



Énergie NB Power

# NB Power Transmission Guide for Base Case Development



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## PREFACE

The North American Electric Reliability Corporation (NERC) Compliance Program Manual has been developed to describe New Brunswick Power Transmission Corporation's (NB Power Transmission) and New Brunswick Power Distribution and Customer Service Corporation's (NB Power Distribution) Internal Compliance Program in order to meet the fosters a culture of compliance amongst all levels of the organization.

This document includes information on Critical Infrastructure Protection (CIP) and non-CIP reliability standards that are applicable to both NB Power Transmission and NB Power Distribution.

## DOCUMENT APPROVAL

This document was produced and reviewed by the Transmission Planning Department. The master signed copy of this document is kept with the Document Control Coordinator.

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**APPROVED**

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## 1.0 INTRODUCTION

The function of the NB Power Transmission Planning Group is to ensure the co-ordinated development of a safe, reliable, efficient and economical transmission system for the benefit of the Province of New Brunswick.

The planning process involves the use of computer simulated power system studies to demonstrate that the power system meets certain planning criteria for the present and projected future uses of the system. Where the computer simulations indicate that the power system is not meeting the planning criteria, the transmission planning process involves developing cost effective transmission solutions for making the power system meet the planning criteria.

### 1.1 Purpose

The purpose of this document is to describe how the Transmission Planning Group prepares the models of the power system, referred to as “base cases”, for use in system studies.

### 1.2 Document Control

This document is intended as a working document to be reviewed at a minimum once a year by the Planning Group to ensure that it contains current information.

Control of this document will follow the document control requirements as described in Procedure SU6-A00050-0002. No controlled hardcopy versions of the document will be maintained. A controlled version of the document will be maintained on the SharePoint site under “Planning”. Any copies (printed or digital) made of this document are considered to be “uncontrolled documents”.

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## 2.0 COMPLIANCE REQUIREMENTS

### 2.1 Reliability Standards

The Transmission Planning Group will ensure compliance with the NERC Reliability Standards pertaining to system modelling. These standards are entitled MOD-010 and MOD-012. Information pertaining to these standards is available on the NERC website ([www.nerc.com](http://www.nerc.com)).

### 2.2 Northeast Power Coordinating Council (NPCC) Criteria

The NPCC Base Case Development (BCD) Working Group (SS-37) will develop a library of base case load flow and dynamic models each year for internal use by NPCC, its members, and NERC MMWG. The Planning Group will ensure that the NB Power System modelling data is submitted to NPCC in accordance to their requirements maintaining membership on the NPCC SS-37 Working Group. Information pertaining to the procedure for system modelling is available on the NPCC website ([www.npcc.org](http://www.npcc.org)) in the document entitled “SS37 Working Group on Base Case Development NPCC Task Force on System Studies Procedure Manual”.

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### 3.0 COMPUTER POWER SYSTEM MODELS

The model for power system studies should include models of all transmission lines, transformers, generators, reactive sources, and any other equipment that can affect power flow or voltage.

Models will be set up in accordance to the NPCC document C-29 entitled “Procedures for System Modeling: Data Requirements and Facility Ratings”. The following gives some information specific to how NB Power Transmission develops the base case models.

#### 3.1 Program Used

NB Power uses the Power System Simulator for Engineers (PSSE) program for doing load flow and dynamic planning studies. The version in use at the time is decided by the NPCC SS37 working group as well as the version compatibility of the base cases being used for the studies.

#### 3.2 Load Modelling

Loads are typically modelled at the high side bus of the substation (the substation transformer is not typically modelled).

For the purpose of constructing the winter peak base case, industrial and residential loads are modelled as per the most recent load forecast for the year that the base case will represent. The load forecast is supplied to Transmission Planning for each substation by Distribution and Customer Service while the aggregate system peak demand is supplied by the Load Forecaster. The residential load is then scaled such that the overall system load is equal to the projected peak for the year being modelled. The ratio of the total of the residential loads after scaling to before scaling yields the coincident load factor.

Load Flow planning studies are done using base cases with loads modelled as 100% constant MVA (P and Q) for both pre-contingency and post-contingency.

Dynamic planning studies are done using bases cases with the New Brunswick loads modelled as 100% constant current (0% constant impedance) for P and 100% constant impedance (0% constant current) for Q.

Power factors for residential are seasonally dependant (based on studies of actual load histories):

Light Load	= 0.964
Summer	= 0.971
Winter Light/Fall Peak/Spring Peak	= 0.976
Winter	= 0.984

Power factors used for industrial loads are based on actual load history and forecast needs.

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### 3.3 Branch Ratings

PSSE offers three MVA ratings (A, B and C) for each branch in the model. Branches are either transformers or transmission line sections. Rate A is set equal to the pre-contingency limit, Rate B is set to the post contingency limit and Rate C is not used. Winter base cases are populated with winter ratings and spring/summer/fall cases are populated with summer ratings.

Transformer branches are rated as Transformers in accordance with the Transmission Guide for Electrical Facility Ratings.

Transmission line sections are rated as Overhead Conductor in accordance with the Transmission Guide for Electrical Facility Ratings.

### 3.4 Generation Dispatch

The generation dispatch used in the base cases developed yearly for submission to NPCC through SS37 should be reviewed by generation marketing to ensure it is acceptable for the year and timeframe that the base case will represent.

### 3.5 Interconnection Flows

The interconnection flows used in the base cases developed yearly for submission to NPCC through SS37 should be reviewed by generation marketing to ensure that any imports or exports being modelled are acceptable for the year and timeframe that the base case will represent.



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#### 4.0 BASE CASE REVIEWS

On a yearly basis, NB Power Transmission submits base case models as per the NPCC SS37 Working Group schedule. These cases will also be used for NB Power Transmission studies.

The following is a general outline of how the cases should be reviewed prior to submission:

1. Update the system model as per any planned changes to the power system for the year and time frame that the base case will represent.
2. Review and update substations loads as per load forecast.
3. Scale residential loads to yield system load being modelled.
4. Review/update transformer and transmission line branch impedances as required.
5. Review/update transformer and transmission line branch ratings as required.
6. Review/update all transformer tap positions that are operated on a fixed tap (generator and tie transformers).
7. Check that all parallel transformers are on the same tap.
8. Review/update all reactive power sources for correct status as required
9. Review/update interconnection flows to desired levels.
10. Review/update generator dispatch to desired levels.
11. Review/update bus names as required
12. Review/update open points on the transmission system as required
13. Review/update any drawing files as required.
14. Review/update machine dynamics data as required.

Following completion of the base case development cycle, a report will be written which will document:

1. A summary of the changes to the model.
2. A list of the Area and Zones used for the NB model.
3. A list of the drawing files available for the cases.
4. The base cases which are available and a summary of the system conditions for each case (year/timeframe being modelled, load, residential load, industrial load, residential load coincidence factor, system losses, and power factor)

This report and the base cases will be issued to all who use PSSE within NB Power and the NBSO.

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## 5.0 REFERENCES

Document C-29 Procedures for System Modeling: Data Requirements and Facility Ratings, Northeast Power Coordinating Council.

New Brunswick Power Transmission, Guide for Electrical Facility Ratings. September 30, 2012

Standard *MOD-010 Steady-State Data for Transmission System Modeling and Simulation*, Effective Date: April 1, 2005

Standard *MOD-012 Dynamics Data for Transmission System Modeling and Simulation*, Effective Date: April 1, 2005

