Eastern Interconnection Planning Collaborative

Steady-State Modeling Load-Flow Working Group Procedure Manual

(SMLFWG)

Revision History

Revision	Date	Comments
0	September 10, 2010	Initial Version

Responsible EIPC Groups

Technical Committee
SMLF Working Group

Eastern Interconnection Planning Collaborative

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I. INTRODUCTION

On May 21, 2009, representatives from 22 Planning Authorities ("PAs") in the Eastern Interconnection (See Appendix A for full listing as entities may be added/removed from time to time) agreed to initiate the technical work to facilitate coordination of existing transmission plans, conduct reliability analyses of the combined interconnection system, and conduct studies to support state, provincial, regional or federal public policy decision making. The group completed an application for funding from the U.S. Department of Energy (DOE) in response to FOA-0000068. The application was submitted by PJM Interconnection, LLC on behalf of PAs representing the entire Eastern Interconnection. Eight PAs elected to represent the Eastern Interconnection as Principal Investigators (PIs). In addition to the eight principal investigators and Eastern Interconnection Planning Collaborative (EIPC) planning authorities, additional participants to the DOE bid include Charles River Associates (CRA) and the Keystone Center.

Each PI is listed below:

1. PJM Interconnection, L.L.C. ("PJM")
2. New York Independent System Operator, Inc. ("NYISO")
3. ISO New England, Inc. ("ISO-NE")
4. Midwest Independent Transmission System Operator, Inc. ("MISO")
5. Southern Company Services Inc., as agent for Alabama Power Company, Georgia Power Company, Gulf Power Company, and Mississippi Power Company ("Southern")
6. Tennessee Valley Authority ("TVA")
7. Mid-Continent Area Power Pool, by and through its agent, MAPPCOR
8. Entergy Services, Inc. on behalf of the Entergy Corporation Utility Operating Companies ("Entergy")

On Dec. 18, 2009, the EIPC was selected by DOE to receive approximately $16 Million. PJM Interconnection, LLC ("PJM") elected to serve as the Lead PI for the DOE Project.

The EIPC is intended to build upon the regional transmission expansion plans developed each year (plans that are well vetted through the respective FERC Order 890 Regional Planning Processes). The EIPC provides a transparent and collaborative venue to interested stakeholders: states, provincial and federal policy makers, consumers, environmental interests, transmission planning authorities and market participants that generate, transmit or consume electricity within the Eastern Interconnection.

The purpose of the SMLFWG can generally be described as the following:

1. Modify/Create steady state load-flow models
2. Steady-state load-flow analysis (including transfer capability)
3. Reporting of results as required/necessary

For a detailed description of the work to be performed as part of the DOE funding, see the following:

http://www.eipconline.com/Documents/EIPSC_SSC_Proposal_5-6-10.pdf

For an overview of the process, related to the DOE funding, that will be employed by the EIPC SMLFWG, see the flowchart depicted in Figure 1 below. Dates represented are tentative and for illustration purposes only.

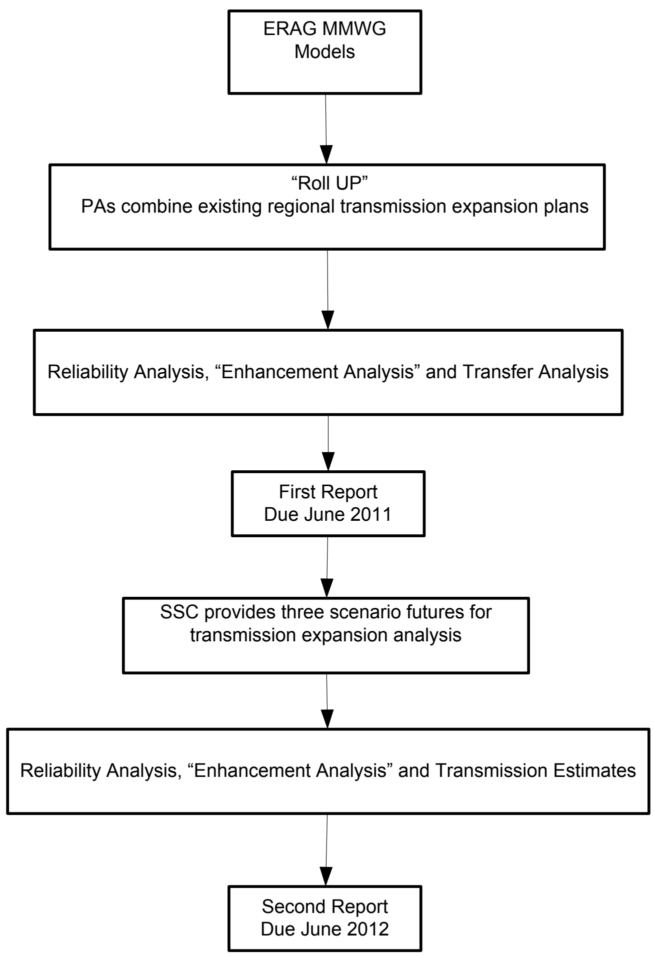

Figure 1

II. STRUCTURE AND ACTIVITIES

A. Structure

The Steady-State Modeling and Load-Flow Working Group (SMLFWG) is comprised of representation from each of the Planning Authorities currently participating in the Eastern Interconnection Planning Collaborative, as identified in the current EIPC Agreement posted at www.eipconline.com (also included in Appendix A). Work products, schedules and technical guidance are provided to the SMLFWG by the EIPC Technical Committee. The general structure of the EIPC and that of the SMLF can be found below in Figure 2.

The SMLFWG is directed by a Chairman and a Vice-Chairman. Duties of the Chairman and Vice-Chairman are outlined in Appendix B.

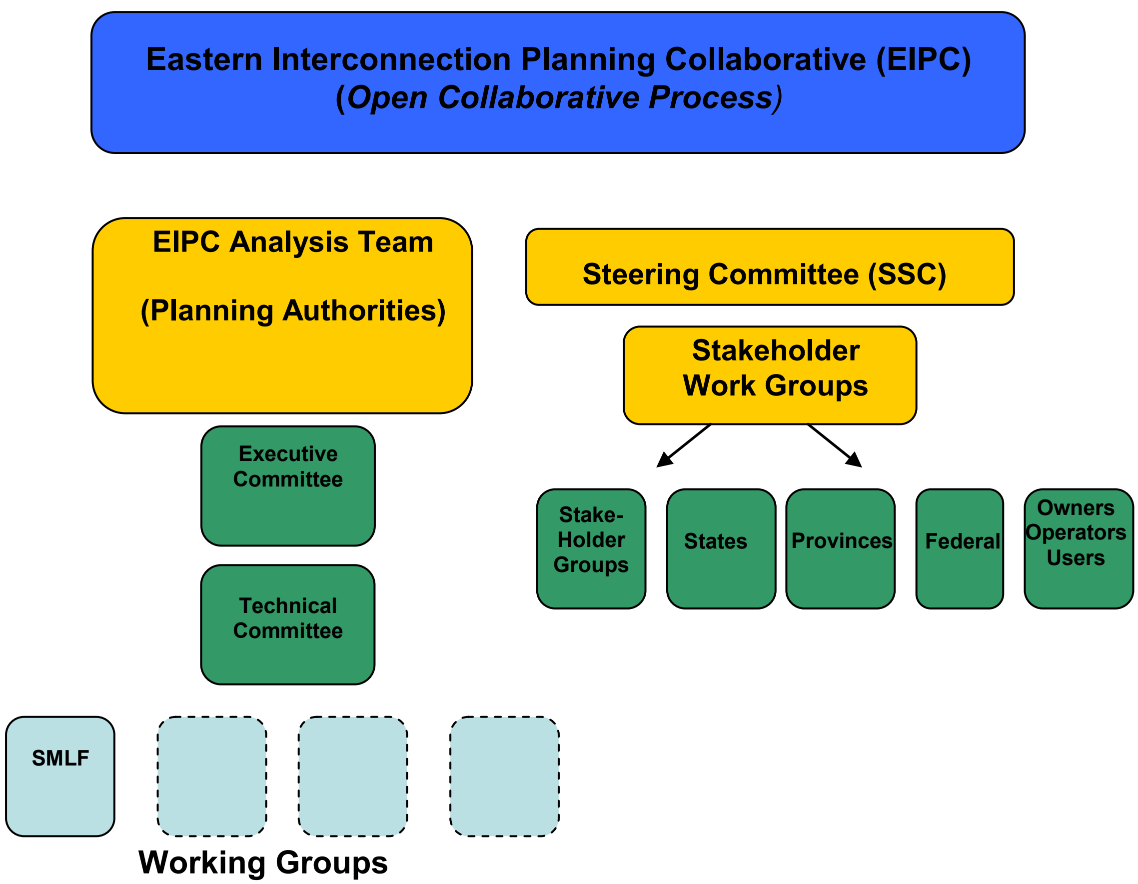

Figure 2

B. Activities

The following is a general list of the current responsibilities and activities of the SMLFWG:

1. Create/modify steady-state load-flow models.
    - Assist in the determination of the year(s)/season(s) to be studied.
2. Perform AC analysis
3. Perform linear transfer analysis.
    - The analysis will be a flow-based analysis and not a contract path based analysis.
4. Assist in development of future transmission expansion scenarios as may be required.
5. Compile analysis into a report.

Case Development

- Generally, the ERAG MMWG cases will be used as a starting point for the creation of the coordinated models.
- Interchange and other assumptions will be coordinated between members of the SMLFWG, consistent with those currently approved by each PA .
- Only confirmed, full path, long term firm transmission reservations (including those with roll over rights), will be included in the coordinated models.
- Coordinated models will be saved and utilized for the transfer analysis.
- For AC analysis, each SMLFWG member will modify the coordinated models to reflect their internal assumptions as mutually coordinated and agreed to by affected systems (e.g., Partial Paths, CBM and TRM).
- Base case generation dispatch and transfer source/sink subsystems are set according to the internal assumptions and procedures of each PA.

Perform AC Analysis

- AC Analysis will be performed in sufficient detail and with sufficient sensitivities to determine the contributing causes of any identified issues.
- N-1 screens performed by EIPC Coordinator (see Appendix B Duties) for modeling validation and neighboring system impacts (PA provides specific contingency/monitor files for its system

facilities and may request other PAs to include specific elements in other affected PA's files).

- Each PA performs reliability analysis of their own system based on the PA planning practices and individual requirements (e.g.TRM, CBM, partial path transactions, etc.) to determine/confirm projected expansion plans.
- Each PA coordinates their respective, approved expansion plans with neighboring PAs for possible, mutual benefit "enhancements" based on the EIPC analysis of the approved plans and deficiencies that are agreed upon by affected systems (this may include one 3-5 day in person meeting). This will result in the EIPC base plan consistent with currently approved plans
- Additional N-1 reliability screen is performed by EIPC Coordinator on the coordinated model that include the projects resulting from the coordinated PA efforts. This additional screen is to help validate the effectiveness of proposed mutual benefit "enhancements" and to indicate if any new wide area reliability issues have been created.

Linear Transfer Analysis

Utilizing the model resulting from the coordinated efforts, perform linear transfer analysis to demonstrate strength of the grid. The intent of this analysis is not to identify constraints such that transmission projects can be identified and transfer capability increased.

- Performed by EIPC Coordinator
- Each PA responsible for review of output

Compile Analysis Into Reports

The SMLFWG members will compile all of the analysis as required and prepare reports. The reports will contain items such as, but not limited to the following:

- A description of the analysis approach and key assumptions
- Included as necessary (not applicable to the roll-up analysis), will be planning level estimates that reflect overnight costs in current year's NPV.
- Included as necessary (not applicable to the roll-up analysis), will be planning level, time to construct estimates.

Section VII, Reporting, contains a description of the information that will be documented and in what format the information will be documented.

III. MODEL BUILDING

In general, when available, MMWG models will serve as the starting point.

For scenarios defined by stakeholders, these guidelines may generally apply to provide the foundation for future or varying assumptions. However, for scenarios provided by stakeholders, these guidelines may be altered as described in the Scenario Analysis section.

A. Master Tie Line Database

The EIPC Coordinator maintains a Master Tie Line Database for use in the case creation process.

1. In general, only inter-area tie lines will be contained in the Master Tie Line Database (However all other PA tie-lines will be coordinated).
2. All tie bus names and tie line data should conform to the entries in the Master Tie Line Database as approved by the EIPC Coordinator.
3. The EIPC Area Coordinator in which a tie line bus is located shall specify the bus name nomenclature that is to appear in the Master Tie Line Database and in the final EIPC models.
4. A tie line will not be represented in a particular power flow model unless both (all) parties affected have agreed to include it.
5. All tie line bus names and numbers should be standard and unique within each area in all models. Changes in tie line bus names and numbers must be kept to a minimum to reduce changes in computer support programs.
6. The in-service date is the date that the line will be operable. The out-of-service date is the date that the line will be inoperable. The In-service and out-of-service dates will be expressed as mm/dd/yyyy.
7. The EIPC Coordinator will maintain only one Master Tie Line Database per series.
8. The EIPC Area Coordinators should only submit tie line changes (additions, deletions, and changes) from the Master Tie Line Database that has been approved by the EIPC Coordinator. Each entry of the tie line data should be clearly labeled.
9. Data for the Master Tie Line Database should be submitted in the spreadsheet format determined by the SMLFWG.
10. Post model creation corrections to the tie line data shall only be made through the process above, and must include revisions to the Master Tie Line Database
11. Ties with an in-service/out-of-service date from 01/16/yyyy to 04/15/yyyy will be in-service/out-of-service in the spring model for the year yyyy.
12. Ties with an in-service/out-of-service date from 04/16/yyyy to 07/15/yyyy will be in-service/out-of-service in the summer model for the year yyyy.

13. Ties with an in-service/out-of-service date from 07/16/yyyy to 10/15/yyyy will be in-service/out-of-service in the fall model for the year yyyy.
14. Ties with an in-service/out-of-service date from 10/16/yyyy to 01/15/yyyy will be in-service/out-of-service in the winter model for the year yyyy.

B. Interchange Schedule Matrices

1. All transactions and interchange schedules conform to tables of interchange transaction schedules developed and agreed to by the EIPC Area Coordinators prior to the creation of the first model. The tables model only firm, full path schedules for all coordinated models. Complete interchange matrices should be submitted which include transactions for all participating PAs (including all area total interchange schedules). Adjusted control area interchanges will be provided as agreed to by all affected areas. Net scheduled interchange for all PAs will be consistent with ERAG models, unless otherwise agreed to by all affected areas and documented.
2. Seasonal transactions should be included, as dictated by the necessary models.
3. Summer interchange schedules should reflect transactions expected to be in effect on July 15th.
4. Winter interchange schedules should reflect transactions expected to be in effect on January15th.
5. Fall interchange schedules should reflect transactions expected to be in effect on October 15th
6. Spring interchange schedules should reflect transactions expected to be in effect on April15th
7. Light Load interchange schedules should reflect transactions expected to be in effect on April first
8. The schedule shall show net scheduled interchange for each PA and for each area within that PA. Accounting by RTO will also be provided.
9. All interchanges must net to zero for all models.
10. Any interchange schedule submitted that has an associated firm transmission service source to sink should be labeled with an X.
11. All areas should be identified with area names and numbers.
12. All interchange schedules shall be integer values.

C. Resources (Including Reserve Margins)

Resource assumptions will be addressed/categorized as indicated in Section VII, “Reporting”. However, for the roll-up of existing plans, the following generally applies: (A) All existing, confirmed native load generation and announced retirements of existing native load generation will be modeled. (B) All future native load assumptions with no current, confirmed transmission service will be modeled according to the current standards/modeling practices of each PA.

(C) Resources will be modeled in accordance with the OATT provisions of each entities tariff. (D) Due to the differences in the way CBM/TRM are applied/accounted for from PA to PA, these reliability margins and resource assumptions will be maintained through the individual analysis performed by each Planning Authority (See Part II, Structure and Activities, Section B for further description of this individual analysis). (E) Base case generation dispatch and transfer source/sink subsystems are set according to the internal assumptions and procedures of each PA.

D. Topology

Transmission facilities modeled in each PA's portion of the roll-up will consist of all existing and approved transmission facilities for the planning horizon being modeled. In addition each PA may include proposed transmission facilities that are consistent with their regional plans for the planning horizon being modeled, provided that any such proposed facilities that have not been formally approved for implementation within the regional planning process of the PA, shall be noted as "Proposed Facilities" in a list provided with the roll-up case. Each PA will be responsible for the specific status modeling of each proposed facility connected to its system for each EIPC analysis. Proposed interconnection facilities status modeling must be agreed to by all affected parties.

E. Model Definition

Each EIPC model is of one of the following model types. Demand-side management should be modeled in accordance with the current standards/modeling practices of each PA.

Summer Peak Load — is defined as the summer peak demand expected to be served, reflecting load reductions for peak shaving. Topological modeling changes shall be incorporated into the model if they are to go into effect on or before July 15th. Summer interchange schedules should reflect transactions expected to be in place on July 15th.

Winter Peak Load — is defined as the winter peak demand expected to be served, reflecting load reductions for peak shaving. Topological modeling changes shall be incorporated into the model if they are to go into effect on or before January 15th. Winter interchange schedules should reflect transactions expected to be in place on January 15th.

Light Load — is defined as a typical early morning load level, modeling at or near minimum load conditions. Topological modeling changes shall be incorporated into the model if they are to go into effect on or before April 1st. Pumped storage hydro units should either be modeled off-line or in the pumping mode, with appropriate pumping interchange schedules in place. Dispatchable hydro units should generally be modeled off-line, with run-of-river hydro on-line. Generation dispatch and interchange schedules should be commensurate with the experience of the PA during such load periods, not just including firm transactions.

Shoulder Peak Load (Summer) — is generally defined as 70% to 80% of summer peak load conditions. Dispatchable and pumped storage hydro units should be modeled consistent with the peak hour of a typical summer day with run-of-river hydro on-line. Generation dispatch and interchange schedules should be commensurate with the experience of the PA during such load periods, not just including firm transactions. Summer or appropriate equipment ratings should be used.

Spring Peak Load — is defined as typical spring peak load conditions. Topological modeling changes shall be incorporated into the model if they are to go into effect on or before April 15th. Pumped storage hydro units should be generally modeled on-line, but not necessarily at full generating capacity (generally not pumping). Dispatchable hydro units should generally be modeled on-line, but not necessarily at maximum generation, and run-of-river hydro should be modeled on-line. Generation dispatch and interchange schedules should be commensurate with the experience of the PA during such load periods. Planned spring maintenance of generation and transmission should be reflected in this model. Summer or appropriate equipment ratings should be used.

Fall Peak Load — is defined as typical fall peak load conditions. Topological modeling changes shall be incorporated into the model if they are to go into effect on or before October 15th. Pumped storage hydro units should be generally modeled on-line, but not necessarily at full generating capacity (generally not pumping). Dispatchable hydro units should generally be modeled on-line, but not necessarily at maximum generation, and run-of-river hydro should be modeled on-line. Generation dispatch and interchange schedules should be commensurate with the experience of the PA during such load periods. Summer or appropriate equipment ratings should be used.

F. Preparation and Transmittal of Power Flow Models

1. All power flow data submitted should be in accordance with the Power Flow Modeling Guidelines contained in Appendix D. It is the responsibility of each EIPC Area Coordinator to ensure that the data is in the correct format.
2. Each PA is to perform an N-1 screening of its bulk electric system for the purposes of identifying modeling errors before submitting their data to the EIPC Area Coordinator.
    - Overloads or voltages that exceed the PA screening criteria should be reviewed and commented on as to whether they are resulting

from modeling errors. Corrections for modeling errors should be made.
- Each PA shall be able to produce the results of the review upon request.

3. Each model submitted by each PA must solve via the same method as noted in the following: **Section III.J**: "**Finalizing Power Flow Models**".
4. The version of software for each model series will be in accordance with the current MMWG process.
5. All models submitted to the EIPC Area Coordinator must be from solved models. These must be solvable in not more than 20 iterations from a flat start with a mismatch tolerance of 1 MW or 1 MVAR per bus and a zero impedance cutoff setting of 0.0001 p.u. Contingency analysis should be run on the cases prior to submission to the EIPC Area Coordinator to check model integrity.
6. Area numbers, zone numbers, owner numbers (if assigned), and bus number ranges must conform to those assigned by MMWG (see Appendix X of the ERAG, MMWG Procedure Manual). The sixteen-character bus name and voltage should be unique for all buses 115 kV and above. The sixteen character bus name shall be unique for all generator buses and all inter-area tie line buses. The bus and equipment names shall not contain the following characters: comma, single and double quote, asterisk.
7. All areas in the models shall have proper area names and numbers for identification, consistent with the designations agreed to by the MMWG. Any changes will be coordinated by the EIPC Coordinator.
8. Models shall use zone numbers consistent with the MMWG zone number ranges assigned by MMWG (see Appendix X of the ERAG, MMWG Procedure Manual).
9. **DC Circuit Number** – Assigned DC circuit numbers are shown in Appendix XII of the ERAG, MMWG Procedure Manual. When a PA would like to use a new DC circuit number, they must contact the EIPC Coordinator. The EIPC Coordinator Power will consult the currently utilized DC circuit number list and assign the requesting PA a new circuit number for their exclusive utilization.
10. **FACTS Device Number** – Assigned FACTS device numbers are shown in Appendix IX of the ERAG, MMWG Procedure Manual. When a PA would like to use a new FACTS device number, they must contact the EIPC Coordinator. The EIPC Coordinator will consult the currently utilized FACTS device number list and assign the requesting PA a new FACTS device number for their exclusive utilization.
11. Ownership data, if used, should be consistent with the list in Appendix IX of the ERAG, MMWG Procedure Manual. If not used, the owner number should be set to the default value of 1, which is unassigned.
12. Models shall be delivered to the EIPC Area Coordinator on or before the scheduled due date.

13. If a Control Area has generation modeled on-line, the control area shall model one of the online generating units bus, within its boundaries, as its area slack bus.

G. Receiving Power Flow Models

The EIPC Coordinator should perform the following steps with every received model:

1. The dates of receipt are logged.
2. The data are read and saved in a file for conversion to the required format used by the EIPC Coordinator for power flow data merging and calculation.
3. Area names, area numbers, zone number ranges, and bus number ranges are checked for compliance with those in Appendices X and XIII of the ERAG, MMWG Procedure Manual.
4. Non-convergent models are reported to the responsible EIPC Area Coordinator for corrective action.

H. Power Flow Model Merging

Once all data have been received from the EIPC Area Coordinators for a specific model, the EICP Coordinator will merge the submittals into an EIPC model. It is the responsibility of the EIPC Area Coordinator to ensure that each PA area representation is approved by each PA prior to finalization of any model.

1. One of TVA's Brown's Ferry generators, represented as on-line, will be the primary swing machine for each EIPC model. Other swing machines are included in all other non-synchronous areas (currently Hydro Quebec, northern Manitoba, WECC, and ERCOT).
2. EIPC Area Coordinators shall resolve all tie line discrepancies specified by the EIPC Coordinator.
3. The process used by the EIPC Coordinator to merge the models will utilize the EIPC Master Tie Line Database. The EIPC Coordinator will notify the responsible EIPC Area Coordinators of any tie line insertion problems, typically due to duplicate or improperly named buses in the models.
4. The EIPC Coordinator will check tie lines in the merged models against the EIPC Master Tie Line database. Any discrepancies will be reported to the responsible EIPC Area Coordinators.
5. The EIPC Coordinator will check interchange in the merged model against the EIPC Scheduled Interchange Matrices. Any discrepancies will be reported to the responsible EIPC Area Coordinators. The sum of area interchange in the model must be zero. Also, the area interchange deviation tolerance for each area should be less than or equal to 5 MW.

6. If convergence of the merged model is not successful, the EIPC Coordinator will notify the EIPC Area Coordinators for corrective action.
7. Successfully converged merged models will be named in accordance with the following convention:

    ***Year* SERIES, EIPC "INSERT DESCRIPTIVE NAME"**
    Year Season* CASE, TRIAL *n

    For Example:
    2010 SERIES, EIPC ROLL-UP
    2020 SUMMER PEAK CASE, TRIAL 1

I. Power Flow Model Screening

Once model merging is successful, the EIPC Coordinator will screen the trial case. Copies of the trial case, the preliminary interchange for the case, and the results of the EIPC Coordinator screening report will be sent electronically to the EIPC Area Coordinators for their review. All changes made to the model data will be reported to the EIPC Area Coordinators responsible for that data. The EIPC Coordinator screening may include, but is not limited to, the following tests:

1. Islands with no swing machine.
2. Buses with blank nominal voltage.
3. PSSTME generator data checks:
    − Default values in the PMAX, PMIN, QMAX, QMIN, and MBASE
    − PGEN < PMIN
    − PGEN > PMAX
    − PMAX < PMIN
    − QMAX < QMIN
    − Machine connected to Type 1 bus
    − Type 2 bus with no machine modeled
    − Machine with zero or negative impedance
    − Machine with MBASE < PMAX
    − Machine with MBASE = 0
    − Machine ZSOURCE with default values
    − Zero impedance branches connected to generation buses.
4. PSSTME branch data checks (activity BRCH):
    − small impedance (less than 0.0001 p.u.)
    − large impedance (greater than 3.0 p.u.)
    − high R/X ratio (absolute value of R greater than absolute value of X)
    − negative reactance (less than 0.0)
    − high charging (greater than 5.0 or negative)
    − non-identical parallel transformers (particularly tap ratios)
    − high tap ratios (greater than 1.20)
    − low tap ratios (less than 0.90)

5. Branch emergency ratings (RATEB) less than the normal ratings (RATEA).
6. PSSTME transformer data checks:
   − tap step = 0.0
   − small tap steps (less than 0.00625)
   − voltage controlling transformers with voltage band less than twice the step size
   − MW or MVAR controlling transformers with flow bands less than 5 MW or MVAR.
   − RMAX and RMIN = default values while VMAX and VMIN <> default values
   − RMAX and RMIN <> default values while VMAX and VMIN = default values
   − RMAX, RMIN, VMAX, or VMIN = 0.0
7. Voltage control conflicts (PSSTME activity CNTB).
8. Switch shunts with missing block 1 steps. A switch shunt can effectively be turned OFF by changing BINIT to 0 and MODSW to 0.
9. Buses with solved voltage above 1.10 p.u.
10. Buses with solved voltage below 0.90 p.u.
11. Branches loaded above Normal Ratings (RATEA).
12. Branches loaded above Emergency Ratings (RATEB).

J. Finalizing Power Flow Models

1. The EIPC Area Coordinators will review the models and provide corrections for any modeling problems according to the previously determined schedule. This fine tuning phase is not intended as an opportunity for a complete revision of the model. Extensive revision should not be required at this time because basic model deficiencies or data errors should have been corrected before the model was submitted to the EIPC Coordinator.
2. To make sure that no changes were made to inter-area tie lines, the Master Tie Line Database should again be read into the models.
3. A model shall receive final approval only when it can be solved with the following conditions:
   a. Solve in less than 20 iterations (preferably in less than 10 iterations)
   b. Solve from a flat start using Fixed Slope Decoupled Newton Solution (PSSTME activity FDNS)
   c. Employ a 1.0 MW/MVAR per bus mismatch tolerance
   d. Enforce area interchange with the "Tie Lines and Loads" option.
   e. Enable
      (1) Tap changing transformers
      (2) Switched shunts
      (3) Phase shifters

    (4) DC transformer tap stepping
  f. Enforce generator VAR limits in 1 iteration
  g. Satisfy the Screening Checks in the preceding section.
4. A model is considered final when all Planning Authorities (via the EIPC Area Coordinators) approve it.
5. All model distributions should include associated interchange tables.

IV. LINEAR TRANSFER ANALYSIS

A. Purpose

Linear transfer power flow analysis is performed to determine the ability of areas to export and import power and demonstrate strength of the planned grid. The intent of this analysis is not to identify constraints such that projects can be identified and transfer capability increased. Linear analysis is thermal only analysis (DC) and does not examine system voltage, reactive supply, or stability issues. Should conditions other than thermal limits dictate the TTC, these will be addressed on a PA basis.

For scenarios defined by stakeholders, these guidelines may generally apply to provide the foundation for future or varying assumptions. However, for scenarios provided by stakeholders, these guidelines may be altered as described in the Scenario Analysis section.

B. Proposed Analysis

1. Analysis Sequence

The linear transfer analysis will be completed in two steps:

a. The initial transfer analysis will be completed and the results will be delivered to the individual PA. Based on these results, some PA may elect to make edits to the subsystem, monitored element, or contingency files. This will ensure that any erroneous flows or dispatches can be corrected for the final analysis.
b. A second and final transfer analysis will be completed based on the sub/mon/con file edits made in step (a). The results of this analysis will be forwarded to the PA.

Subsequent to delivery of the final analysis, additional analysis may be required by certain PAs due to additional contingency requirements or known voltage and stability issues. This analysis will be performed as required at the PA level.

2. Transfer Guidelines and Assumptions

- Transfers will be 5000MW
- Transfer amounts will be allocated amongst the sink on a load

ratio share.

- Transfers will be generator to generator and consistent with NERC standards, a change in the generation pattern will be allowed to achieve the 5000 MW value.
- Transfer sources will be available generation, including off-line, honoring machine limits
- Transfer sinks will be on-line generation, excluding nuclear plants
- Contingencies will be N-1, which may include generator outages as appropriate on systems ≥161kV
- All transmission facilities >100kV will be monitored
- Report limits with OTDF>3%

3. Transfers
   Transfers will be based upon the PAs defined in Table 1 below (Participation in the area is based upon PAs that are parties to the EIPC):

A	B	C	D	E	F
FPL	MAPPCOR	New York ISO	PJM	Duke Energy Carolinas	SPP
JEA	MISO	ISO New England		Entergy	
Progress Energy Florida	ATC	Ontario IESO		E.ON.U.S.	
		New Brunswick System Operator		GTC	
				Power South	
				Progress Energy Carolina	
				SCEG	
				SC	
				Southern Company	
				MEAG	
				Alcoa Power Generating	
				TVA	
				Electric Energy, Inc.	

TABLE 1

Transfers will be based upon the definitions in Table 1 and performed based upon Table 2 below (Participation in the transfer is based upon PAs that are parties to the EIPC):

	Sink					
Source	**A**	**B**	**C**	**D**	**E**	**F**
A					Y	
B			Y	Y	Y	Y
C		Y		Y		
D		Y	Y		Y	
E	Y	Y		Y		Y
F		Y			Y	

TABLE 2

Note that some Areas, individual PAs, or combined PA's may desire to see specific transfers in addition to the transfers shown above. These additional transfers will be documented in the reporting process.

C. Power Flow Cases

Base cases described in Section III will be utilized for the Linear Transfer Analysis.

D. Auxiliary File Naming Convention

Abbreviations

Company Identifiers:

(Example listing is below)

AL Alcoa Power Generating
AT American Transmission Company
DK Duke Energy Carolinas
EE Electric Energy, Inc.
EN Entergy
FP Florida Power and Light
GT Georgia Transmission Corporation
IO IESO (Ontario, Canada)
LG E.ON-U.S., LLC (formerly Louisville Gas and Electric Energy/LGEE)
NE ISO-New England

JE JEA (Jacksonville, Florida)
MP MAPPCOR
MI Midwest ISO
MG MEAG (Municipal Electric Authority of Georgia)
NB New Brunswick System Operator
NY New York ISO
PJ PJM Interconnection
PC Progress Energy Carolinas
PF Progress Energy Florida
SC South Carolina Public Service Authority
SG South Carolina Electric and Gas
SO Southern Company
SP Southwest Power Pool
TV Tennessee Valley Authority

Seasonal Load Identifiers: *(Recommend using ERAG)*

S Summer Peak Load - SUM
W Winter Peak Load - WIN
Z Spring Peak Load - SPR
F Fall Peak Load - FAL
L Light Load (Valley) -SLL
H Shoulder - SSH

Table Identifiers:

CO Conclusions
MG Major generation changes
MT Major transmission changes
ID Import discussion
CF Critical facilities
IT FCITC tables
TT FCTTC tables
OG Operating guide
GD Generation dispatch
DI Detailed interchange
IS Interchange schedule
TD Transcription diagram
OL Outage listing
CL Case listing

Transfer Specific Subsystem Description File Examples:
Participants will provide required source and sink files for transfers to and from their areas. The file name shall specify the company submitting the participation factors and the file extension shall specify the year and season. For example:

> SO20S.SUB includes Southern Control Area data for the 2020 summer peak season.

All subsystem labels will be in quotes, identify the company, the MW test level, whether it is for an export or import and the opposing company. (If the transfer level is valid for all transfers at the specified test level, no opposing system needs to be identified in the subsystem label.) Each subsystem will be commented to clarify the subsystem description.
For example:

```
'SO3000IMVC'     /* Southern Company 3000 MW Import part. factors from VACAR
'SO3000IMTV'     /* Southern Company 3000 MW Import p.f.s from TVA
'SO3000EX'       /* Southern Company 3000 MW Export p.f.s for all 3000 MW exports
'AP3000IM'       /* AEP 3000 MW Import p.f.s for all 3000 MW imports
```

All subsystems will have two [END] statements between them with no blank spaces between and be listed from lowest MW test level import to highest, followed by the lowest export test level to the highest. For example:

```
SUBSYSTEM 'CE700IMSG'  /* CP&L-E 700 MW Import p.f.s for transfers
from SCE&G
AREA 'number'
PARTICIPATE
BUS bsid    MW/%        /* Unit Name
.
.
END
END
SUBSYSTEM 'CE1000IMGT'  /* CP&L-E 1000 MW Import  p.f.s  for transfers
from GTC
AREA 'number'
PARTICIPATE
BUS bsid    MW/%        /* Unit Name
.
.
END
END
```

```
SUBSYSTEM 'CW500IM'  /* CP&L / West  import participation factors from
all areas
AREA 'number'
PARTICIPATE
BUS bsid     MW/%          /* Unit Name
.
.
END
END
```

Combined PA subsystem description data files shall be submitted separately and identify the company submitting the p.f.s. For example:

VCVP30EX.15S for VP's portion of the SCRTP/NCTPC 3000 MW export p.f.s for the 2015 summer

VCCE30IM.15S for CE's portion of the SCRTP/NCTPC 3000 MW import p.f.s for the 2015 summer

E. Auxiliary File Submittals

1. PAs shall include known, approved operating procedures in the contingency file, if applicable to the EIPC study. If an operating procedure utilizes a generation re-dispatch, load shedding scheme, or load shift, it shall be included in the contingency file.
2. Export and Import subsystem files should be checked to verify that the values add up to the transfer test level or 100% prior to submittal.
3. Export and import subsystem files will have two END statements.
4. The subsystem name shall be in single quotations.
5. Each PA will submit all their import and export participation factors in a single file with two [END] statements, if necessary, between each set of subsystems in ASCII format.
6. A master subsystem description data file shall be compiled by the EIPC Coordinator that will include all participation subsystems and the monitored subsystem. This will allow for the use of a single subsystem file to be loaded into the MUST program. It shall use the following naming convention: EIPC case name.sub.

An example of the subsystem file is show below:

```
SUBSYSTEM 'VASTMON'
JOIN
  AREAS 300 400
```

```
  AREA  201   /* AP
  AREA  205   /* AEP
  AREA  207   /* HE
  AREA  210   /* SIGE
  AREA  502   /* CELE
  AREA  503   /* LAFA
  AREA  504   /* LEPA
  AREA  515   /* SWPA
  AREA  520   /* CESW
  AREA  523   /* GRRD
  AREA  524   /* OGE
  AREA  540   /* MIPU
  AREA  541   /* KACP
  AREA  544   /* EMDE

AREA  546   /* SPRM
  KVRANGE 46 765
END
END

SUBSYSTEM 'DK2000EX' /* Duke Scale generation for 2000 MW export
 AREA 342
   PARTICIPATE
      BUS  306460  824      / CLIFSID6
      BUS  306119  620      / 6BUCK
      BUS  306486  169      / ROWANS1
      BUS  306484  157      / ROWANC4
      BUS  306485  157      / ROWANC5
      BUS  306019  54       / BUCK 3
      BUS  306020  19       / BUCK 4
    END
 END

SUBSYSTEM 'DK1000EX' /* Duke Scale generation for 1000 MW export
 AREA 342
   PARTICIPATE
      BUS  306119  517      / 6BUCK
      BUS  306486  169      / ROWANS1
      BUS  306484  157      / ROWANC4
      BUS  306485  157      / ROWANC5
   END
 END

SUBSYSTEM 'DK800EXCW' /* Duke Scale generation for 800 MW export to
CP&LW
 AREA 342
   PARTICIPATE
```

```
      BUS  306460  800       / CLIFSID6
    END
  END

 SUBSYSTEM 'DK2000IMAM' /* DUKE 2000 MW IMPORT FROM AMEREN
  AREA 342
    PARTICIPATE
      BUS 306003  1160  /* CATAWBA #1
     BUS 306004   840  /* CATAWBA #2
   END
        END

      END
```

7. The Master Subsystem description file participation factors shall be in alphabetical order by PA. Each area's unit import participation factors will be listed first followed by their export participation factors.

F. Linear Analysis Methodology

1. Using MUST: All linear load flow data will be exported to another workbook into a single EXCEL file using **EIPCCaseName_LTA**.XLS as the file name. The worksheet title will reflect the transfer (i.e., AEP to VACAR). Heading information in the case does not need to be changed since MUST lists the subsystem file names used in its summary report.
2. Monitored areas include all Eastern Interconnection control areas. Other areas may be included as needed for particular studies.
3. The monitored kV range is typically 100-765 kV. (This will also prevent GSUs from being included in the output). Additional power system elements not included in this default range may be monitored as needed through supplemental instructions added to the monitored data list specified for each study.

4. The general format required for the monitored file is:

```
MONITOR BRANCHES IN SUBSYSTEM 'VASTMON'
MONITOR TIES FROM AREA 330
MONITOR BRANCHES IN SUBSYSTEM 'AECI345&UP'
MONITOR BRANCHES IN SUBSYSTEM 'AECI100TO345'
MONITOR VOLTAGE RANGE SUBSYSTEM  'AECI345&UP'     0.92 1.10
MONITOR VOLTAGE RANGE SUBSYSTEM  'AECI100TO345'    0.90 1.05
```

5. In order to maintain correlated input and output data, and to prevent duplication of outputs, only the EIPC Coordinator will issue linear analysis output to EIPC study group members. If additional sets of linears are required, or if linears must be repeated to correct input data errors, the

EIPC Coordinator will perform these evaluations and distribute results to all participants.

6. Rerun mailings will be sequentially numbered to help the EIPC know the order that they should insert the reruns in their output.
7. MUST should be run from the GUI and the log file checked for errors in the .con, .mon and .sub files. Verify that the complete .con file has run by checking the script in the log file that states the number of lines read. Verify that the complete .sub file has been read by verifying that the last subsystem read is available as a valid source/sink.
8. The following linear parameters will be used (parameters are specified for PSS/E but are to be applied to MUST except where noted):

1:	2	MW Mismatch Tolerance (If using MUST this parameter may have to be lowered to 0.1 to allow the case to be read into the MUST program)
2:	1	Normal (all facilities in service) Rating (1=Rate A)
3:	2	Contingency Case Rating (2=Rate B)
4:	100	Percent of Rating
5:	1	Line Flow Code (1=AC model)
6:	0	Phase Shifter (Locked=0, Regulating in model)
7:	1	0=Ignore model constraints in contingency case, 1=Include)
8:	0	List study system buses (0=No, 1=Yes)
9:	0	List opposing system buses (0=No, 1=Yes)
10:	0	List study system tie lines (0=No, 1=Yes)
11:	0	Add study system ties to monitored line list (0=No, 1=Yes)
12:	0	Output Code (0=Summary, 1=Yes)
13:	0	Interchange Limit Output Code (0=Incremental, 1=Total)
14:	20	Number of elements to include in flow tables
15:	####	Maximum import or export in summary table: 250 MW above test level for 0-500 MW test levels 500 MW above test level for 501-1500 MW test level 1000 MW above test level for test levels >1500 MW (If using MUST this option will be in the “FCITC Violations Dialog” options)
16:	0.03	Summary table minimum distribution factor magnitude
17:	##	Summary Table Maximum Times for Reporting this same Event (15 when using Operating Procedures, 5 when no O.P.’s are included in the contingency file)
18:	1	Apply minimum distribution factor to solution reports (0=No, 1=Yes)
19:	0.0	Minimum contingency case pre-shift flow change
20:	0.0	Minimum contingency case distribution factor change
21:	0	Convert Ratings to Estimated MW Ratings (0=No, 1=Yes)
		22: 1 Summary Table Contingency Descriptions (0=Labels, 1=Events, 2=Both)

MUST Specific parameters in "FCITC Violations Dialog" options:

1: Output format selection will use "TWO LINES REPORT" format. (The output will then provide Line Outage Distribution Factors (LODF) for each contingency and Power Transfer Distribution Factors (PTDF) for both monitored and contingency elements).

2: Select the option: "Add Subsystem Adjustments Detailed Report" using the above stated criteria for maximum transfer level.

G. Linear Analysis Output ("DC" Power Flows)

In order to conduct an evaluation of transfer capability, the SSMLFWG uses a "DC" power-flow technique (linear analysis) to determine line-flow conditions for modeled transfers and/or simulated outages of transmission facilities. The following discussions outline required study procedures to conduct and document linear analysis of transfer capability.

H. Transfer Levels

In general, transfers will be as defined in Section IV.B.3, and 5000MW according to Section IV.B.2 and 3. Additional transfers will be documented as described in Section IV.B.3

I. Transfer Factor Cut-Off

A facility is generally not reported as a valid limit if the response to transfers [Transfer Distribution Factor (TDF)] is below 2-3%. (See NERC's *Transmission Transfer Capability* Document, Page 18.) Usually the facility with a low transfer response is identified as a limit because it is heavily loaded in the model. Therefore, for purposes of this analysis, a 3% transfer factor cutoff will be utilized, but it is the PA of the facility in question who decides if the facility is a valid limit.

J. Operating Procedures

Specific study instruction may require the SMLFWG to identify specific operating procedures where necessary to improve transfer capabilities. When an operating procedure is identified, a verification case should be run with the operating procedure in effect to determine if additional limits to transfers are identified. The table of transfer capabilities should clearly show whether an operating procedure was in effect in order to obtain the noted transfer capability.

In order to comply with NERC guidelines for calculating transfer capabilities (refer *to Transmission Transfer Capability* Document), an automatic or normal operating procedure is characterized as an action that occurs automatically or can and will be implemented pre-contingency. Only operating procedures that meet the "Excluded Limitations" criteria can be implemented post-contingency. It is the responsibility of each PA to determine that operating procedures identified will actually be implemented if conditions warrant. This determination is made by consulting with operations personnel of their respective system responsible for implementing the operating procedure(s). The validity of proposed operating procedures should be verified for each study period.

K. NITC, FCITC and FCTTC Values

The Normal Incremental Transfer Capability (NITC) and First Contingency Incremental Transfer Capability (FCITC) identified through linear analysis techniques (on an AC base case configured not farther than 1000 MW from the incremental transfer limit) are not extrapolated beyond the test level. Extrapolation could result in the assumption that the generators used in the transfer dispatch may either exceed their rated capability or be dispatched to below zero generation (generators will be operated within all limits at the final incremental limit). The calculated transfer capabilities shall respect all applicable System Operating Limits (SOLs).

If the transfer test level was 2,000 MW and the NITC or FCITC were calculated to be 2,175 MW, the reported results would be 2,000+. When the NITCs and FCITCs are equal to or exceed 1,000 MW, they are rounded down to the nearest 100 MW. When they are less than 1,000 MW, they are rounded down to the nearest 50 MW. For example, 1,575 MW would be rounded down to 1,500 MW (assuming the test level was at least 1,500 MW) and 875 MW would be rounded down to 850 MW. For transfers less than 200 MW round down to the nearest 10 MW.

L. LODF and TDF Sign Convention

As part of study-reporting efforts, each PA is responsible for including LODF values in tables used to summarize calculated transfer capability. As part of performing computer simulations for these studies, the linear runner should provide sufficient data to permit each PA to tabulate LODF values. Particular attention is required if multiple sets of linears have been performed to insure appropriate values are correctly reported. LODF values may be generated using an abbreviated contingency and monitored file that lists only the contingency and monitored elements that will appear in the table. These values can be retrieved using the distribution factor reporting activity [OTDF] function of PSS/E. Specific data output formats using MUST also provide LODF values as a part of linear analysis results.

The LODF and TDF should be shown as positive values in the tables in the report. The signs of the LODF and TDF are dependent upon the order of the buses for both the monitored and outaged lines (i.e., Oconee-Norcross or Norcross-Oconee). The following table may be used to obtain positive signs for both the LODF and TDF. If the signs are:

TDF	LODF	Action
+	+	No action necessary
+	-	Reverse order of outaged line
-	+	Reverse order of monitored and outaged lines
-	-	Reverse order of monitored line

M. Incremental Transfer Capability Tables

The tables in the EIPC transfers are intended to provide a detailed summary of incremental transfer capability values for the specified transfers. These values are obtained from the previously described linear power-flow analysis techniques. The following is a summary of the guidelines, for documenting incremental transfer capability values in EIPC reports.

1. The first data column indicates the evaluated transfer and also provides the generation dispatch of the importing system for the modeled transfer. If the exporting company's load is reduced, the amount of load reduction should be noted here.
2. The second data column provides the NITC values (in ascending order) for each evaluated transfer. When practical, an NITC value is recorded for each limit that is encountered up to the transfer test value. Unless otherwise noted, the higher NITC values are determined independent of any Operating Procedures (if applicable to study) associated with the lower NITC values. For reporting purposes, the singular value that represents the maximum transfer capability (i.e., "identified limit") for the evaluated transfer is preceded by an asterisk symbol (*). Whenever there are no identified transfer limitations up to the tested level, only the test level value is reported in the NITC column and a plus sign ("+") is placed to the right of the NITC value in the footnote indicator column.
3. The third data column provides identifiers that refer the user to footnotes related to the NITC values. The primary purpose of the footnote indicators is to identify the availability and utilization of operating procedures for the evaluated transfer. The absence of a footnote identifier indicates that an operating procedure is not available for that

NITC limit and higher values of transfer capability cannot be obtained. The presence of the "(1)" footnote identifier indicates that an operating procedure (if applicable to study) is available for that respective NITC limit and implementation of that operating procedure will be required to obtain higher values of transfer capability. The presence of the "(2)" footnote identifier indicates that this NITC limit represents the maximum transfer capability that can be obtained with a previously implemented operating procedure.

4. For reporting purposes, the first occurrence of an absent or "(2)" footnote identifier indicates that the associated NITC value is the maximum transfer capability with all lines in-service for the evaluated transfer and the NITC value should be denoted by a preceding asterisk symbol (*).
5. The fourth data column provides the FCITC values (in ascending order) for each evaluated transfer. When practical, an FCITC value is recorded for each limit that is encountered up to the transfer test value. Unless otherwise noted, the higher FCITC values are determined independent of any operating procedures (if applicable to study) associated with the lower FCITC values. For reporting purposes, the singular value that represents the maximum transfer capability (i.e., "identified limit") for the evaluated transfer is preceded by an asterisk symbol (*). Whenever there are no identified transfer limitations up to the tested level, only the test level value is reported in the FCITC column and a plus sign ("+") is placed to the right of the FCITC value in the footnote indicator column.
6. The fifth data column provides identifiers that refer the user to footnotes related to the FCITC values. The primary purpose of the footnote indicators is to identify the availability and utilization of operating procedures (if applicable to study) for the evaluated transfer. The absence of a footnote identifier indicates that an operating procedure is not available for that FCITC limit and higher values of transfer capability cannot be obtained. The presence of the "(1)" footnote identifier indicates that an operating procedure is available for that respective FCITC limit and implementation of that operating procedure will be required to obtain higher values of transfer capability after the indicated contingency has occurred. The presence of the "(2)" footnote identifier indicates that this FCITC limit represents the maximum transfer capability that can be obtained after the indicated contingency has occurred with an available operating procedure. For reporting purposes, the first occurrence of an absent or "(2)" footnote identifier indicates that the associated FCITC value is the maximum single-contingency, transfer capability for the evaluated transfer and the FCITC value should be denoted by a preceding asterisk symbol (*).
7. The sixth data column identifies the limiting facility for each reported NITC or FCITC value. The same limiting facility is reported only a maximum of

three times for each transfer. Only one limiting facility for parallel or series elements with identical line ratings are reported for the same outage facility.

8. The seventh data column identifies the MVA line rating for the respective limiting facility.
9. The eighth data column identifies the LODF for the respective limiting facility. This value is the response of the limiting facility to the indicated line outage.
10. The ninth data column identifies the TDF for the respective limiting facility. This value is the response of the limiting facility to the transfer after the line outage. NITC and FCITC limits are not reported for limiting facilities with a TDF value of less than 3%.
11. The tenth data column identifies the outaged facility for each reported FCITC value. Outaged facilities in parentheses indicate an operating procedure in effect.
12. The eleventh and final data column provides the operating procedure identifier associated with the transfer.

V. AC ANALYSIS

A. Purpose

The intent of AC Analysis is to perform analysis that is consistent with NERC, regional (including applicable transmission owner criteria and RTO criteria) and local transmission planning criteria applicable to the Bulk Electric System ("BES"), as defined by NERC in the "Reliability Standards for the Bulk Electric Systems of North America". This part of the analysis is not intended to be a transfer analysis to demonstrate the import/export capability of various areas, nor is it intended to serve as a means of obtaining AC verification of the transfer limits resulting from the linear transfer analyses.

For scenarios defined by stakeholders, these guidelines may generally apply to provide the foundation for future or varying assumptions. However, for scenarios provided by stakeholders, these guidelines may be altered as described in the Scenario Analysis section.

B. Power Flow Cases

Base cases described in Section III will be utilized for the AC Analysis.

C. Auxiliary Files

In order to perform the contingency analyses, the following auxiliary files will be developed and utilized by the working group:

Monitored file

Monitored elements for the AC analysis will be specified via a monitored element file. The monitored file specifies the criteria used to monitor branches, interfaces, flow gates and bus voltages. The monitored file filters for thermal, voltage magnitude, and voltage drop issues based on the specific planning criteria as determined by the Planning Authorities. For thermal monitoring, PSSE/MUST uses two sets of ratings for every monitored branch: model (Rate A) and contingency (Rate B). The groupings of buses, lines, zones or areas defined in the subsystem file may also be used to set the monitoring criteria in the monitored file. BES elements above 100 kV will be monitored.

Contingency File

The contingency description data file allows for two ways to apply contingencies:

1. A block structure that defines contingencies of transmission elements or generating units according to a user definition.

2. An automatic contingency selection of transmission elements or generating units of a group of single or double outage contingencies in a subsystem.

Contingency files in the format of breaker to breaker, bus to bus, or a combination will be utilized in the study.

The contingency files will represent the contingency outage(s) of all transmission elements 230 kV and above and all transformers with a low-side voltage rating of 110 kV or above.

D. Performance Criteria

The performance criterion for assessing thermal loading conditions is as follows (Consistent with TPL-001, TPL-002, TPL-003, and TPL-004):

- For normal (all facilities in-service) conditions, facilities loaded above 100% of the modeled “Rate A” MVA rating will be reported (NERC TPL-001).

- For a single contingency event (NERC TPL-002), facilities loaded above 100% of the modeled “Rate B” MVA rating will be reported.

- For multiple or extreme events as related to NERC TPL-003 and NERC TPL-004, selected contingencies will be analyzed. The selection of these events to be included in the analysis will be provided by each PA.

- For bus voltage criteria, the Planning Authorities shall provide the acceptable voltage range used within their respective study region for planning purposes. The acceptable voltage ranges vary among the study regions, and, therefore, a common voltage monitoring criterion cannot be used in the AC analysis study.

E. Planning Authority Sensitivities

In the course of the analysis, individual planning authorities may elect to perform their own individual sensitivities in order to account for items such as partial path transactions, CBM and/or TRM.

F. Assessing Results

The results format for the contingency analysis will include the reporting of thermal and voltage constraints for each category of contingency analyzed. Due to the very large number of contingencies being considered and the number of constraints that may occur, the working group may have to, at their discretion, process and filter the study output to obtain meaningful results. The working group might also consider certain constraints to be invalid due to the existence of special protection schemes not modeled in the monitored file. Similarly, duplicate constraints and constraints due to elements connected in series and those resulting from different categories of contingencies may be filtered by the working group to list the most limiting constraint.

VI. SCENARIO ANALYSIS [Place Holder]

This section will describe how methodologies for scenario analysis may differ from those methodologies of the previous sections. This section will be drafted following the completion of the roll-up analysis.

VII. REPORTING [Place Holder]

This section will describe how the roll-up of the base plans and how the scenario analysis results will be reported. NOTE: After a presentation of information/assumptions is made, this section will be finalized/updated to incorporate any feedback received. At that time, a new revision of the manual will be released.

A. Roll-Up

B. Scenario Analysis

APPENDICES

APPENDIX A – EIPC Participants

PARTICIPATING EIPC PLANNING AUTHORITIES

- **Alcoa Power Generating**
- **American Transmission Company**
- **Duke Energy Carolinas**
- **Electric Energy, Inc.**
- **Entergy ***
- **E.ON (Louisville/Kentucky Utilities)**
- **Florida Power & Light**
- **Georgia Transmission Corporation**
- **IESO (Ontario, Canada)**
- **International Transmission Company**
- **ISO-New England ***
- **JEA (Jacksonville, Florida)**
- **MAPPCOR ***
- **Midwest ISO ***
- **Municipal Electric Authority of Georgia**
- **New Brunswick System Operator**
- **New York ISO ***
- **PJM Interconnection ***
- **PowerSouth Energy Coop**
- **Progress Energy – Carolinas**
- **Progress Energy – Florida**
- **South Carolina Electric &Gas**
- **Santee Cooper**
- **Southern Company ***
- **Southwest Power Pool**
- **Tennessee Valley Authority ***

**** Also a Principal Investigator on the DOE proposal***

APPENDIX B - Duties

A. Chairperson

One of the SMLFWG members will serve as the study group chairperson whose term will be rotated among the EIPC participants every two years or as the scope of the associated projects dictate.

The chairperson's duties generally include the following:

1. Preparing the schedule of work activities (under direction of Technical Committee.
2. Ensuring the schedules are met.
3. Attending Technical Committee meetings.
4. Serving as a communications link between the working group and the Technical Committee.
5. Providing the Technical Committee reports of current work.
6. Setting the agenda for the working group meetings.
7. Coordinating periodic updates of the current roster of all participants and liaison representatives of the working group.
8. Maintaining a current list of the rotated study responsibilities for the working group.
9. Coordinating the periodic update of the SMLFWG Procedural Manual.

B. Vice-Chairperson

The principal functions of the vice chairman are to assist the chairman in the performance of the chairman's duties and to serve on behalf of the chairman during the chairman's absence. In general, the vice chairman is expected to succeed the chairman at the end of the chairman's term.

C. Coordinator Responsibilities

Area Coordinators

Area	2010-2012	Future Rotation	Future Rotation
FRCC	FRCC		
MRO	MAPPCOR*		
NPCC	NYISO*		
PJM	PJM*		
RFC (non-PJM)	MISO*		
SERC (non-PJM)	SOCO*		
SPP	SPP		

* Denotes PI in DOE Bid

EIPC Coordinator

Area	2010-2012	Future Rotation	Future Rotation
FRCC			
MRO			
NPCC			
PJM			
RFC (non-PJM)			
SERC (non-PJM)	TVA*		
SPP			

* Denotes PI in DOE Bid

Report Coordinator

Area	2010-2012	Future Rotation	Future Rotation
FRCC			
MRO			
NPCC	ISO New England*		
PJM			
RFC (non-PJM)			
SERC (non-PJM)			
SPP			

* Denotes PI in DOE Bid

APPENDIX C – Power Flow Modeling Guidelines

POWER FLOW MODELING GUIDELINES

See ERAG, MMWG Procedure Manual (V.5), Appendix V, Power Flow Modeling Guidelines