

- 1 **Q. Provide an electronic copy of Newfoundland Power’s Restoration Manual referred**
2 **to in PUB-NP-028.**
3
4 A. A copy of Newfoundland Power’s current System Restoration Manual is provided in
5 Attachment A.

**Newfoundland Power's System Restoration Manual
June 2014**

System Restoration Manual

June 2014

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1.0 Introduction

In Newfoundland Power's service territory there are a number of potential events that can have a significant impact on the ability of the electricity system to provide service to customers. The vast majority of damage incurred on the electricity system is caused by severe weather events. The magnitude and duration of the impact on the electricity system is a function of the severity of the weather event and the particular section(s) of the electricity system that is affected and extent of damages incurred.

2.0 Proactive Monitoring

Events Affecting System Reliability

Events affecting system reliability and the performance of the electricity system fall into the following categories:

- (i) Freezing rain
- (ii) Blizzard/ winter storm
- (iii) High winds
- (iv) Lightning
- (v) Flooding or coastal storm surges
- (vi) Hurricanes or tropical storms
- (vii) Forest fires impacting transmission line ROW
- (viii) Erosion or landslides
- (ix) Vandalism, theft or sabotage
- (x) Electrical equipment failure

Monitoring and Internal Notifications Protocol

The vast majority of the events identified are weather or environment related. Typically warning is available prior to the event via weather forecasting services and provincial fire and emergency services contacts. The System Control Centre ("SCC") has the responsibility to continually monitor and assess the potential impacts of weather forecast and environmental events. Should a pending event have a strong probability of impacting our electrical system the Superintendent or Supervisor of System Control will contact the Manager Operations, Vice President Customer Operations & Engineering and the Regional Managers, identifying the risk and the probable areas of the Company that may be affected.

For events with high probability of significant damage, the Fortis Hurricane Warning System will also be updated to make other Fortis utilities aware their assistance may be required. The SCC will continue to provide updates on pending weather and environmental events until the danger has passed or Newfoundland Power has entered into active storm and major outage event restoration mode. Internal notification of non-weather related outage events shall follow the normal outage management communications protocol.

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Monitoring Resources

The following resources and websites are used by the SCC operators and the Superintendent and Supervisor System Control for monitoring of severe weather forecasts and major environmental events:

- http://weather.gc.ca/forecast/canada/index_e.html?id=NL /Environment Canada
- <http://www.nhc.noaa.gov/>US National Hurricane Center
- <http://www.ec.gc.ca/ouragans-hurricanes/>Canadian Hurricane Centre

Email warnings for significant storms are also received directly from the Warning Preparedness Meteorologist within Environment Canada and from the Provincial Aerospace VOCM meteorologist.

Communication may also be received from Fire and Emergency Services Newfoundland (“FES”). In addition, this agency coordinates conference calls with all emergency service agencies and municipalities in anticipation of significant weather events. The Superintendent System Control or designate will participate in these conference calls.

Hydro subscribes to a real time lightning detection service known as LTRAX. As lightning is detected that may affect the electrical power grid, Hydro’s Energy Control Centre contacts the SCC. Regular updates are provided as lightning storms track across areas of the province.

3.0 Storm and Major System Event Preparations

Days Prior to Event

When a severe weather event is forecast, adjustments to routine operations are made to ensure all Areas of the Company are prepared to respond quickly should the system sustain significant damage and customer outages occur. Preparations should start two days prior to the forecasted severe weather event to place operations staff on alert, to review all work in progress and temporary system conditions to determine the impact of the approaching storm. When practical, lines and equipment should be returned to service and temporary system configurations returned to normal to ensure the integrity and readiness of the electricity system. The status of the workforce should be reviewed and locations where staff may be redeployed should be discussed in advance. If necessary, employees should be recalled from vacation, and non-operations employees who might be called upon to help with logistical assignments and other support tasks should be put on notice.

Contact should be made with the Company’s key contractors (pole setting, line construction and vegetation management) to advise them of the forecasted weather or environmental event and confirm their availability of resources and readiness to respond. If major system damage is expected to occur, other Fortis companies should be put on notice of the possible need for their assistance and asked to assess their workforce and be ready to deploy resources.

On the day prior to the forecasted severe weather event, any switching or work started to ensure the security of the electricity system should be completed. Also, any redeployment of the workforce to locations where the storm damage is most likely to occur should take place the day

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prior to the event. Consideration should be given to packing up, and making ready for transport, Newfoundland Power's mobile generators and portable substations and whether any of this equipment should be moved in advance of the storm to arrive while road conditions permit.

All vehicles should be fuelled up, backup generators placed on line and tested, and fuel levels checked. Inventories of materials are to be reviewed and prepared for distribution. Key customers, municipal leaders and FES personnel should be contacted to ensure they are aware of the upcoming event and are making necessary preparations.

Day of Event

Depending on when the storm is expected to hit employees should be identified who will start work prior to their regular start time. On the day of the event consideration should be given to have extra staff scheduled to work at the SCC and consideration given to having senior engineering personnel at the SCC for operational support and system restoration decision making. The Customer Contact Centre ("CCC") should consider the need to schedule additional staff at the CCC and make preparations for establishing the Communications Hub to support internal and external outage communication information. Also, consider whether Information Services staff should be deployed to the SCC, CCC and Regional Operations facilities to be ready to provide on-site technical support for computer systems, operational applications and customer communications technology.

Storm Preparation Checklist

The Company maintains an online checklist for storm preparation. Download a current version of the checklist from Webster.

4.0 Initial Event Response

Identification of System Faults

In major outage situations, it is critical that there be clear communication on the status of all transmission and distribution lines and substation equipment and that regular updates be provided as status changes. Through normal protocol, the SCC operator shall provide notification to each Area as faults are encountered on transmission and distribution lines or substations. In addition Informer, Whiteboard and Outage Management will be updated. The Superintendent of System Control or designate will be responsible to prepare and communicate a summary of the system status by operating Area or Region, and shall communicate this to Operations and Regional Managers, Corporate Communications staff and the Vice President Customer Operations & Engineering. This summary will be updated hourly during a major storm event, and as long as the system continues to incur damage.

In the case of significant outages to the Island Interconnected System, the SCC is responsible to coordinate with Hydro as may be required to operate and switch the electrical system and restore the power grid. A number of power system restoration plans have been prepared for various

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system outage scenarios. The most current versions are available on Webster for download and are listed here:

SRP-003	Restoration Plan Trinity North
SRP-004	Restoration Plan Burin Peninsula
SRP-005	Restoration Plan Bonavista North
SRP-006	Restoration Plan Bonavista Peninsula
SRP-007	Restoration Plan East Coast

High Level Damage Assessment

Within each operating Area, the Superintendent of Area Operations or Regional Engineering or designate will be responsible to initiate a damage assessment for all faulted transmission lines, distribution lines and substation equipment. Where practical, patrols should be completed via helicopter to speed assessments and restoration times. If air patrol cannot be completed due to weather conditions, availability, darkness or terrain, a ground patrol shall be initiated as soon as conditions permit.

The following format can be used for the assessment of damage on transmission and distribution plant.

Location Information:

- (i) Line or feeder number,
- (ii) Trunk or tap, structure number,
- (iii) Civic reference or GPS coordinates,
- (iv) Structure type,
- (v) Pole height and class

Damage:

- (i) Poles, broken off or leaning
- (ii) Broken crossarms,
- (iii) Broken cross braces,
- (iv) Broken insulators,
- (v) Broken line ties,
- (vi) Conductor, spans or kms broken, damaged or on the ground
- (vii) Transformers, faulted, damaged or on the ground
- (viii) Pulled anchors, or guys broken
- (ix) Structures or downed wires impeding roadway and/or a public hazard

The Superintendent Area Operations or Regional Engineering shall provide regular damage assessment updates to the Regional Manager and the Superintendent System Control.

Mitigation of Additional Damage Following an Event

Following an event and damage assessment, there may be sites identified where immediate action is required to prevent additional damage to the electricity system. Examples of this are failed structures that have placed additional stress on remaining plant that has high potential to cause cascading failure of adjacent structures, or areas of downed conductor near vehicular

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traffic that could damage the conductors. Every effort should be made by either direct intervention or through local authorities to limit the potential for additional damages.

Protection of the Public

The primary objective during power system damage assessments and restoration efforts is the protection of the public from the electrical and physical hazards presented by downed electrical plant and the restoration of electricity supply in an orderly, efficient and safe manner. Corporate Communications and Customer Relations shall communicate regularly with customers on the general hazards of downed power lines, as well as any specific hazards presented by downed plant. Direct notification through the media, including social media such as Twitter and Facebook, will be used. In addition, direct communication with affected customers or Municipal and Provincial government authorities in affected areas may also be required.

5.0 Categorizing the Event

The damage assessment will be used to determine restoration team requirements, location of restoration centers, contractor, labour, material and equipment requirements. In order to categorize these, the 3 levels of emergency are defined as follows:

- Level 1: A local area outage where damage is confined to a smaller geographic area and the restoration of electricity supply can be carried out by local crews and requires no support from other Areas or Regions. Potential impact on the health and safety of the public and the environment is minimal.

- Level 2: An event that requires external support from other Areas or Regions but the impact of the event is limited to Newfoundland Power infrastructure. Potential impact on the health and safety of the public and the environment is moderate. This event will require communication with Newfoundland Power senior management, the Public Utilities Board, the media and the general public.

- Level 3: An emergency whose impact and required response extends beyond Newfoundland Power, requiring significant external resources for restoration effort from government and other utilities. Potential impact on the health and safety of the public and the environment is significant. Protective measures may be required to protect the health and safety of the general public. This event will require communication with senior management, the Public Utilities Board, media and general public. Once assessments indicate that restoration efforts will extend for multiple days, out of province resources and mobile substations and generation will typically be called upon.

Table 1 provides guidance to the classification of the emergency levels.

Table 1
Emergency Level Classification

Emergency Classification	Initiating Conditions	Response Coordination	Restoration Center Locations
Level 1	2,000 customers or less without power and restoration effort 12 hours or less. Repairs typically completed by local crews.	Superintendent of Area Operations	Area Office
Level 2	Between 2,000 and 10,000 customers without power and restoration effort expected to exceed 24 hours. Restoration effort will typically require resources from other Areas and possibly NL Hydro.	Regional Manager	Designated Area / Regional Emergency Operations Centre established
Level 3	Greater than 10,000 customers without power and restoration effort expected to exceed 72 hours. Restoration effort will typically require significant resources from outside Newfoundland Power.	Vice President Customer Operations & Engineering	Restoration Center may be established at the SCC for overall coordination and restoration response and in Regional Operations offices depending on scope of the response.

6.0 Response Planning Phase

Estimation of Restoration Effort

Following the initial inspection, the Superintendent of Area Operations in consultation with engineering and operations staff will review damaged lines and prepare plans for restoration. Specifically:

- (i) Detailed description of the damage;
- (ii) Time required to complete repairs;
- (iii) Materials required;
- (iv) Salvageable materials;
- (v) The number of crews required;
- (vi) Specialized equipment requirements;
- (vii) Other resources required, Engineering, Substations, Generation.

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All damage reports for a specific operating region shall be reviewed by the Regional Manager and updates provided to the SCC.

Determining Priorities

When there are multiple damaged lines, priorities will be established for the sequence of repairs. Generally restoration priorities are determined based on achieving the greatest number of customers restored with the least amount of restoration effort in the shortest amount of time. Restoration priorities must also consider the following:

- (i) Importance of the line in the overall restoration process or stability of the system;
- (ii) Priority customers such as hospitals, nursing and seniors homes, fire and police, airports, community centers, emergency shelters, pharmacies, groceries, fuel suppliers, water supply and sewage stations;
- (iii) Availability of crews and/or materials;
- (iv) Restoration site access issues.

Critical Load and Customers

An up to date list of priority feeders and critical customers shall be maintained by each Operating Area.

Establish Restoration Operation Centre

While the emergency level and scope will determine the requirements for establishing emergency operations centres, as a rule the centre or centres shall be located at the closest Area office in consideration of logistics for the anticipated size of the restoration team (both internal employees and contractors). In addition, in the case of Level 3 outages, the boardroom of the SCC can be utilized as a base for overall planning and tracking of the restoration process. This location is especially suitable for loss of supply system events and restoration of generation and transmission events. The SCC boardroom is equipped with SCADA system access, access to all Company communications systems and has redundant supply of power.

7.0 Communication with Customers

One of the most critical aspects of any restoration process is communicating with customers that are affected by the outage in a timely manner. Customers need to understand the cause, what we are doing to respond and when they can expect to have their power restored. Depending on the outage level, the delivery method for notifying customers will vary.

For a Level 1 outage, ensuring that the telephone-based Informer outage messaging system, and the internal “whiteboard” outage information system, accurately describe the location and cause, and provide realistic restoration times, is critical for this communication. Note that Informer outage messages are also linked to Newfoundland Power’s website where an additional level of outage detail can be provided over that afforded by the telephone message alone. Supplementing this, customers can make contact with a live agent (CAR, SCC Operator) should they have or require more detailed information on their outage. Area customer service staff should also provide direct communication to municipalities and large commercial customers within the affected area. As a general rule, outage messages should be updated every 1 to 2 hours for Level 1 outage events.

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For Level 2 and 3 outages, which involve significantly more customers with restoration times that can extend to days rather than hours, Newfoundland Power's Communications Hub will become operational. The role of the Communication Hub during the Company's restoration effort is to ensure we update customers with accurate, consistent and timely communication using the following suite of outage communication tools:

- (i) Informer – Newfoundland Power Website updates and automated recorded phone messages;
- (ii) Newfoundland Power Website – Outage Maps and Outage Listing , Storm Mode;
- (iii) Outage Blog – updates contact center agents to assist in processing calls;
- (iv) Social Media – Twitter.

Note that for Level 2 and 3 outage events, Corporate Communications take the lead role for communications with Government, Fire and Emergency Services and the media. Information provided to these groups is typically reviewed prior to release by the appropriate Manager, the Vice President Engineering and Customer Operations, and the Manager or Director responsible for Corporate Communications.

In releasing information, the following elements should be considered.

- (i) Public safety messaging;
- (ii) Description of the system failure or event and what caused it;
- (iii) Location affected by the failure or event;
- (iv) Proposed plan for restoration;
- (v) Estimated time for restoration;
- (vi) How can customers help (conserve energy, reduce cold load pickup, stay at home, stay off roads);
- (vii) Location of shelters, where power is on, where essential supplies are available.

Once public communications has started, regular updates should be provided at set intervals until power is restored. For Level 2 events, outage updates should generally be provided every 2 to 4 hours, and for Level 3 events, every 4 to 6 hours. Status of our efforts in relation to the plan and updates on any significant changes should be covered. In addition to traditional media releases, posting via social networking (Twitter) and the corporate website should mirror information released through the traditional media. Social media should also be monitored by Corporate Communications to gauge the effectiveness of our information release.

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8.0 Resourcing the Restoration

Internal Workforce

For a Level 1 response, it is assumed that the resources required will not extend beyond the normal staffing of an operating Area. In this case, the Area Superintendent shall select the necessary workforce based on the scope of the restoration work, including supervision and technical support. They will also ensure that there is adequate staffing to maintain customer contacts throughout the outage.

In the case of Level 2 and 3 outages, the Regional Manager(s) shall ensure that based on the detailed damage assessment and the targeted restoration times there are an adequate number of internal resources to complete the following functions:

- (i) Engineering / Technical;
- (ii) PLT and maintenance trades;
- (iii) Line patrol;
- (iv) Crew and contractor management;
- (v) Vehicle maintenance and support;
- (vi) Public, media and government coordination;
- (vii) Field support clerical;
- (viii) Customer contact.

Contractor and External Resources

- (i) Pole installation
Standard contracts for the installation of poles shall have provision for emergency response and contain performance criteria regarding lead times. Contracts will also have provision for providing emergency response outside their normal operating Area including terms of engagement. This will be required in a Level 2 or 3 response.
- (ii) Transmission line construction
Newfoundland Power has and maintains Standing Agreements with approved contractors for providing transmission line construction services. These contracts contain provision for emergency response.
- (iii) Distribution line construction
Newfoundland Power has and maintains Standing Agreements with approved contractors for providing distribution line construction services. These contracts contain provision for engagement under emergency response.
- (iv) Brush and tree removal
Newfoundland Power has and maintains Standing Agreements with approved contractors for providing brush and tree removal. These contracts contain provision for engagement under emergency response.

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- (v) **Helicopter services**
Newfoundland Power maintains service contracts for helicopter services which outline the terms of engagement under emergency response scenarios.
- (vi) **Fuel supply**
Newfoundland Power has supply contracts for the purchase of vehicle and generation fuels that incorporate specific provisions for the supply of fuel under extended power outage conditions. Contracts include terms that allow Newfoundland Power to provide electricity to the supplier's fuel terminal facilities and be provided with fuel on a priority basis for Company vehicles and generation. In addition, where practical, the delivery of diesel fuel to the heavy fleet vehicles at our operation centers is provided for.
- (vii) **Accommodations and Food**
By their nature Level 2 and 3 responses will require the traveling of crews from other operation centres within the Company and in the case of Level 3 response from other utilities and organizations. For Level 2 and 3 responses a team of employees shall coordinate the overall process of arranging required accommodations within the affected area. This same group will ensure breakfast and dinner and worksite lunch is provided. Each traveling crew will be informed of the arrangements provided for them while they are en-route to the affected area.

The Regional Manager for the affected Area shall determine if Clause 14.12 "Emergency Situations" will be invoked in the Craft and Clerical collective agreements, thus suspending rights under clause 14.08 "Travel Allowance" and 14.09 "Commuting Option", and shall communicate this to workers.

Materials

- (i) **Storm contingency inventory:**
 - a) Newfoundland Power's inventory levels for transmission and distribution material contains provision for a Level 2 event. Inventory items that are included in this contingency will be identified by the Newfoundland Power Materials Management Section and reviewed on an annual basis to ensure standards changes are incorporated into the contingencies.
 - b) Contingency inventory items will be held either directly within Newfoundland Power warehouses or be stocked within the warehouses of approved suppliers. These external suppliers have provision for delivery of these contingency items to Newfoundland Power's warehouses on a 24 hour, 365 day a year basis.
 - c) Poles, anchors and associated hardware inventories are held directly by Newfoundland Power pole installation contractors at their facilities. These inventories are carried either on consignment or purchased directly from suppliers selected by Newfoundland Power. Newfoundland Power has established minimum inventory quantities to be maintained by contractors with provision for

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emergency contingency. For consignment items, the supplier will provide monthly reports of inventory in contractors' yards and other on-island inventory.

(ii) Needs assessment:

As soon as damage assessments have been completed, the Superintendent of Area Operations for the affected area shall provide the Materials Management Section with a breakdown of required materials for each major section of damaged plant. In addition, they will provide an overall assessment of the material requirements for individual service calls within their Area.

(iii) Contingency for material shortfalls:

Newfoundland Power-approved suppliers for storm contingency items shall provide information on normal manufacturer inventory levels, production lead times and a listing of other Canadian utilities that use the same approved product.

(iv) Worksite delivery:

Where practical the Materials Management Section should provide for worksite delivery of bulk materials on larger restoration projects. Depending on the nature of the restoration, this may involve placing the required components adjacent to structures or establishment of remote stores facilities to distribute materials.

Equipment

Newfoundland Power has 4 portable substations of various voltage configurations and power ratings as well as 2 portable generators. One portable generator is a 2.5 MW portable diesel on a single trailer that connects at 12.5kV or 25kV 3-phase voltages, and the other is a 6 MW portable gas turbine in a 2 trailer configuration that interconnects at 12.5kV or 25kV 3-phase voltages.

Also consider availability of smaller mobile generation rental packages that may be useful in providing power to a priority building in a community, such as a community hall or designated warming center.

9.0 Execution of the Plan

Securing and dismantling damaged equipment

- (i) Damaged equipment shall be dismantled, removed and either reclaimed as salvage or disposed of in an environmentally-responsible manner.
- (ii) All damaged equipment that may present a public safety hazard shall be rendered to a safe condition as soon as possible following an event. This may require grounding of downed wires and removal of hanging equipment, particularly in urban areas.
- (iii) Public warnings should be provided if specific hazards exist and cannot be remedied in a reasonable timeframe.
- (iv) If practical, the specific location should be barricaded or warning signs posted if there will be a significant delay before the equipment can be placed in a safe status.

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Design requirements for rebuilds

If the nature of the restoration requires engineering resources beyond the capability of the affected Area (e.g. transmission rebuild, installation of a portable substation or portable generator), the Regional Manager in conjunction with the Manager Engineering or Manager Operations will assign a design team and equipment installation team to be dedicated to the restoration process.

ROW and environmental issues

The corporate Environment and Lands sections shall be consulted to help with coordinating and resolving any right-of-way and environment issues associated with repairs, access to effect repairs, permissions, permits and any other conflict that may occur in redesign of lines.

Material Requirements

The Materials Management Section shall coordinate the supply of material requirements to support the restoration process. This may include the release of emergency stock, procurement of additional requirements from suppliers or other utilities, and the salvaging of damaged lines or equipment.

Resources, contractors, vehicles and equipment

Regional Managers shall insure that the required resources, contractors, vehicles and equipment are mobilized and that adequate accommodation provision for meals is put in place.

Field and project safety

Working 16-hour days under adverse conditions with a multitude of external hazards will present challenges to providing worker safety. It is critical that safe work practices are maintained throughout the restoration process. Maintaining the safety of the workers is the first priority in any restoration.

A daily safety briefing should be held with all workers to review hazards specific to the restoration process, worker concerns, and any near miss incidents that can be learned from, to ensure all job safety planning practices are maintained and tailboards completed. These meeting will also serve as opportunities to discuss overall progress and reinforce support for their efforts.

Managers, Superintendents and other supervisors, in addition to representation of the Safety section, shall have a presence in the field to observe work and reinforce safety.

Worker Protection – Switching Orders, Work Permits and Protection Guarantees

In the case of Level 2 and 3 storm response, there will be heightened requirements for formal worker protection and emergency contacts with customers and outside agencies. The Superintendent of System Control shall insure that the SCC shifts are adequately staffed to effectively manage this additional workload. Consideration shall be given to the need to establish a local Area control authority as provided by the Worker Protection Code.

Inspection prior to being energized

Prior to energizing reconstructed lines over 750V the line shall be inspected to ensure there are no unrecognized hazards and that all grounds have been removed.

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Worksite cleanup and property issues

Should the restoration process involve damage to private property in accessing our plant, this damage will be documented as soon as possible. If possible, a photo of the damaged property should be filed as well.

If there are sections of plant that are replaced as part of the restoration process and damaged plant remains in the field these locations should be recorded by Area staff. These locations should be addressed as soon as possible following the restoration effort.

The Superintendent of Operations for the affected Area shall be responsible for ensuring damaged property or plant to be removed is recorded.

Cold Load Pickup and Power Rotation

Newfoundland Power has System Restoration Procedures to guide operations personnel in managing cold load pickup when restoring electricity supply to feeders, substation transformers and transmission lines that have been out of service for many hours in cases where higher than normal peak loads can be expected during power restoration activities. Procedures have been developed to guide operations personnel in cold load pickup and feeder rotation activities as may become necessary such as during system generation shortage events. The most current versions of the procedures are available on Webster for download and are listed here:

SRP-001	Rotating Power Outages
SRP-002	Cold Load Pickup

10.0 Post Event Review

A post event review shall be completed as soon as practical after the restoration is complete. It shall review the event and identify improvements for responding to future events. The review shall include.

- (i) Cost of repairs;
- (ii) Description of damage;
- (iii) Probable cause of failures;
- (iv) Completion of outage reports;
- (v) Identify opportunities for improvement;
- (vi) Assess inventory levels and replenishment of material stocks ;
- (vii) Assess effectiveness of how the restoration was executed and how it can be improved.

11.0 Management Review

On an annual basis, the System Restoration Manual shall be reviewed to ensure its effectiveness as a guide for restoring service to customers. In particular, the review shall focus on the safety of employees, the public, the Company's assets, and the environment, and the continued ability of the Company to respond effectively to a significant outage event or major damage to the electrical system.

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This review will revise emergency restoration standards, requirements, policies and objectives and program documentation. The review should consider the following:

- (i) Findings from post event reviews;
- (ii) Findings from drills and exercises;
- (iii) Findings from past reviews;
- (iv) Changes in Company structure and employees;
- (v) Updates to emergency contact data;
- (vi) Advances in technology;
- (vii) New equipment;
- (viii) Changes in the regulatory environment;
- (ix) Changes in the expectation of stakeholders.