candidate, a project must be part of the DPP or the next DPP study group within 60 Calendar days from the withdrawal date of a project creating such opportunity or before the completion of the restudy, whichever occurs first. The backfill candidate must meet all the Deposits (D1, D2 and D3) and M2 Milestone requirements pursuant to the requirements as delineated in the Attachment X of the tariff and Generator Interconnection Business Practices Manual prior to being considered as a backfill candidate. MISO will not consider any projects as backfill candidates that do not meet the above requirements.

- In the event of a backfill opportunity, MISO will send a notice to all potential backfill candidates about such opportunity. Within ten (10) business days of receiving notification from MISO, the Interconnection Customer for the backfill candidate must provide MISO their decision on such qualification. If MISO does not receive written notification of acceptance within 10 Business Days, MISO will proceed with the restudy. Competing backfill candidates vying for the same backfill opportunity will be processed in accordance with section 4.2 and Article 2.2.5 of Appendix 9 of the GIP. In the event that multiple candidates are identified from the same DPP study group,

MISO will accept the first Interconnection Customer to provide such written acceptance.

- Once the restudy for the withdrawn project has begun, MISO will continuously monitor the Interconnection queue and if a backfill candidate is identified then MISO will send the affected Interconnection Customers a notice of the opportunity to backfill. The Interconnection Customer will have ten (10) business days to notify MISO of its acceptance of the backfill opportunity. MISO will stop all restudy work when a backfill candidate accepts the backfill opportunity. The Interconnection Customer will be required to fund all restudy costs² incurred up to the point when the backfill opportunity is accepted. Failure to fund all the restudy work after accepting a backfill position will result in the following:
 1. MISO will remove the backfill candidate from contention and recommence the restudy work after which the backfill window will be closed.
 2. The Interconnection Customer will still be required to fund the restudy costs pursuant to section 3.6 of Attachment X.
- Backfill will not be permitted if the backfill candidate is deemed to materially impact the cost or schedule of other projects in the same DPP Group study from which the higher queued project withdrew

6.1.4.2. Criteria for evaluation of potential Backfill Candidates

MISO will use the following rule set when determining if a project will qualify as a backfill candidate for a withdrawn or terminated project, pursuant the backfilling process covered under Attachment X of the MISO tariff. The analysis to determine projects that may be considered for backfill will occur at the time a project in the DPP is deemed withdrawn (either voluntarily or involuntarily), and also prior to the completion of the restudy. Interconnection Customers can access the Interactive queue on the MISO website to view a list of withdrawn³ projects.

To be considered a valid backfill candidate, a project must have the following attributes when compared to the withdrawn project

- ✓ Nearly the same electrical POI at the same kV level
- ✓ The same requested MW Amount
- ✓ The same Fuel Type

² The Interconnection Customer can work with MISO to get a Good Faith cost estimate of the restudy work.

³ <https://www.misoenergy.org/Planning/GeneratorInterconnection/Pages/InterconnectionQueue.aspx>

- ✓ Similar Machine Characteristics

In addition to the criteria mentioned above, MISO will use the following criteria related to the Interconnection Service of the backfill candidate.

- ✓ A backfill candidate, with an NRIS request, will be allowed to replace a withdrawn project that had requested NRIS
- ✓ A backfill candidate, with an NRIS request, will be allowed to downgrade its NRIS to ERIS in order to replace a withdrawn project that had requested ERIS
- ✓ A backfill candidate, with an ERIS request, will be allowed to replace a withdrawn project that had requested ERIS.
- ✓ A backfill candidate, with an ERIS request, will be NOT be allowed to upgrade its ERIS to NRIS in order to replace a withdrawn project that had requested NRIS

6.1.5. Customer Funded Network Upgrade Optional Study

Any existing Interconnection Customer can request an optional study, as pursuant to Section 10 of the Attachment X of the MISO Tariff. The purpose of these technical studies is to provide additional information to the Interconnection Customer that is normally outside the scope of a typical System Impact Study. MISO initially charges a \$60,000 study deposit to perform such optional studies and then may request, if necessary, additional funds to complete the study.

6.1.5.1. Background

The Generation Interconnection System Impact Study results identify reliability constraints that must have a mitigation plan prior to the execution of a Generator Interconnection Agreement. Depending on the individual generator impact and the type of the requested interconnection service, there could be a situation where a reliability constraint is identified in the System Impact Study report but the Interconnection Customer is exempt from mitigating the constraint if its impact is below the threshold as identified in Section 6.1.1.1.6.

Therefore, despite not being responsible for paying for Network upgrades, identified in the System Impact Studies, an Interconnection Customer's generation facility can get curtailed in Real Time for the same constraint under varying operating environments. Therefore, to evaluate potential transmission upgrade options to reduce Real Time congestion and curtailment for their respective generating facilities, Interconnection Customers can request an Optional Interconnection Study by providing a detailed scope.

Since Optional Interconnection Studies are outside the scope of regular System Impact Studies and are performed out of regular interconnection study cycles, the results of any such analysis are non-binding.

6.1.5.2. Network Upgrade Funding and Facilities Studies:

If the Interconnection Customer(s) decide to fund the network upgrades, to mitigate the identified constraints identified in the Optional Interconnection Study, MISO will then facilitate the coordination with applicable Transmission Owners. With applicable agreements between Interconnection Customer and Transmission Owner(s) in place, MISO will include these network upgrades within its MISO Transmission Expansion Plan (MTEP) as “Other – MP Funded” project. MISO will work with applicable Transmission Owners to conduct a Facility Study. Facility Study timelines and cost would be consistent with Section 6.2 of this BPM.

6.1.5.3. MISO Sub Regional Planning Meetings

Where Market Participant requests and funds a Facility Study, MISO staff will notify all stakeholders at its upcoming applicable Sub Regional Planning Meeting. Further, when necessary Facility Construction Agreements are in place, MISO staff will notify all stakeholders at subsequent SPM and include in MTEP as “Other - MP Funded” project.

6.1.5.4. Availability of ARRs

Interconnection customers can request MISO ARRs associated with funded transmission expansions. This will be handled by FTR group consistent with BPM-004.

6.1.5.5. Shared Network Upgrade Cost Allocation Treatment:

Pursuant to Section III(A)(2)(a) of Attachment FF, a Market Participant or a group of Market Participants are allowed assume cost responsibility to fund a network Upgrade on the Transmission System. However, any upgrade that is funded by the Interconnection Customer that was not identified as a required Network upgrade, during the Generation Interconnection Study process, will not qualify for the Shared Network Upgrade treatment as noted in Section 0.

6.2. Facility Study

The Facility Study will determine the cost and time estimate to construct the Network Upgrades and Transmission Owner’s Interconnection Facilities necessary to physically and electrically interconnect the proposed Generating Facility to the Transmission System.

The Facilities Study will be broken down into two stages, the Interconnection Facility facilities study and Network Upgrade facilities study. The Interconnection Facility facilities study will be

done in parallel with the System Impact Study and the Network Upgrade facilities study will be done after the System Impact Study is complete. The combination of the two facilities studies will determine the cost and construction schedule of identified Network Upgrades and Interconnection Facilities for each project in the Definitive Planning Phase.

6.2.1. Study Objectives

For facility improvements determined from the System Impact Study and based on the official Point of Interconnection:

- Design and specification of facility improvements in accordance with Good Utility Practice and applicable planning and design criteria. These criteria must be consistently applied to all existing and proposed generation projects in a Local Balancing Authority.
- Development of detailed cost estimates that include equipment, engineering, procurement and construction costs according to the level of accuracy possible based on the proposed in-service date of the projects.
- Identification of the electrical switching configuration of the connection equipment, including, but not limited to the transformer, switchgear, meters, and other station equipment.
- Identification of the nature and estimated cost of any Transmission Owner's Interconnection Facilities and Network Upgrades, System Protection Facilities and Distribution Upgrades on the Transmission System and Affected Systems necessary to accomplish the interconnection.
- An estimate of the time required to construct facilities and required phasing of improvements, if any.
- Preparation of the draft Appendices to the Interconnection Agreement/Facilities Construction Agreement with completed exhibits

Generally, the Transmission Owners with facilities needing upgrades identified in the System Impact study will determine the construction and cost estimate of those upgrades and/or Interconnection Facilities. Cost estimates will be determined to a +/- twenty percent (20%) margin if the lead time to the in-service date for the required facilities does not exceed eighteen (18) months. For studies requiring cost estimates for longer lead items, a good faith estimate will be developed. To the extent the Interconnection Customer requests a cost estimate with a smaller margin of error, and the Transmission Owner can reasonably obtain that estimate

without holding up other projects in the Definitive Planning Phase, then the estimate will be within the negotiated margin.

6.2.2. Scope of Upgrades

Facilities Study will clearly describe and list various upgrades required to interconnect the proposed Generating Facility. The report should include the following Exhibits to include in Appendix A of the Generator Interconnection Agreement:

- Exhibit A1: (Interconnection Customer provides to Consultant) Interconnection Customer Generating Facility and Interconnection Customer constructed Interconnection Facilities. This would include Interconnection Customer Single Line or Elementary One-line Diagram(s) and system Maps depicting and identifying the Point of Interconnection, meter point(s), metering and relaying CT arrangements, the Ownership demarcation(s).
- Exhibit A2: (Consultant develops) Transmission Owner single line or Elementary One-line Diagram(s) and system Maps depicting and identifying the Point of Interconnection, meter point(s), metering and relaying CT arrangements relative to the Interconnection, the Ownership demarcation(s), the Transmission Owner Interconnection Facilities, Network Upgrades, Stand-Alone Network Upgrades, System Protection Upgrades and Affected System Upgrades.
- Exhibit A3: (Consultant develops) a Site Plan and/or General Arrangement drawing showing the entire interconnection substation complete with all transmission line structures impacted by the new substation. This drawing will be based on and developed from the Interconnection Customer provided certified site survey drawing.
- Exhibit A4: (Consultant develops) a basic Plan and Profile drawing showing the required line tap work associated with the interconnection sub or switching station. This drawing will be based on and develop from the Interconnection Customer provided certified site survey drawing.
- Exhibit A5: (Consultant develops) a categorized list or tabulation of Transmission Owner Interconnection Facilities, non-Stand-Alone Network Upgrades, Stand-Alone Network Upgrades, System Protection Upgrades and Affected System Upgrades to be constructed by the Transmission Owner.

- Exhibit A6: (Consultant develops) a categorized tabulation of Transmission Owner Interconnection Facilities, Non-Stand-Alone Network Upgrades, Stand-Alone Network Upgrades, System Protection Upgrades to be constructed by the Interconnection Customer.

6.2.3. Cost of Upgrades

The Facilities Study will provide a breakdown of various components of Network Upgrades and Interconnection Facilities required to interconnect the proposed Generating Facility. The report should include the following Exhibits to include in Appendix A of the Generator Interconnection Agreement:

- Exhibit A7: (Consultant develops) a categorized detailed cost breakdown of facilities identified in Exhibit A5 as by Transmission Owner, by major component (e.g. transformer, line terminal, breaker, etc.) and by subcomponent (e.g. lightning arrester, disconnect switches, protection equipment, communication equipment, monitoring and alarm equipment, metering facilities, grounding, special controls or equipment needed to meet stability or short circuit criteria, etc.) Similarly, each transmission line should be subcategorized by ROW acquisition needs (new/existing, and major/minor) and the major and minor components.
- Exhibit A8: (Consultant develops) a categorized detailed cost breakdown of facilities identified in Exhibit A6 as by the Interconnection Customer by major component (e.g. line terminal, etc.) and by subcomponent (e.g. breaker, lightning arrester, disconnect switches, protection equipment etc.).
- Exhibit A9: (Consultant develops) Total categorized cost estimate for Transmission Owner Interconnection Facilities and Network Upgrades (Stand-Alone and non-Stand-Alone) including a list or tabulation of Interconnection Network Upgrades (Stand-Alone and non-Stand Alone) that are subject to the transmission service credits described in Article 11 of the Interconnection and Operating Agreement. No refund for radial facilities from network to the Generating Facility.

6.2.4. Contingencies

The Facilities Study will identify any contingency conditions for the proposed interconnections. These conditions will include any higher queued Interconnection Requests, Network Upgrades, Distribution Upgrades, or System Protection Upgrades for higher queued projects. The report should include a separate exhibit to include in the Appendix A to the Generator Interconnection Agreement:

- Exhibit A10: (Consultant develops) a categorized list of contingent facilities needed for this Interconnection Service from higher queued projects with costs that appear in those posted project reports.

6.2.5. Facility Study Exhibits for the GIA

The Facilities Study report will include the following exhibits to describe the milestones, Construction and Coordination Schedule for the proposed interconnection. These exhibits will be included in the Appendix B of the Generator Interconnection Agreement:

- Exhibit A11 (Interconnection Customer provides): A list of key project and regulatory activities that must be met by the Interconnection Customer after receipt of the final GIA for the project to maintain its queue position or mutually agreeable in-service schedule. The Interconnection Customer must either provide evidence of Site Control demonstrating that there is sufficient land area equal to one hundred percent (100%) of that required to support the size and type of Generating Facility proposed or post an additional non-refundable security of \$250,000, which will be applied towards future construction costs, within fifteen (15) Calendar Days of receiving the final GIA. The Interconnection Customer must also provide evidence that one or more of the following items are in development within one hundred eighty (180) Calendar Days of receiving the final GIA: 1) contract for the supply or transportation of fuel to the Generating Facility; 2) contract for the supply of cooling water to the Generating Facility; 3) contract for engineering services, construction services, or generating equipment; 4) contract for the sale of electric energy or capacity from the Generating Facility; or 5) application for state and local air, water, land or federal nuclear permits and that the application is proceeding per regulations.
- Exhibit A12 (Consultant develops): Construction and Coordination Schedule of the Generating Facility, Interconnection Customer Interconnection Facilities, the Transmission Owner Interconnection Facilities, Network Upgrades (subcategorized by non-Stand-Alone and Stand-Alone Network Upgrades) identifying long lead items, outage issues and expected critical path coordination items. Identify activity start

dates, duration of activity and expected completion dates for all major components. Identify Progress Payments Identify start-up and test responsibilities. Identify Transmission Owner permitting process and issues including right-of-way acquisition for new transmission lines or substations.

- Exhibit A13 – (Consultant Develops) List of affected Transmission Owner activities and schedules necessary to obtain regulatory approval for facilities to be provided by affected Transmission Owner(s).

6.2.6. Interconnection and Operating Guidelines

The study report should include any “project specific” guidelines or requirements for the interconnection and/or operation of the Facility that go beyond the generic and universal requirement of “Good Utility Practice.” These requirements/guidelines may include topics such as System Protection Facilities, communication requirements, metering requirement, grounding requirements, transmission line and substation connection configurations, unit stability requirements, equipment ratings, short circuit requirements, synchronizing requirements, generation and operation control requirements, data provisions, energization inspection and testing requirements (if applicable), the unique requirements (if any), of the transmission owner to which the facility will be physically interconnected, switching and tagging, data reporting requirements, training, capacity determination and verification (including Ancillary Services and certification), emergency operations, including system restoration and black start arrangements, identified must-run conditions, provision of Ancillary Services, specific transmission requirements of nuclear units to abide by all NRC requirements and regulations, stability requirements, including generation short circuit ratio considerations, limitations of operations in support of emergency response, maintenance and testing, and any other specific requirement not listed above.

All such Interconnection and Operating Guidelines must be included in Appendix C to the Generator Interconnection Agreement (GIA).

6.2.6.1. Interconnection Agreement Appendices Populated

The Facilities Study report must include the Appendices A through C of the GIA populated in Draft format. These appendices must go through legal review by the Transmission Owner prior to publishing the report. Having the draft GIA appendices in the Facilities Study report will provide a good starting point for the development of the Generator Interconnection Agreement and will make the GIA review process smoother and less time consuming.

6.2.7. Submittal of IA for Appendix Review

The MISO will provide the Interconnection Customer and Transmission Owners with the completed Facilities Study report including draft Appendices A through C of the GIA, and those parties will have thirty (30) Calendar Days upon receipt to return comments on those documents. The MISO will circulate a draft GIA/FCA to the parties involved within fifteen (15) Calendar Days after receipt of comments on the Facilities Study and draft GIA Appendices. At the same time, MISO will schedule a series of conference calls to review and finalize the Appendices to the GIA. The meetings will take place in the following order:

- **Technical Review Meeting:** The purpose of this meeting will be to address any technical issues on the Appendices to the GIA/FCA. MISO will provide these documents for review at least five (5) Business days prior to the date comments are due. The participants are expected to review the technical information in the draft appendices to the GIA/FCA and provide any comments to the MISO at least two (2) Business Days prior to the meeting.
- **Legal Review Meeting:** Will address any legal issues in the draft GIA/FCA. The participants are expected to complete a legal review of the draft GIA/FCA and provide any comments to the MISO at least two (2) Business Days prior to the meeting. Typically the Wrap-Up portion of the meeting will cover any remaining open issues including any open technical issues.

Five Business Days prior to the Technical Review meeting the Interconnection Customer shall provide 1) It's initial payment option pursuant to Article 11.5 of the GIA and 2) Interconnection Customer's desired ISD and COD, if different from the dates in the Facility Study Report. These dates will be used to complete the cash flow payments and milestones in Appendix B of the GIA.

6.2.8. Submittal of GIA/FCA for Execution / Filing Unexecuted

Within fifteen (15) Business Days of the Legal Review Meeting, MISO will circulate the final Generation Interconnection Agreement and Facility Construction Agreement (if applicable) to all parties for execution. If there is a deviation in pro-forma Agreement, the GIA/FCA will be filed with the FERC after execution by all parties. Otherwise the MISO will maintain the executed agreement and notify to FERC via its next Electric Quarterly Report (EQR). If the GIA negotiations result in an impasse, the MISO will file the Agreement unexecuted with the FERC no later than ten (10) Business Days from the date of party(ies) declaring an impasse.

6.2.9. Provisional Generator Interconnection Agreement

Interconnection Customer can request a provisional Generator Interconnection Agreement for a project for a limited operation of the plant if all of the following conditions are met

- All planning studies identifying system impacts and mitigations have been completed in accordance with the NERC and applicable regional reliability criteria
- Project has met all milestones in the process (i.e. M1, M2, D1, D2, and D3)
- Facility Study has been completed for the required Interconnection Facilities for the project or there are existing Interconnection Facilities that can be used for the project without any modifications
- Interconnection Customer agrees to install equipment or protective devices that would disconnect the Generating Facility in the event the output of the Generating Facility exceeds the operational limit described in the provisional Generation Interconnection Agreement
- Interconnection Customer agrees to assume all risks and liability associated with the changes in the Interconnection Agreement including but not limited to the change in output limit and additional costs for Network Upgrades

Under the provisional Generator Interconnection Agreement, maximum permissible output of the Generating Facility will be determined based on the incremental transfer capability available at the Point of Interconnection to the MISO footprint. Such limit will be identified on the Base Cases used for Available Flowgate Capacity (AFC) calculations under Attachment C of the MISO OATT. Analysis to identify the operational limit for provisional GIA will be performed after Interconnection Customer meets all process milestones for the project. The operational limit for the Generating Facility under provisional GIA will be reviewed and updated as required on a quarterly basis.

The methodology for calculating operating limits for all generators requesting interconnection service by executing a provisional Generation Interconnection Agreement can be found in a whitepaper posted on the MISO website.

<https://www.misoenergy.org/Planning/GeneratorInterconnection/Pages/ActiveStudyReportsandPolicyStatements.aspx>

6.2.10. Use of Multi Party Facility Construction Agreement (MPFCA)

A Multi-Party Facility Construction Agreement will be developed in the event multiple Interconnection Requests share the responsibility for a common Network Upgrade or System Protection Facility on the Transmission Owner's Transmission System ("Common Use Upgrade" or "CUU"). A separate MPFCA will be developed for a CUU on each Transmission Owners' Transmission System. A CUU may consist of multiple Network Upgrades and/or System Protection Facilities.

The Network Upgrades and System Protection Facilities required solely for a single Interconnection Request on the direct connect Transmission Owner's Transmission System will continue to be included in the GIA for that Interconnection Request. Further, any Network Upgrades or System Protection Facilities that are not a CUU on the Transmission System of a Transmission Owner which is not a party to the GIA will continue to be included in the Facility Construction Agreement (FCA).

The Interconnection Customer's GIA will include in Appendix A and Appendix B the facilities that are required under separate FCA(s) and/or MPFCA(s) and corresponding Milestones that must be completed prior to commencement of service under the GIA.

Reasonable efforts will be made to conduct negotiations and prepare appendices for a GIA in parallel with any related FCA(s) and MPFCA(s). If parallel processing is impractical, MISO may vary the order in which it prepares the necessary documents and conducts negotiations. In general, for a particular project, MISO will prioritize the GIA negotiations ahead of the FCA negotiations, then the FCA negotiations ahead of the MPFCA negotiations.

Interconnection Customers with Interconnection Requests that require a CUU will be held responsible to execute and provide irrevocable security for their respective shares of a MPFCA (or in the case of an unexecuted MPFCA, provide irrevocable security after acceptance of the unexecuted MPFCA by FERC) in the event that:

1. A constraint is identified in the Definitive Planning Phase System Impact Study, that meets the criteria to require mitigation, and
2. One or more of the following:
 - a. More than one Interconnection Request contributes to that constraint, and/or
 - b. Other Interconnection Request(s) contribute to a different constraint(s) requiring mitigation before commencement of their Interconnection Service, and where:
 - i. The constraint(s) is resolved by the same upgrade (i.e., CUU); and
 - ii. The CUU is determined to be the most prudent upgrade to resolve the constraint(s) to such a level that the CUU enables the interconnection of multiple Interconnection Requests.

6.3. Coordination of studies between PJM and MISO

In accordance with Section 9.3.3 of the MISO-PJM Joint Operating Agreement (“JOA”), MISO and PJM shall conduct Interconnection Studies, as necessary, to determine the impacts of Interconnection Requests on each other’s transmission system, which will be treated as an Affected System. This joint coordination of Interconnection Studies will be in addition to the existing Interconnection Studies that MISO and PJM already perform to evaluate the impacts of their respective queues on their own transmission system, and will be subject to the guidelines laid out in the MISO-PJM JOA.

The Transmission reinforcement and the study criteria used in the Coordinated Interconnection Studies will honor and incorporate provisions as outlined in the PJM and MISO Business Practices Manuals and their respective Tariffs.

When MISO and PJM perform any Coordinated Interconnection Study, the PJM and PJM Transmission Owner study and reinforcement criteria will apply to PJM transmission facilities and the MISO and MISO Transmission Owner study and reinforcement criteria will apply to MISO transmission facilities.

Coordination timing, as prescribed below, shall be based on the current MISO and PJM study cycles and will be adjusted if there are changes to the study cycle timelines in the future.

6.3.1. Study of PJM Interconnection Request impacts on MISO transmission

During the course of PJM Interconnection studies, PJM shall monitor the MISO transmission system and provide the draft results of the potential impacts to MISO. These potential impacts shall be included in the PJM System Impact Study report along with any information regarding the validity of these impacts and possible mitigation received from MISO and the MISO Transmission Owners.

Following the completion of the PJM System Impact Study and the execution of the PJM Facilities Study Agreement by the customer, PJM shall forward to MISO, at a minimum of twice per year (November 15 and May 15), information necessary for MISO and the MISO transmission owners to study the impact of the PJM Interconnection requests on the MISO transmission system.

MISO and the MISO Transmission Owners shall study the impact of the PJM Interconnection on the MISO transmission system and provide draft results to PJM by:

- February 1 for PJM interconnection requests provided to MISO on or before November 15 of the previous year,
- August 1 for PJM interconnection requests provided to MISO on or before May 15 of the same year.

These impacts will be studied using methodology and criteria specified in Section 6.1 6.1 of the MISO BPM and may include thermal analysis and other analysis as necessary. These impacts identified by MISO shall include a description of the required system reinforcements, an estimated planning level cost and construction schedule estimates of the system reinforcement. At times PJM may identify to MISO the need to perform studies associated with an Interconnection other than the times identified above. MISO shall endeavor to study these requests at the earliest time that is feasible, but not later than the times as specified above (commencing after November 15 and May 15).

If MISO identifies required Network Upgrades on the MISO transmission system, due to a PJM Interconnection request, the PJM Interconnection Customer(s) shall be required to follow all provisions, delineated under Attachment X of the MISO tariff, related to Facilities Study funding in accordance with Section 6.2 of the BPM and the appropriate Network Upgrade Facility Construction Agreement.

Cost allocation for required Network Upgrades on the MISO transmission system, for PJM Interconnection projects, shall be governed by and subject to MISO Tariff and Manuals. MISO will validate all constraints identified by PJM on MISO's transmission system before assigning costs that shall be determined in accordance with Section 6.1.5.2 of this BPM.

6.3.2. Study of MISO Interconnection Request impact on PJM Transmission

During the course of MISO Interconnection studies, MISO shall monitor the PJM transmission system and provide the draft results of potential impacts to PJM. These potential impacts shall be included in the MISO System Impact Study report along with any information regarding the validity of these impacts and possible mitigation received from PJM and the PJM Transmission Owners.

Prior to commencing the MISO DPP study MISO shall forward to PJM, at a minimum of twice per year (January 1 and July 1), MISO Interconnection Requests and information necessary for PJM and the PJM Transmission Owners to study the impact of the requests on the PJM transmission system. For the prescribed times when MISO provides this information to PJM, January 1 and July 1, PJM and the PJM Transmission Owners shall study the impact of the MISO interconnection requests and provide draft results on the PJM transmission system by:

- March 31, for requests submitted to PJM on or before January 7th of the same year, and
- September 29 for requests submitted to PJM on or before July 8 of the same year.

These impacts identified by PJM shall include a description of the required reinforcements on PJM's transmission system, an estimated planning level cost and construction schedule estimates of the system reinforcement. At times MISO may identify to PJM the need to perform studies associated with an Interconnection other than the times identified above. PJM shall endeavor to study these requests at the earliest time that is feasible, but not later than the times as specified above (commencing after January 7 and July 7).



If PJM identifies required Network Upgrades on the PJM transmission system, due to a MISO Interconnection request, then the MISO Interconnection Customer(s) shall be required to follow all provisions delineated under the PJM Tariff related to Facilities Study funding and appropriate Network Upgrade Facility Construction Agreement obligations.

Cost allocation for Network Upgrades necessary on the PJM transmission system due to MISO Interconnection projects shall be governed by and subject to the PJM Tariff and related Manuals.

6.3.3. Coordination of Projects with Provisional/Conditional GIAs

If a generation interconnection project is conditional upon Network Upgrades on the Affected System, and comes in service prior to those Network Upgrades being completed, that project's output will be subject to limitations in accordance with the applicable tariff of the Affected System.

Limitations on PJM Generators with Impacts on the MISO System

PJM Generation Interconnection Projects that come into service prior to completion of required Network Upgrades on the MISO transmission system will be subject to the MISO Quarterly Operating Limit process, as outlined in the MISO Tariff in Attachment X Section 11.5 and in the MISO Transmission Access Planning Provisional Interconnection Agreement Limit Methodology whitepaper, until required Network Upgrades on the MISO transmission system have been completed. MISO will coordinate project output limitations with PJM on a quarterly basis, and MISO will provide PJM the list of conditions that will be added to PJM Interconnection Customer's Interconnection Service agreement.

Limitations on MISO Generators with Impacts on the PJM System

MISO Generation Interconnection projects that come into service prior to completion of required Network Upgrades on the PJM transmission system will be subject to PJM's yearly process until required Network Upgrades on the PJM transmission system have been completed. PJM updates the output limits on all Interconnection Service agreements on a yearly basis, at a minimum, to account for changing transmission and generation assumptions. Any significant changes to the assumptions of the study may be reviewed on a more frequent basis. PJM will coordinate project output limitations with MISO on a yearly basis, and PJM will provide MISO the list of conditions that will be added to MISO Generator Interconnection Agreement.

7. Post – GIA Phase

The following sections describe various activities in project development after the Generator Interconnection Agreement is executed.

Initial Payment

The Interconnection Customer is required to pay the initial payment of either 1) twenty percent (20%) of the total cost of Network Upgrades, Transmission Owner Interconnection Facilities, Transmission Owner's System Protection Facilities, Distribution Upgrades and/or Generator Upgrades identified in the GIA within thirty (30) days of executing its GIA if the Generator In-service date is within five (5) years of executing the GIA; or 2) ten percent (10%) if it is beyond five (5) years; or 3) the total cost of Network Upgrades, Transmission Owner Interconnection Facilities, Transmission Owner's System Protection Facilities, Distribution Upgrades and/or Generator Upgrades in the form of security.

Limited Operation

If any of the Transmission Owner's Interconnection Facilities, Network Upgrades, or Transmission Owner's System Protection Facilities, Distribution Upgrades or Generator Upgrades are not reasonably expected to be completed prior to the Commercial Operation Date of the Generating Facility, Transmission Provider shall, upon the request and at the expense of Interconnection Customer, perform operating studies on a timely basis to determine the extent to which the Generating Facility and the Interconnection Customer's Interconnection Facilities may operate prior to the completion of the Transmission Owner's Interconnection Facilities, Network Upgrades, Transmission Owner's System Protection Facilities, Distribution Upgrades or Generator Upgrades consistent with Applicable Laws and Regulations, Applicable Reliability Standards, Good Utility Practice, and the GIA. The maximum permissible output of the Generating Facility will be updated on a quarterly basis if the Network Upgrades necessary for the interconnection of the Generating Facility pursuant to the GIA are not in service within six (6) months following the Commercial Operation Date of the Generating Facility as specified in Appendix B of the GIA. These quarterly studies will be performed using the same methodology set forth Section 6.2.9 of this BPM for Provisional Generation Interconnection Agreements. These quarterly updates will end when all Network Upgrades necessary for the interconnection of the Generating Facility pursuant to this GIA are in service.

7.1. Suspension

After the execution of the Interconnection Agreement, the Interconnection Customer is expected to meet the milestones and construction schedule as established in the Interconnection Agreement. In certain conditions, Interconnection Customer has the option to suspend the construction of the Network Upgrades and Interconnection Facilities based on narrowly defined criteria. The following rules and conditions will govern the suspension of a project in the post-IA phase.

- Permitted only for Force Majeure reasons: “Any act of God, labor disturbance, act of the public enemy, war, insurrection, riot, fire, storm or flood, explosion, breakage or accident to machinery or equipment, any order, regulation or restriction imposed by governmental, military or lawfully established civilian authorities, or any other cause beyond a Party’s control. A Force Majeure event does not include an act of negligence or intentional wrongdoing by the Party claiming Force Majeure.”
- When coming out of suspension with only partial construction resulting in reduced project capacity, recovery eligibility is reduced on a pro-rata basis relative to the new size of the project
- Will require an up-front payment equivalent to greater of Network Upgrade costs or \$5 million
- Suspended IRs may be revisited periodically to ensure Interconnection Customer is working toward coming out of suspension

When emerging from suspension, the Interconnection Customer must provide written notice to the MISO noting the date as of which the request is no longer suspended along with notice of any changes to the Interconnection Facilities and/or Generating Facility as compared to the description in the Interconnection Agreement or the studies performed in support of the Interconnection Agreement. If such a change is sought by the Interconnection Customer, all data necessary to perform any new System Impact or Facilities Studies must be provided at the time of notice in a format consistent with the requirements of both the M1 and M2 milestones. Failure to provide the needed data at the time of notice may lead to the IC being declared in Breach of Agreement.

7.2. Construction

The project construction will take place according to the construction schedule established in the Generator Interconnection Agreement. In the event, a project goes into suspension the required Network Upgrades and Transmission Owner Interconnection Facilities will be constructed on the schedule described in the appendices to the GIA, except for the following reasons: (1) construction is stopped by a Governmental Authority; (2) Network Upgrades are not needed for another project; or (3) the MISO or Transmission Owner determine that a Force Majeure event prevents construction. Interconnection Customer will closely coordinate the various construction activities with the Transmission Owner to make sure the appropriate design standards are followed and technical specifications of the Interconnection Customer constructed facilities match with that of the Transmission Owner constructed facilities.

7.3. Testing

Interconnection Customer or the designated Market Participant will notify MISO with a test plan in advance of conducting the tests for the Generating unit(s). The notification should be provided by completing the Pre-commercial Generation Test Notification form located in Appendix E of this BPM and submitting it to MISO Real Time Operations at least five (5) Business Days prior to the first testing date. The MISO Operations will work with the Asset Owner/Market Participant and approve a schedule to conduct the tests. The testing process will also be coordinated with Transmission Operators.

7.4. Registration of Asset with MISO

The Market Registration BPM describes the details of Asset Registration.

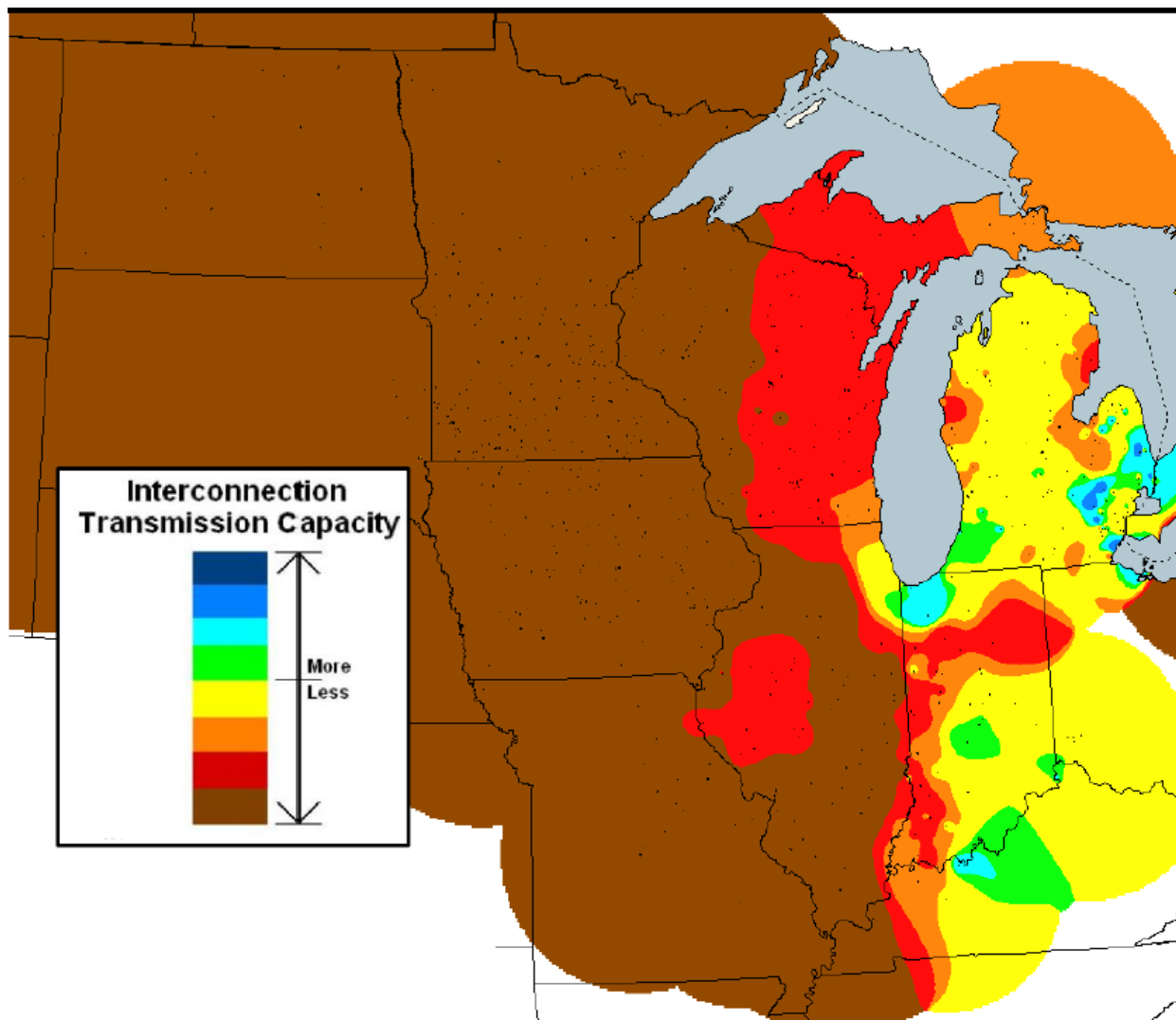
7.5. Inclusion in Network Model

The Network and Commercial Model BPM describes the steps required to submit the information to include a generator in Network Model.

7.6. Commercial Operation

Interconnection Customer must provide notification to the MISO after the project achieves Commercial Operation. Such notification is provided in the form of Appendix E to the GIA and must be received by the MISO within thirty (30) days of Commercial Operation date in order to initiate any refund. The notification should also include as built modeling data of the plant. Attachment A of the application can be used to provide such data. The MISO will settle the project account and provide a final invoice to the Interconnection Customer within thirty (30) days of receiving the Appendix E to GIA.

Appendix A Sample Contour Map



This is a sample contour map generated using an off-the-shelf MTEP 2013 summer peak model. Estimated time through interconnection queue does not include construction time.



Appendix B

Generator Interconnection Ad hoc Information Session Request Form

I. Interconnection Customer

Name: _____

Title: _____

Company Name: _____

Address: _____

Phone No. _____

Email address _____

II. Project Details

Project Size (MW) _____

No. of units/rating _____

Fuel type: _____

Desired ISD: _____

Anticipated date to enter the Queue _____



III. Site

County: _____

State: _____

Area Transmission Owner(s) _____

POI: _____

(If not identified, list all options that are being considered)

Distance from the nearest substation or transmission line _____

Available Connection Voltage(s) _____

Site Control _____ (Yes/No)

ROW Required for Interconnection Facilities? _____ (Yes/No)

IV. Specific Questions for the Transmission Provider/Transmission Owner (use a separate sheet, if required)

1.

2.

3.



4.

V. Information Session is requested by

Signature: _____

Name (print or type): _____

Title: _____

Company Name: _____

Address: _____

Phone No. _____

Email address _____

This form can be faxed or mailed to the following address:

Midcontinent Independent System Operator, Inc.
Attn: Transmission Access Planning
PO Box 4202
Carmel IN 46082-4202
Fax 317-249-5358

Appendix C

General Study Process Diagrams

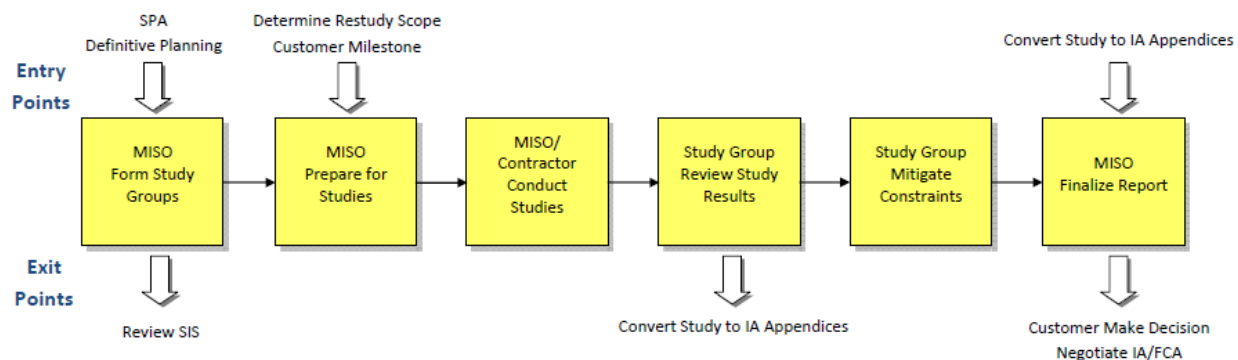


Figure C.1: Overview of General Study Process

The study process diagrams are included separately since the general structure is similar for multiple studies required throughout the GI process. The purpose of the studies is to determine implementation factors such as time, cost, and infrastructure requirements. As depicted in Figure C.1, there are six major steps for conducting a study:

1. Form a study group
2. Prepare for the study
3. Conduct the study
4. Review study results
5. Mitigate constraints, if necessary
6. Finalize Study Report

The scope of the study is specific to the phase and the specific intent of the particular study, but determining what is included in the scope, determining the objectives of the study, and determining the study deliverables are requirements of all studies that are performed. The determination of who is included in the study is generally performed by MISO and specific to the type of study (Step 9.1). The setting up of the study meetings, sending the proposed study scope to the study members and conducting the kick-off meeting are standard activities for all studies. In most cases, MISO prepares a request-for-proposal for outside assistance in performing various Generator Interconnection studies.



During step 9.2, the study model is reviewed. The model that will be used in the study is selected and sent to the study group for review. Models are reviewed for their constituency and technical parameters. Comments on the model are gathered by MISO and appropriate changes are incorporated into the model. A subsequent model review may be necessary. Once the model is approved by the study group, the model is signed off and ready for use in conducting the study (Step 9.3).

During Step 9.4, the study group conducts a preliminary analysis of the study results. Following that, a constraint mitigation meeting is held (Step 9.5), where the team discusses and resolves constraints. After the resolution, the study analysis is re-run. Note that constraint mitigation is not part of the Facilities Study process.

Next, Network Upgrade schedules and cost estimates are prepared and reviewed with the Interconnection Customer. Following the review, the study report is finalized (Step 9.6).



Appendix D

Pre-Commercial Generation Test Notification Form

The following form would need to be submitted to MISO Real Time Operations at least five (5) Business Days prior the first date of testing.

Project Number:

Project Name:

Point of Interconnection:

Dispatcher Contact Information:

Date	Start Time (in EST)	End Time (in EST)	Expected MW Output	Expected MVAR Output (Only needed if beyond normal power factor)