Large Generator Interconnection Study Criteria

Version 5.0
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Revision History

Date	Version	Description
August 01, 2012	0	Original Document
January 24, 2013	1.0	Clarification of steady state modeling for a ERIS generation without long-term firm transmission service
February 28, 2013	2.0	Update and clarification of maximization of generators
May 15, 2013	3.0	Increment version to 2.0; Clarification on maximization of generators; Update contingency file usage; Change minimum impact from 1MW to 2MVA; Update stability performance criteria; Removed EKPC from CRSG references
October 11, 2017	4.0	Revisions were made to align with modified Planning Guidelines document, TPL-001-4, flowgate analysis and Reliability Margins. Additional revisions were made to enhance clarity for the reader.
November 6, 2017	5.0	Summary of Changes Resulting from this Annual Review: Added additional process to allow Ad Hoc Study Group member to perform their own test to determine if their system is affected by a GI request.

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Large Generator Interconnection Study Criteria

1. Application

This *Large Generator Interconnection Study Criteria Document* (this "Document") is applicable to all Large Generator Interconnection ("GI") requests under Louisville Gas & Electric Company and Kentucky Utilities Company's (collectively "LG&E/KU") Open Access Transmission Tariff ("OATT"). This Document will be posted on the LG&E/KU Open Access Same-Time Information System ("OASIS") and will be utilized by the Independent Transmission Organization ("ITO") for all GI System Impact Studies ("SIS"), GI Feasibility Studies ("FES"), and GI Facilities Studies ("FS"). LG&E/KU's OATT and Transmission System Planning Guidelines will supersede this Document if inconsistency, errors, or omissions are identified.

2. Study Queue Processing

The interconnection requests in the LG&E/KU GI study queue will be processed in the order as posted on OASIS in accordance with the OATT.

The ITO may concurrently perform SIS, FES, and/or FS for several GIs (not a cluster study) in the GI queue in order to accelerate the GI queue processing. The ITO will start a new study only after all higher queued GI requests' studies are already started or in progress. The ITO will perform a study for each of the GI requests independently and determine any required Network Upgrades for the interconnection service individually. The SIS will include all higher queued GI projects even if Network Upgrades for any of these higher queued GIs are not known or available at the commencement of the study.

GI requests included in a cluster study by an eligible customer will be given a queue date of the end date of the "queue cluster window" and studied in accordance with the OATT.

3. Generator Interconnection System Impact Study Procedures

The SIS will determine the impacts of the proposed generator on the transmission system performance, including steady-state, short-circuit and stability impacts. The scope of the SIS is limited to identifying injection constraints, which likely would limit the ability of the generator to interconnect. The SIS will not address the deliverability issues from a proposed GI. Therefore, mitigating the injection constraints identified in the SIS does not grant the customer any right for firm delivery from a new generator. A separate Transmission Service Request ("TSR") / deliverability study will be performed for the new generator in accordance with LG&E/KU's TSR Study Criteria once a customer submits a TSR on OASIS for long-term firm Transmission Service.

It should be noted that the study schedule and the modeling utilized for the GI SIS will be based on the GI study queue and the study schedule and modeling utilized for the TSR SIS will based on the TSR study queue.

3.1 Study Scope

A study scope will be developed outlining the following major items and will be sent for review to the Ad Hoc Study Group and the customer. To the extent practical, the ITO will make a reasonable effort to incorporate comments and changes from the Ad Hoc Study Group if the proposed changes would not impact the study completion deadline. The study scope will include:

- A description of the GI request under study.
- Identification of the starting point models which will be used for the study.
- Information regarding the modeling of the study GI request.
- A preliminary list of higher queued GI requests or facilities which will be added to or removed from the models.

The ITO may change the study scope during the course of the study as needed and will not be required to provide an updated study scope to the customer due to time constraints.

The Ad Hoc Study Group members may perform their own test to determine if their system is affected by the GI request. The preliminary results, including the details of the transmission constraint(s), must be communicated to the ITO within 30 calendar days of the initial Ad Hoc Study Group meeting for inclusion into the final ITO study report. If there are impacts to third party Transmission Systems, the customer must coordinate with the impacted third party system owner to remedy. The impacted third-party should work with the customer to provide appropriate data regarding the impact. The GI request will not be finalized until resolution of third party impacts.

3.2 Ad Hoc Study Group

An Ad Hoc Study Group process will be set-up as follows:

- An Ad Hoc Study Group will be formed for all GI requests in compliance with the Congestion Management Process (“CMP”) between Tennessee Valley Authority (“TVA”) and PJM and PJM and Midwest Independent System Operator (“MISO”).
- Participation in the Ad Hoc Study Group will be by invitation to all first tier Transmission Providers and/or Transmission Owners (“TO”) to LG&E/KU, currently comprised of MISO,

PJM, TVA, TVA (as the Reliability Coordinator), BREC, OMU, DUKE, VECTREN, AEP, OVEC, EKPC, and EEI/DOE; these participants may be amended from time-to-time. Transmission Providers and/or TOs that indicate their interest in participating in the Ad Hoc Study Group by the date specified in the invitation and have executed the *Confidentiality Agreement For Treatment of Critical Energy Infrastructure Information and Confidential Transmission Planning Information* (OATT Attachment K, Appendix 1)will be allowed to participate in the Ad Hoc Study Group. The ITO will distribute the study scope and models to the Ad Hoc Study Group members.

- The Ad Hoc Study Group will be responsible for reviewing and commenting on the draft study scope, preliminary pre and post project models, and study report within 5 business days of receiving the ITO's notification of its availability.
- The ITO will take all comments concerning the study method or study conclusions into consideration; however, the ITO will have final decision authority over whether or not to accommodate any particular comment. The ITO may finalize the study report and identify the non-accommodated comments at any time the ITO deems appropriate and subsequently issue the report to the customer in order to complete the study within the established study schedule.

3.3 Steady State Analysis

3.3.1 Computer Programs

The steady-state analysis will be performed using Siemens' PSS/E® and/or MUST®. In addition, other programs may be used to assist the engineer with processing and evaluating the system contingencies and special generation dispatch scenarios.

3.3.2 Pre-Project Model

Pre-project models for various seasons will be created from the most recent North American Electric Reliability Corporation ("NERC") Multi-Regional Modeling Working Group ("MMWG") and internal LG&E/KU base case series to perform the study. A set of pre-project models without the new GI will be developed, including a summer peak, a winter peak model coincident with the start-date of the proposed generator and a summer peak and a winter peak out year models as appropriate. A near-term and out year off-peak load model will be used when such model becomes available in a model series from an ITO approved TEP. To the extent practical, models available from recent GI studies or from the LG&E/KU Transmission Expansion Plan ("TEP") will be utilized. The anticipated transmission configuration will be based upon the latest approved TEP.

The models will be adjusted to include appropriate changes applied to the most recently approved LG&E/KU TEP and take into consideration any changes resulting from the Ad Hoc Study Group. The generation for all models will be based on the generation capacities provided by the Network Customers in their annual MOD-032 data submittal, which includes a 10 year forecast of loads and resources. Generation capacities will be capped at the NITS Capacity value posted on OASIS in the event that the MOD-032 data exceeds this value. Until ITO approval of 2018 TEP, models will be developed based on the OASIS posted NITS Capacity as the generation capacity for each resource. These models will only be evaluated for system intact (P0).

Wind generators within LG&E/KU control area, but outside an approximately 50 mile radius of the Point of Interconnection ("POI") of the studied request, will be modeled at 20% of their nameplate capacity in the peak models and 100% of their nameplate capacity in the off-peak models. Scheduled outages of any facility at 100 kV and above with a duration of six months or longer during the study period will be included in the pre-project models, as appropriate. Generators interconnected to the Transmission System pursuant to Interim Interconnection Service will not be added to the model, except to the extent those units' permanent output will be considered in the studies of lower-queued customers in the normal course.

Confirmed status long-term firm TSRs will be added to the models to the extent the TSRs are not already included.

All higher queued Network Resource Interconnection Service ("NRIS") GI requests in the LG&E/KU queue (including their network upgrades), and existing NRIS Generation in the LG&E/KU BA, will be added to or maximized in the models at their NRIS capacity if they are within 50 miles of the subject GI. The amount of generation increase in the 50 mile radius will be accommodated by reducing generation within the LG&E/KU BA outside of the 50 mile radius. At the request of an Ad Hoc Study Group member, models will be adjusted to reflect desired changes which could include, but is not limited to, generation output and higher queued GI requests in non-LG&E/KU GI queues.

All higher queued Energy Resource Interconnection Service ("ERIS") GI requests in the LG&E/KU queue (including their network upgrades), and existing ERIS Generation in the LG&E/KU BA, will be added to or maximized in the models at their ERIS capacity if they are within 50 miles of the subject GI. The amount of generation increase in the 50 mile radius will be accommodated by decrementing the generation by scaling the generation of control areas or local BAAs to the north, south, east and west of the LG&E/KU control area each by 25% of the increase. At the request of an Ad Hoc Study Group member, models will be adjusted to reflect desired changes which

could include, but is not limited to, generation output and higher queued GI requests in non-LG&E/KU GI queues.

3.3.3 Post-Project Model

Post-project models will be created by adding the new generator and its associated interconnection facilities to the pre-project models. For NRIS requests, the generation to be decremented will typically be based on economic merit order of the new resource compared to other resources, respecting must-run limitations. An exception to the use of an economic merit order to sink the project generation would be when the project generation is a non-dispatchable resource such as wind. Non-dispatchable resources will typically be dispatched against on-line generating units which operate on Automatic Generation Control. For ERIS requests, the generation to be decremented will typically be based on scaling the generation of control areas or local balancing authority areas to the north, south, east and west of the LG&E/KU control area each by 25% of the requested interconnection.

3.3.4 Steady State Contingency Criteria

The simulations performed as part of the SIS should consider the:

- P1 and P3 planning events using the performance requirements of NERC TPL-001-4 Table 1 and the LG&E/KU *Transmission System Planning Guidelines*.
- P2 and P4 EHV (300 kV and above) contingencies in which interruption of firm transmission service and non-consequential load loss are not permitted per TPL-001-4 will be evaluated using the performance requirements of TPL-001-4 and the LG&E/KU *Transmission System Planning Guidelines*. The same contingencies will be analyzed for the pre-GI models and the post-GI models, to the extent practical.
- Additional contingencies, consistent with this criterion or the criterion of the requesting party, may be performed at the request of the Ad Hoc Study Group.
- As described in the *Transmission System Planning Guidelines*, several generation replacement scenarios are evaluated.

In an ERIS study, an outage of 1 transmission circuit or transformer with 1 generator outage, the replacement generation required to offset the unit outage will be simulated from the most restrictive of internal sources or TVA (CRSG partner) if LG&E/KU has an energy contract and transmission service for the replacement energy from the respective direction.

In an ERIS study, outage of 2 generators, the replacement generation required to offset the second unit outage will be simulated from TVA (CRSG partner). The replacement generation for the first unit outage will be assumed from internal resources.

Typically, ITO will use the contingency file from LG&E/KU that was used in the last approved TEP study. The ITO will update this contingency file based on current system configuration and expected future network changes working with LG&E/KU. The ITO will also remove contingencies from the file which are outside of the contingency criteria discussed in this section. This contingency file includes both predefined LG&E/KU contingencies as well as selected first tier BAs contingencies. The ITO will add additional first tier BAs contingencies if requested by Ad Hoc Study Group based on the contingency criteria discussed in this section.

3.3.5 Model Solution Method

After applying the contingency, the models will be solved with the following options enabled to establish system conditions after the contingency.

- Transformer Tap Adjustment.
- Area Interchange (Tie Lines and Loads).
- Phase Shifter Adjustment.
- Switched Shunt Adjustment.
- DC Taps Adjustment.

Network Loads, which are removed from service due to the fault clearing action, will be reconnected using Load Restoration and Switching procedures, if applicable.

3.3.6 Monitored Elements

All LG&E/KU, OMU, and EKPC, facilities will be monitored at 69 kV and above for thermal and voltage impacts. Additionally all first tier TO facilities will be monitored at 100 kV and above for thermal and voltage impacts. Additional facilities may be monitored if requested by the Ad Hoc Study Group.

3.3.7 Reliability Margins for LG&E/KU Flowgates

The LG&E/KU flowgate impact of Capacity Benefit Margin (“CBM”) requests will be included in the 18 month ATC calculation horizon. Requests for CBM set-aside that go beyond the 18 month ATC calculation horizon will be accounted for in the SIS process by developing additional generation scenarios that mimic the requesting entities original request which must include the assumed sources of the CBM.

The LG&E/KU flowgate impact of Transmission Reliability Margin ("TRM") will be included in the 18 month ATC calculation horizon. TRM outside of the 18 month ATC calculation horizon will be accounted for in the SIS process by the generation replacement scenarios that include both internal and Contingency Reserve Sharing Group ("CRSG") partner sources for the replacement generation. These generation replacement scenarios will be ran against 100% of the applicable facility ratings.

3.3.8 Performance Criteria

The performance criteria are provided in the latest versions of the NERC TPL-001-4, applicable SERC standards, and the LG&E/KU *Transmission System Planning Guidelines*.

The objective of the steady-state contingency analysis is to identify overloaded facilities at 100 kV and above for non-LG&E/KU facilities and at 69 kV and above for LG&E/KU facilities on which the new GI request has a significant impact. For non-LG&E/KU facilities, an impact will be considered significant in accordance with the TO's written and posted criteria.

For steady state analysis, a thermal loading impact will be considered significant if 5% or more of the new GI request is found to detrimentally impact an overloaded facility under system intact conditions or if 3% or more of the new GI request is found to detrimentally impact an overloaded facility under contingency conditions. For AC contingency analysis, the new GI project impact will be calculated as follows, where DF implies Distribution Factor:

$$\text{DF } \% = 100 \times \frac{\text{MVA flow (with GI Request)} - \text{MVA flow (w/o GI Request)}}{\text{GI Request MW}}$$

If the total impact on a facility due to the GI request under study is less than or equal to 2 MVA, the impacted facility will be noted in the study report as not being significantly impacted.
Multiple GI requests with the same POI, from the same customer and queued within the last 6 months will be aggregated and the sum of the aggregate impact will be used for the two MVA impact criteria check.

All LG&E/KU bus voltages will be monitored in accordance with the LG&E/KU *Transmission System Planning Guidelines*. All non-LG&E/KU bus voltages will be monitored in accordance with the TO's written and posted criteria when that criteria has been provided to the ITO. For LG&E/KU facilities, a voltage impact will be considered to be significant if the voltage changes by 0.5% or more and is outside acceptable voltage guidelines. For non-LG&E/KU facilities, an impact will be considered significant in accordance with the TO's written criteria when that criteria has been provided to the ITO.

A flowgate impact will be considered significant if the following conditions are met:

- The flowgate is loaded above its flowgate rating in the post-TSR model.
- The Power Transfer Distribution Factor ("PTDF") is greater than 5% or the Outage Transfer Distribution Factor ("OTDF") is greater than 3%.
- The increase in loading on the branch is greater than 1 MW.

Non-LG&E/KU owned flowgates normally monitored by the ITO will be monitored in the study using the list of flowgates posted on the LG&E and KU OASIS. Non-LG&E/KU flowgate analysis will be performed considering the ATC components as provided by the flowgate owner. A flowgate analysis will not be performed for ERIS requests.

For the flowgate analysis, the DF will be calculated as follows:

$$\text{DF} = 100 \times \frac{\text{MW flow (with GI Request)} - \text{MW flow (w/o GI Request)}}{\text{GI Request MW}}$$

The flowgate analysis will identify all LG&E/KU non-owned reciprocally coordinated flowgates which are loaded beyond acceptable levels and have significant impacts due to the new GI request.

3.3.9 Injection Related Constraints

The SIS will identify "injection-related constraints." The Interconnection Customer will be required to mitigate the injection-related constraints in order to interconnect with the LG&E/KU system.

For a NRIS request, a constraint will be considered an injection-related constraint if it is identified as a significant impact in accordance with impacted facility and voltage criteria.

For an ERIS request, a constraint will be considered an injection-related constraint if any of the conditions identified below is met:

- A significant impact, as defined above, is due to an impact for which the DF of the new GI request is larger than or equal to 10%.
- A facility caused to be overloaded by the new generator is local to the POI (based on engineering judgment typically within a three bus radius). In this case, the Performance Criteria given above will be used to determine significant injection related constraints.
- Voltage criteria violations will be assessed in accordance with the above section.
- Respective TO criteria will be used for the non-LG&E/KU constraints.

3.3.10 Sensitivity Studies

A steady state sensitivity may be performed removing modeling of an existing generator (prior to the effective date of FERC Order No. 2003[1]) and/or higher queued ERIS generator without an associated long term firm TSR. Associated planned Network Upgrades also will be removed along with these generators without a long term firm TSR. The steady state injection constraints on the LG&E/KU Transmission System that are not found in the sensitivity study will be removed from the final injection constraint list. New constraints that are found in the sensitivity study will be added to the final injection constraint list. The ITO will document both an initial injection constraint and a final injection constraint list in the study report.

3.4 Short-Circuit Analysis

3.4.1 Computer Programs

Short-circuit analysis will be performed using ASPEN®.

3.4.2 Methodology

A pre-project model will be developed without the interconnection request to represent system conditions with all generators in the area with higher interconnection queue priority. A post-project model will be created with the interconnection request by adding the new generation interconnection to the pre-project model.

Short Circuit analysis will include three-phase faults and single line-to-ground faults at various substations near the POI on the pre-project model and the post-project model to determine the available fault current with and without the new generator.

3.4.3 Short-Circuit Study Criteria

Three-phase faults and single line-to-ground faults will be simulated at various substations in the pre-project and post-project models to determine the impact on available fault current of the new generator. The available fault current will be calculated for buses within a 5 bus radius of the POI. The available fault current will be compared to the breaker short-circuit interrupting capabilities. The available fault current will be calculated recognizing the short-circuit current which a particular breaker will need to interrupt.

If the post-project available fault current of any breaker is shown to exceed 100% and the impact of the new generator is greater than or equal to 5% of the breaker's interrupting capability, the post-project available fault current will be compared to the pre-project available fault current. If the new request caused the available fault current at the breaker to increase by at least 5% of the

[1] FERC Order No. 2003 "Standardization of Generator Interconnection Agreements and Procedures" FINAL RULE was issued July 24, 2003.

breaker's interrupting capability and the pre-project available fault current for the breaker was less than 100% of the breakers interrupting capability, the replacement of this breaker will be considered an injection-related constraint and the customer will be responsible for its replacement.

3.5 Stability Analysis

3.5.1 Computer Programs

A stability analysis to be performed using Siemens PSS/D®.

3.5.2 Methodology

A pre-project model will be developed without the interconnection request to represent system conditions with all generators in the area with higher interconnection queue priority. A post-project model will be created with the interconnection request by adding the new GI to the pre-project model.

Stability simulations will be performed for various three-phase faults with normal clearing and single line-to-ground faults with delayed clearing to evaluate the stability of the project and the impact of the project on the stability of the transmission system. The disturbances will be evaluated under both system intact and prior outage conditions near the POI. The stability performance of the post-project model will be compared to the stability performance of the pre-project model.

3.5.3 Pre-project Model

Pre-project models will be developed without the interconnection request. To the extent practical, models available from the previous LG&E/KU GI stability study will be utilized. The models should reflect summer peak and light load conditions. The models will be adjusted to include appropriate model changes provided by the Ad Hoc Study Group. Earlier queued generation interconnection projects in a state of active or complete from adjoining Transmission Providers' interconnection queues deemed by the Ad Hoc Study Group to be electrically "near" the interconnection request location will be added when the information required to add those requests is provided to the ITO during the study scope review period. This typically includes requests no more than one tier from the LG&E/KU control area.

Additionally, a maximized summer peak model will be developed with all generation in the LG&E/KU Balancing Authority Area maximized to the generation interconnection capacity values posted on the LG&E/KU OASIS. Excess generation is typically exported equally to local Balancing Authority Areas to the north, south, east, and west of the LG&E/KU area.

3.5.4 Post-project Model

The new generation will be added to the model and dispatched either in the direction of the prevailing flows or to neighboring control areas to the north, south, east, and west of the LG&E/KU control area by 25% of the requested interconnection as determined by the Ad Hoc Study Group.

3.5.5 Stability Disturbance Criteria

The stability simulations performed as part of the study should consider selected disturbances near the POI in accordance with P1 through P7 of NERC TPL-001-4, Table 1 and with LG&E/KU's *Transmission System Planning Guidelines*. The simulations will be performed as described in the LG&E/KU *Transmission System Planning Guidelines*. In addition, the ITO will simulate other regional disturbances, consistent with this criterion or the criterion of the requesting party, which are identified by the Ad Hoc Study Group.

3.5.6 Stability Performance Criteria

The performance criteria are provided in NERC TPL-001-4, applicable SERC standards and LG&E/KU's *Transmission System Planning Guidelines*. Stability performance will be evaluated based on these criteria

3.6 Non- LG&E/KU Constraints

If a non-LG&E/KU constraint is identified in the study, the TO of the impacted facility will be notified by the ITO. The customer must work with the affected TO of the impacted facility to mitigate the new GI request's impacts.

3.7 Mitigation Plan

To the extent the study determines that there are injection constraints to providing the requested service, the study will evaluate system additions and/or modifications to address the LG&E/KU constraints. Mitigation is required to address any injection constraints found in the study in order to provide interconnection service. No Remedial Action Scheme ("RAS") will be considered as part of the mitigation plan. If constraints are outside the LG&E/KU system, the ITO will make a reasonable effort in assisting the customer to obtain a mitigation plan from the third party TO. However, the customer is responsible for addressing non-LG&E/KU constraints and developing a mitigation plan by working with the third party TOs.

3.8 System Impact Study Report

The SIS report must identify:

1. The transmission facility and flowgate injection constraints to providing the interconnection service and dictating the need for a facilities study.
2. Preliminary list of Generator Interconnection Facilities and Network Upgrades required to provide the interconnection service.
3. Planning level non-binding cost estimate for Generator Interconnection Factilitiesand Network Upgrades.

4. Interim SIS

If Interim Interconnection Service is requested, the ITO will perform a sensitivity analysis (not required to be performed in queue order) to determine requirements to interconnect to the transmission system. The Interim Interconnection Service customer must agree to assume all risks and liability associated with the change from interim service to permanent service as described in the Standard Large Generator Interconnection Agreement including, but not limited to, a change in the output limit and additional costs for Network Upgrades; the Generator Operational output limit will be reviewed and updated as required at least seasonally or any time there is a change in higher queued generation interconnection status or Network Upgrade requirements/responsibility or a change in study assumptions. The Interim Interconnection Customer will be responsible for facility upgrade costs, including any accelerated construction cost, even if that Network Upgrade is a requirement of a higher queued project and if that Network Upgrade is required for the Interim Interconnection Service. In this case, the Interim Interconnection Service customer will be reimbursed for the cost of this Network Upgrade, except for the costs which resulted from the accelerated construction, once the higher queued project pays for the Network Upgrade.

The Interim Interconnection Service SIS will follow the same methodology and utilize the same criteria as given in Section 3 of this Document for the steady-state, stability and short circuit analyses, with the following exceptions:

The Interim Interconnection Service SIS will evaluate the adequacy of the transmission system in its current configuration, or in its anticipated configuration on the effective date of the Interim Interconnection Service requested, to accommodate the Interim Interconnection Service at the megawatt level specified in the Interim Interconnection Request, which must be the same megawatt level as the megawatt level specified in the original Interconnection Request.

The Interim Interconnection Service SIS will use a summer peak, a winter peak and, a summer off-peak model coincident with the start-date of the proposed generator and anticipated network configuration on the effective date of the Interim Interconnection Service requested in the steady-

state analysis. Summer peak and off-peak models coincident with the start-date of the proposed generator and anticipated network configuration on the effective date of the Interim Interconnection Service requested will be used in the stability analysis. This study will determine maximum generation output without any Network Upgrade for the requested interim interconnection.

5. Feasibility Study

The FES will follow the same methodology and utilize the same criteria as given in Section 3 of this Document with the following exceptions:

- With the exception of LG&E/KU participation in comments and model review, no Ad Hoc Study Group will be formed.
- No formal study scope will be developed.
- A limited number of pre-project models (summer and winter peak cases) will be used for performing the feasibility study.
- No effort will be made to update the model with higher queued GI requests from Non-LG&E/KU GI queues.
- No stability analysis will be performed.
- A mitigation plan will be identified only for the LG&E/KU transmission system and a planning level cost estimate will be provided.

6. Facilities Study

The ITO will oversee the FS performed by LG&E/KU. FSs will consider only the LG&E/KU constraints identified in the SIS by the ITO. Typically, an FS will not require additional power flow analysis if the final mitigation plan is consistent with the SIS identified mitigation plan and no significant changes to the SIS assumptions are identified. The ITO will perform additional power flow and stability analysis if there are significant changes to the SIS assumptions or constraints in the FS. FSs will include steady state, stability and short-circuit analyses if significant Network Upgrades are required.

6.1 Computer Programs

If additional power flow, stability and short-circuit analysis are required, steady-state analysis will be performed using Siemens PSS/E® and/or MUST®, stability analysis will be performed using PSS/E® and short-circuit analysis will be performed using ASPEN®.

6.2 Model Development

The pre-project and post-project models developed for the SIS will be used for the FS.

6.3 Contingency Criteria

The simulations performed as part of the FS will be consistent with the simulations performed for the SIS.

6.4 Monitored Elements and Flowgates

The monitored elements in the FS will be consistent with those monitored in the SIS.

6.5 Performance Criteria

The performance criteria for the FS will be the same as the performance criteria used for the SIS.

6.6 Physical and Electrical Design Criteria

The physical and electrical design will conform to LG&E/KU's engineering design practices, design standards, equipment specifications, and safety rules.

6.7 Facilities Cost Criteria

LG&E/KU will use good faith efforts to develop cost estimates using the same methods used to develop cost estimates for facilities required to serve retail load.

6.8 Facility Study Report

The FS report will specify and provide an estimate for the equipment, engineering, procurement and construction work required to implement the conclusions of the SIS / FS.