Document A-4

NORTHEAST POWER COORDINATING COUNCIL

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Maintenance Criteria for Bulk Power System Protection

Adopted by the Members of the Northeast Power Coordinating Council April 22, 1969, based on recommendations by the System Design Coordinating Committee, in accordance with paragraph IV, subheading (a), of NPCC's Memorandum of Agreement dated January 19, 1966 as amended to date.

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Note:

Terms in bold typeface are defined in the *NPCC Glossary of Terms* (Document A-7)

1.0 Introduction

This document establishes the minimum maintenance objectives and recommends maintenance practices for **protection** of the NPCC **bulk power system**, including Type I **special protection systems** and **protection** required for the NPCC Automatic Underfrequency Load Shedding Program. Automatic underfrequency **load shedding protection systems** and generator underfrequency tripping **relays** are not generally located at **bulk power system** stations; however, they have a direct effect on the operation of the **bulk power system** during major **emergencies**, and as such they are subject to this Criteria.

This Criteria is not intended to be a maintenance procedure, but rather a guide for member systems in developing their maintenance procedures. Adherence to this Criteria must be reported in a manner and form designated by the Compliance Monitoring and Assessment Subcommittee.

2.0 General Maintenance Criteria

Minimum periodic maintenance of each **protection group** shall consist of verifying that the **protection group** is capable of performing its intended **protection** function. This includes:

- making visual inspections,
- verifying inputs and outputs,
- confirming that the intended version of software is installed (microprocessor-based relays),
- verifying operating characteristics,
- verifying the integrity of current and voltage transformers and associated circuitry,
- verifying the proper performance of communications systems,
- verifying proper performance of auxiliary devices,
- performing trip or other operational tests required to assure satisfactory operation of the protective equipment as a system*.

All of the above shall be performed on a maintenance interval not exceeding that specified in Table 1 for **bulk power system protection groups**.

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* To assure satisfactory operation of the protective equipment as a system, test procedures and test facilities must ensure that related tests properly overlap.

3.0 Additional Maintenance

Additional periodic maintenance is recommended on the following **protection** equipment:

On continuously monitored analog **teleprotection** channels, verify signal adequacy every twelve months.

On non-monitored analog **teleprotection** channels, verify signal adequacy every month.

On digital **teleprotection** systems, which are inherently monitored, verify local function every two years.

On batteries and chargers, verify proper operation and general condition every month.

On circuit breakers, verify ability to trip via each trip coil every two years, with due regard to critical trip paths between sensing **relays** and the breaker trip coils.

It is the responsibility of each member system to evaluate its own particular circumstances and determine if any additional maintenance should be performed on its system. More extensive maintenance may be required:

- during the initial break-in period,
- where **protection systems** are exposed to abnormal conditions such as temperature extremes, vibration, corrosive atmosphere, etc.,
- when the operating condition of **protection system** control wiring is suspect.

4.0 Underfrequency Load Shedding and Generator Tripping

Trip testing for **protection** required by the NPCC Automatic Underfrequency Load Shedding Program need not be performed more frequently than the trip test for other **protection** on the same breaker. Because of the distributed nature of this **load shedding protection**, random failures to trip do not compromise the objectives of the NPCC Automatic Underfrequency Load Shedding Program.

The successful operation of the NPCC Automatic Load Shedding Program requires the proper coordination of generator underfrequency tripping, as described in the NPCC Emergency Operation Criteria, Document A-3. For generators rated 20 MW and above, the correct calibration of generator underfrequency tripping **relays** shall be verified at an interval not exceeding that specified in Table 1.

TABLE 1
MAINTENANCE INTERVALS FOR PROTECTION GROUPS

	Electromechanical **Protection Group** Design	Solid-State **Protection Group** Design	Microprocessor-Based **Protection Group** Design[1]
Transmission Line **Protection Groups**	**2 years**	**2 years**	**6 years**
Transformer, Bus, Shunt Reactor and Capacitor **Protection Groups**	**4 years**	**4 years**	**6 years**
Protection required for the NPCC Automatic Underfrequency Load Shedding Program*	**2 years**	**2 years**	**6 years**
Generator Underfrequency Tripping Relays*	**2 years**	**2 years**	**6 years**
All Other **Protection Groups**	**2 years**	**2 years**	**6 years**

*Calibration verification only - see Section 4.0

Note:

1. Microprocessor-based **protection group** design where the principal fault-sensing and logic components include extensive self monitoring or self checking. This must include checking or monitoring of:

   - power supplies
   - ac voltage and current inputs for reasonableness
   - calibration and functionality of analog data acquisition and conversion
   - integrity of programs (e.g., via checksums)
   - integrity of settings
   - execution of programs (e.g., via watchdog timers)

Lead Task Force: Task Force on System Protection

Review frequency: 3 years

References: *NPCC Glossary of Terms* (Document A-7)
NPCC Guide for Maintenance of Microprocessor-based Protection Relays (Document B-23)