



November 8, 2019

Island Regulatory & Appeals Commission
PO Box 577
Charlottetown PE C1A 7L1

Dear Commissioners:

Review and Report on Post Tropical Storm Dorian and Restoration

Please find enclosed 6 copies of Maritime Electric's Review and Report on the Post Tropical Storm Dorian and Restoration.

If you have any questions, please do not hesitate to contact the undersigned at 902-629-3641.

Yours truly,

MARITIME ELECTRIC



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Manager, Regulatory & Financial Planning

GCC44
Enclosure

**All our energy.
All the time.**



**Post Tropical Storm Dorian
Post-Mortem Report**

November 8, 2019

EXECUTIVE OVERVIEW

Late in the afternoon on Saturday, September 7, 2019, Post Tropical Storm Dorian made landfall on PEI and impacted Maritime Electric customers Island-wide. The storm lasted approximately 15 hours with peak winds exceeding 100 km/h and rainfall amounts of up to 135 mm.

Post-storm restoration efforts started at daybreak on Sunday, September 8th for the approximately 65,000 customers without power. At that time, transmission serving the eastern, western and much of central PEI was out of service. Within two days power was restored to approximately 45,000 customers. Restoration efforts continued until the end of the day, Sunday, September 15th when the last of the outage jobs had been addressed. This was the largest response to a storm in Maritime Electric's history utilizing 62 line crews, 18 vegetation management crews as well as other supporting resources such as damage assessors, field supervisors, and traffic control personnel at the height of the restoration effort.

The transmission system was affected by tree contacts, but to a great degree, redundancies in the system allowed for reconfiguration to reduce the impact on customer outages. The transmission lines associated with wind farms were also impacted by tree contacts. Most of the wind farms were back in service within three days, however, one took six days to restore to service due to the extensive number of trees on the line itself and across the access routes to the line.

The resulting damage, caused mainly by fallen trees, required the replacement of 97 distribution poles, 93 transformers and related conductor.

Customer Service responded to over 32,000 customer interactions in the Contact Centre. These included phone calls and emails as well as social media interactions via Facebook, Messenger and Twitter. A high level of internal and external communications throughout the restoration contributed to a safe work environment with no incidents or near-miss events.

Pre-planning by all departments played a key role in the success of the storm response. The Company was well prepared and implemented best practices learned from previous weather events.

The estimated cost of restoration is approximately \$3.5 million. The System Average Interruption Index (“SAIDI”) figures show the average outage for customers as a result of the storm was 35.82 hours.

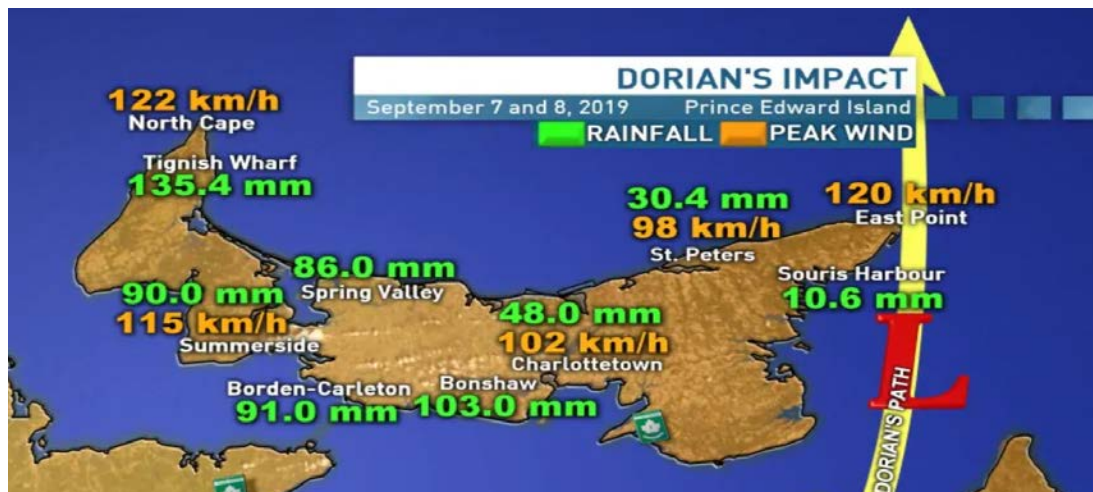
BACKGROUND

The possibility of post-tropical storm Dorian to pass through the Maritimes as a significant weather event gained certainty approximately three days before its arrival and Maritime Electric began internal notifications and storm response preparations at that time.

On Saturday, September 7th the leading edge of the storm arrived in the region and the intensity of the storm increased as the day progressed. By early evening, strong winds and heavy rain were impacting the entire Province. This continued throughout the night and the strongest storm conditions occurred in the early morning hours of Sunday, September 8th.

Post Tropical Storm Dorian was not a hurricane when it passed through PEI but it was more damaging than 2003's Hurricane Juan. In Dorian's case, the storm had been downgraded to a post tropical storm by the time it reached the Island but the storm picked up energy as it combined with another weather system moving in from the west. The result was destructive hurricane strength winds combined with heavy rainfall. All areas of the Island experienced winds exceeding 100 km/h and the western end of the Island received a significant amount of rainfall. Figure 1 is a map originally broadcast by CBC which shows the peak storm conditions experienced during the storm and cumulative precipitation across the Island.

Figure 1: Peak and Cumulative Impacts of Post Tropical Storm Dorian



The heavy rains created wet conditions softening the ground. The combination of high winds and soft ground caused trees to move and/or uproot creating numerous contacts with energized lines. A significant number of trees fell to the ground, breaking conductor and poles and causing transformers to fall to the ground. By daylight on the morning of Sunday, September 8th, the full impact of this storm was evident with hundreds of fallen trees on the ground and widespread power outages throughout the Province.

STORM PREPARATIONS

Several days before the storm arrived, planning for a storm response began. The various departments confirmed key positions, the availability of workers, contractor resources and supplies. Energy Control reviewed the system for abnormal conditions, monitored the storm track and provided updates. Customer Service and Corporate Communications confirmed on-call storm supervisors, staffing levels and arranged pre-storm messages to inform customers of the impending weather forecast and provide advice on what they could do to prepare. The Company anticipated the need for off-Island contractor resources, checked the availability of accommodations and preparing contractor safety orientations. Pre-storm meetings were held on the morning of Friday, September 6th and at noon on Saturday, September 7th to review preparations for an effective storm response.

SYSTEM IMPACTS AND RESTORATION

On Saturday, September 7th, the first distribution outages occurred around 14:00 hours and transmission outages started at 17:00 hours. At 08:30 hours on the morning of Sunday, September 8th after the peak of the storm had passed, there were approximately 65,000 customers without power. As shown in Figure 2 on page 5, transmission lines Y-104, T-10, T-4, T-1, T-8, T-5 and T-21 were out of service at this time.

Damage Assessment

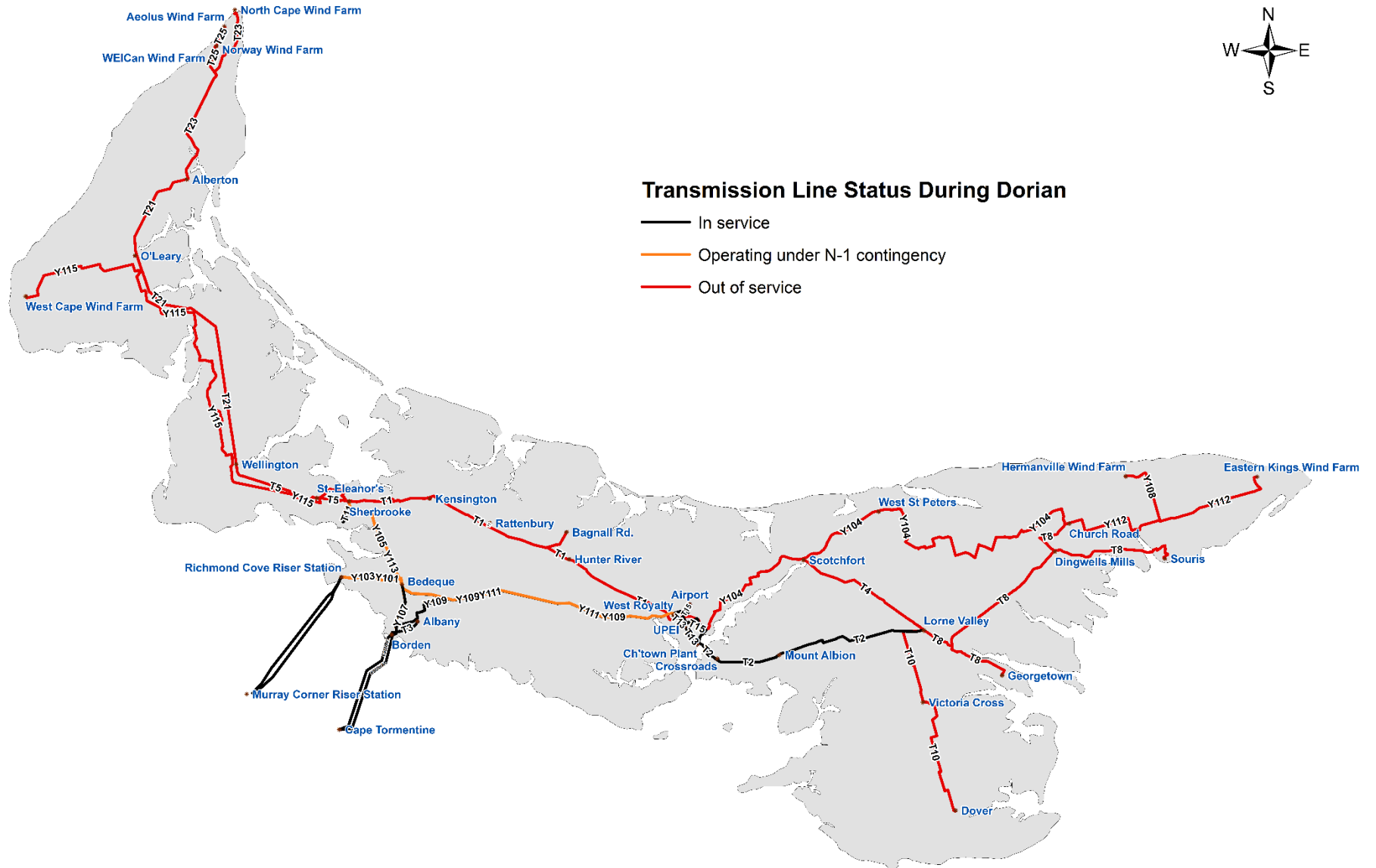
Maritime Electric crews and damage assessors were promptly dispatched on the morning of Sunday, September 8th to evaluate the damage to the transmission and distribution systems. A helicopter inspection of the transmission system was performed across the Island as soon as the weather permitted and it was safe to do so. A significant number of trees on the affected transmission lines were reported Island wide. The distribution system across the entire Island was also impacted by the trees which resulted in the failure of 97 distribution poles, 93 transformers

and related conductor. Many customers also experienced damage to their individual electrical services.

Core Transmission Restoration

Restoration of the transmission system was a priority and completed within the first three days. The helicopter inspection of the transmission lines expedited the restoration. Transmission lines Y-103, Y-111 and Y-113 which operate with an N-1 contingency were also affected but this did not result in customer outages due to redundancies in the backbone transmission system. As shown in Figure 2 on page 5, North Cape, Norway, Aeolus, Eastern Kings and Hermanville wind farms were out of service for approximately three days as a result of the loss of transmission capabilities due to tree contacts. The West Cape wind farm was out of service for six days as a result of the number of fallen trees on the transmission line and on access routes.

Figure 2: Transmission Line Status During Dorian



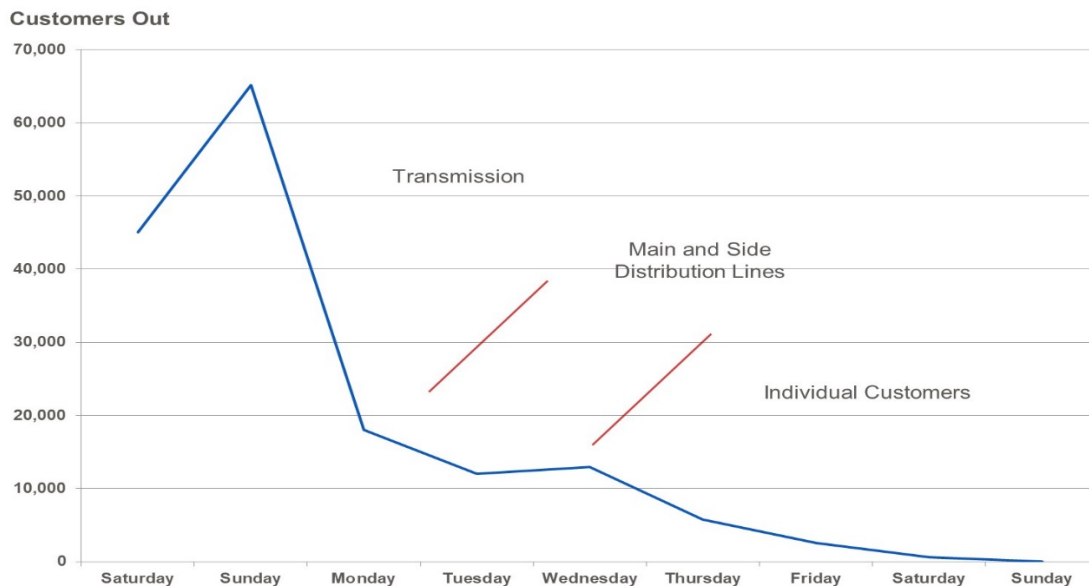
Distribution System Restoration

The Company responded to distribution system outages immediately, but the majority of distribution system work was completed after the transmission system was restored. The restoration approach involved repairing the main feeders from substations followed by secondary feeders and individual outages. Power restoration to nonessential services and vacant residences were the last to be completed.

Significant damage to customer-owned service components delayed power restoration to some customers. Electricians were repairing numerous services from the storm and most components and hardware for repairs were in short supply on the Island.

Figure 3 below illustrates the customer outage timeline for Post Tropical Storm Dorian.

Figure 3: Customer Outage Timeline for Post Tropical Storm Dorian

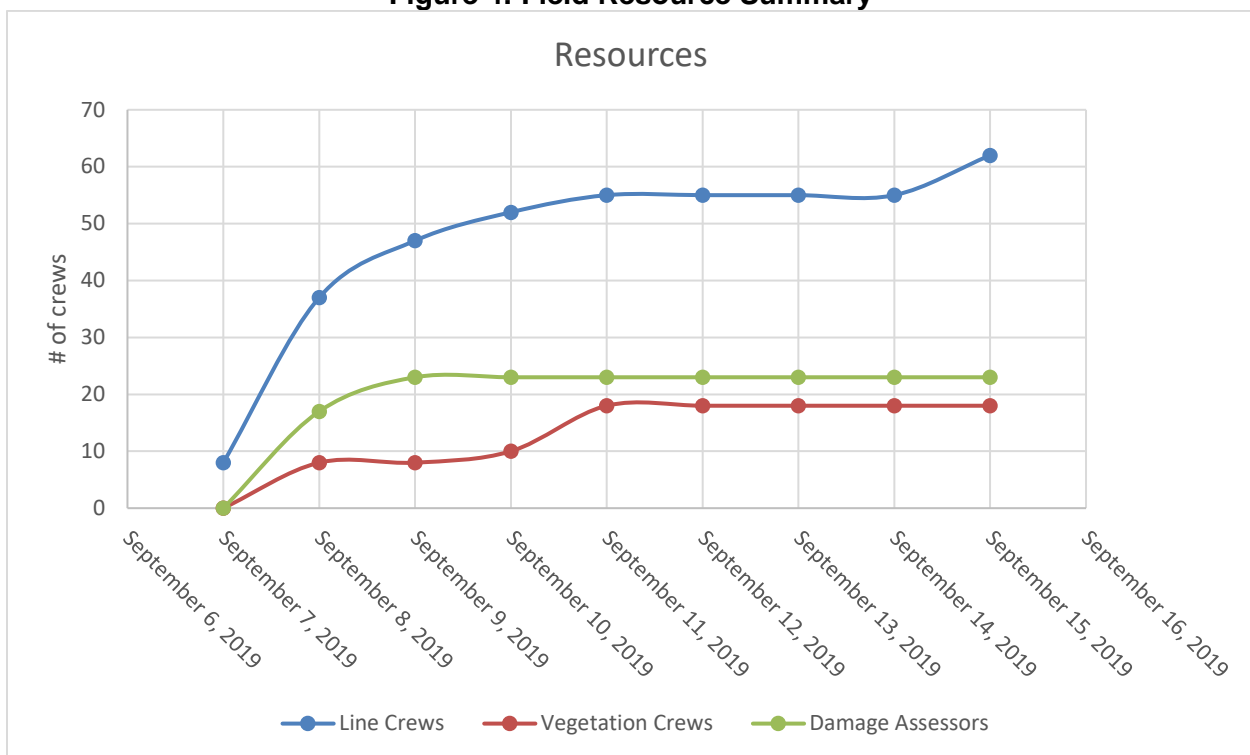


RESTORATION RESOURCES

The Company recognized the significant impact of this storm very early and contacted on-Island contractors immediately. The availability of nearby assistance was limited since neighboring provinces were also affected by Dorian and were staging their own response plans. The Company also reached out to off-Island contractors and other Fortis companies to assist with the system restoration. As off-Island contractors and Fortis crews arrived they were immediately provided a

safety orientation and dispatched to the field. A breakdown of the total number of crews working each day is provided in Figure 4 below. During the storm on September 7th, a decision was made to only have a minimum amount of line crews available to respond to emergency outages for safety reasons. However, during the restoration following the storm, up to 80 line and vegetation management crews and 22 damage assessors were dispatched across the Island. Additional mutual aid was provided by Saint John Energy and City of Summerside Electric Utility during the last two days of restoration.

Figure 4: Field Resource Summary



CUSTOMER SERVICE RESPONSE

The Customer Service and Corporate Communications departments responded to over 32,000 customer interactions in the Contact Centre, including phone calls, emails and social media.

As well, there were over 484,500 hits to the Outage Map page on the Company’s website. The Company’s social media interactions continues to grow as more customers choose these technologies as their preferred method of communication.

SAFETY ISSUES

There were no safety issues or incidents reported during the storm restoration. Effective communication and planning among field crews, the Energy Control Centre (ECC) and the Dispatch Centres resulted in a safe and successful response.

IMPACT ON RELIABILITY

The System Average Interruption Duration Index ('SAIDI') is commonly used as a reliability indicator by electric utilities. The SAIDI statistic for Post Tropical Storm Dorian with a comparison to Hurricane Juan is shown in Table 1 below.

TABLE 1 SAIDI	
Statistic	Hours
Post Tropical Storm Dorian, September 7-16, 2019	35.82
Hurricane Juan, September 2003	12.57

ESTIMATED TOTAL COSTS

The financial impact of the storm was significant with the largest cost component being internal and external labour.

Table 2 on page 9 provides a breakdown of the total cost of the storm restoration. The nature of the damage from this storm was such the majority of the effort was spent removing fallen trees and repairing existing conductor rather than replacing poles and conductor. As such, approximately 87 per cent of these costs are charged to operating expenses. Costs to replace poles and conductor broken during the storm make up the remainder of the costs and resulted in 11 per cent of the total costs being charged to capital and 2 per cent to retirement.

TABLE 2	
BREAKDOWN OF STORM RESTORATION COSTS	
Item	Total Cost
Maritime Electric Labour and Transportation	\$ 1,008,696
H-Line (Contractor)	695,739
Atlantic Reach (Contractor)	254,246
GSD (Contractor)	83,105
T&T Line Construction (Contractor)	135,719
Ontario Line Clearing (Contractor)	281,994
City of Summerside EU (Mutual Aid)	5,656
Saint John Energy (Mutual Aid)	38,559
Fortis Ontario (Mutual Aid)	154,640
Newfoundland Power (Mutual Aid)	253,955
PEI Forestry	15,487
Helicopter Inspection	2,340
Go with the Flow Traffic Control	175,072
Materials	183,482
Travel, Accommodations, Meals, Telecommunications, Other	177,100
Storm Costs Total	\$ 3,465,790
Operating Cost	\$ 3,002,884
Capital Cost	\$ 388,110
Retirement Cost	\$ 74,796

CONCLUSION

Post Tropical Storm Dorian was an extraordinary system event for Maritime Electric in terms of restoration time, effort and cost. Over a period of nine days, from September 7 - 15, 2019, the deployment of resources to restore power to over 65,000 customers was the largest in the history of the Company. There were many challenges presented by the storm damage including the need for significant tree clearing and strict inspection protocols to energize circuits safely, in many cases line by line. These, and other challenges resulting from the storm, were effectively addressed by the Company through pre-storm preparation, early damage assessment, focused communication and a strong contingent of internal and external resources.

Although restoration was completed in a timely and safe manner, Maritime Electric recognizes that there are always lessons learned and opportunities for improvement following a major storm response. The experience with Dorian was no exception and such information was collected

throughout the post-mortem process. This information is now being reviewed by the Company with some items already being acted upon and others planned for implementation prior to or during the next storm event.