

# Investigation Report

## Block Island Transmission Cable Outage on January 18, 2023

EC-2023-02



**STATE OF RHODE ISLAND**

**DIVISION OF PUBLIC UTILITIES & CARRIERS**

Engineering Section

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Warwick, Rhode Island 02888

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May 16, 2023

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## **Executive Summary**

This report is prepared from a cumulation of reports provided by Rhode Island Energy (“RIE”) and Block Island Utility District d/b/a Block Island Power Company (“BIPCo”), which were submitted by the companies as directed by the Division of Public Utilities and Carriers (“Division”) under Engineering reference number 2023-2 (“EC-2023-02”) regarding the “Block Island Transmission Cable Outage on January 18, 2023”. This cable is commonly referred to as the Block Island Transmission System (“BITS”), or the Block Island subsea 34.5kV 165T1 cable (“cable”).<sup>1</sup> The BITS is a 34.5kV AC bi-directional submarine transmission cable, and is the only electric connection between the mainland and Block Island, which is situated twelve (12) miles off the southern coast of Rhode Island. It is also the only connection to the United States’ first and largest offshore wind farm.<sup>2</sup> The cable has had a recent history of outages and the Division investigated to ensure there is not a systematic problem with the cable. The reliability of the cable is more important than ever, as a result of the passage of the Act on Climate.<sup>3</sup> A cable outage requires BIPCo to run its backup diesel generators that produce higher carbon emissions than the power supplied from the mainland and prevents the renewable power from the offshore wind farm from being transmitted to the mainland.

On Wednesday, January 18, 2023, at 19:06 hours,<sup>4</sup> the Block Island subsea 34.5kV 165T1 cable lost power.<sup>5</sup> The outage was caused by a failed electrical splice connection in manhole 9024 on Point Judith Road in Narragansett, Rhode Island. BIPCo used its onsite diesel generators to restore power to the island in a matter of minutes. There were no reported injuries due to this event. The cable outage also prevented the offshore wind turbines (which are currently owned by Orsted) from selling electricity back to the mainland. RIE repaired the electrical splice and brought the cable back in service on Thursday, January 19, 2023, at 9:20 hours (the cable was out for 26 hours and 14 minutes). BIPCo was able to transfer all customers from the backup generators to the BITS cable without interrupting service. In the future, RIE is planning to install fault detection equipment that will help with fault locating, response times, and restoration efforts.

## **Incident Summary**

On Wednesday, January 18, 2023, at 19:06 hours, the Block Island subsea 34.5kV 165T1 cable lost power. The cable is responsible for supplying electricity between Block Island and the mainland and electricity from the offshore wind farm to the mainland. This cable was initially installed in 2016.

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<sup>1</sup> “BITS” and the 165T1 Cable (“cable”) are synonymous. Depending on the context of the report, both are used to describe the Block Island Transmission Cable.

<sup>2</sup> Block Island Wind Farm is located approximately 3.8 mi off the coast of Block Island. The five-turbine, 30 MW project was developed by Deepwater Wind in 2015 and was operational in December 2016. On October 8, 2018, Orsted agreed to purchase Deepwater Wind, however these offshore wind turbines are still commonly referred to as Deepwater Wind.

<sup>3</sup> On April 14, 2021, Governor Dan McKee signed into law the 2021 Act on Climate (RIGL §42-6.2)

<sup>4</sup> Times shown are using a 24-hour clock. Thus, for example, “19:06” hours equates to “7:06 p.m.”

<sup>5</sup> The Division was notified of the outage from RIE at approximately 19:45 hours on January 18, 2023, pursuant to the Division’s *Standards for Electric Utility Rules*.

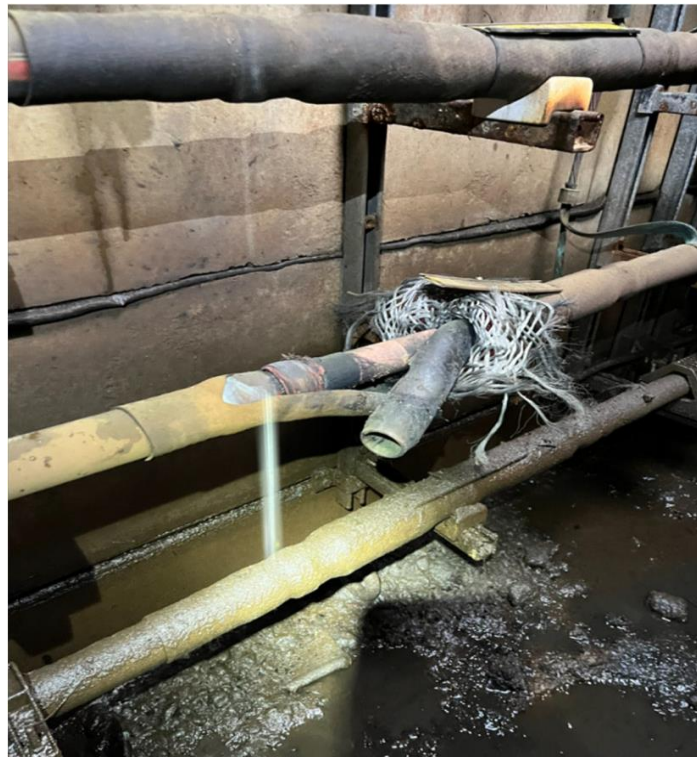
On January 18, 2023, the weather in Narragansett was calm, partly cloudy, with a high of 49°F and a low of 37°F (maximum wind speed was 21 mph<sup>6</sup> -- i.e., this was not a windstorm event).

The cable tripped offline due to the 165T1 circuit breaker (located at RIE's Dillon's Corner Substation in Narragansett) locking out, which caused transfer trips to be sent to the feeder breaker inside the Block Island substation (located on Block Island). The result was a total power loss to all of Block Island (approximately 2,000 accounts, of which many are seasonal) and the offshore wind farm. The outage also disrupted all power flows from the offshore wind farm. BIPCo took immediate action and, through use of its stationary onsite backup diesel generators,<sup>7</sup> was able to restore power to all affected customers in approximately ten (10) minutes (details in Appendix).

The cause of the outage was a failed electrical splice connection in manhole 9024 on Point Judith Road in Narragansett, Rhode Island. GPS coordinates are 41° 25' 53.40" N (Latitude), 71° 28' 53.68" W (Longitude).<sup>8</sup>

RIE was questioned if this was an unusual event or a common occurrence. RIE explained that this was not an unusual event. Cable faults occur on underground electric systems. This was the first outage attributed to a cable failure on the BITS.

Below: Figure 1 shows the failed electrical splice in manhole 9024 on Point Judith Road



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<sup>6</sup> Source: Weather Underground website for Warwick, Rhode Island.

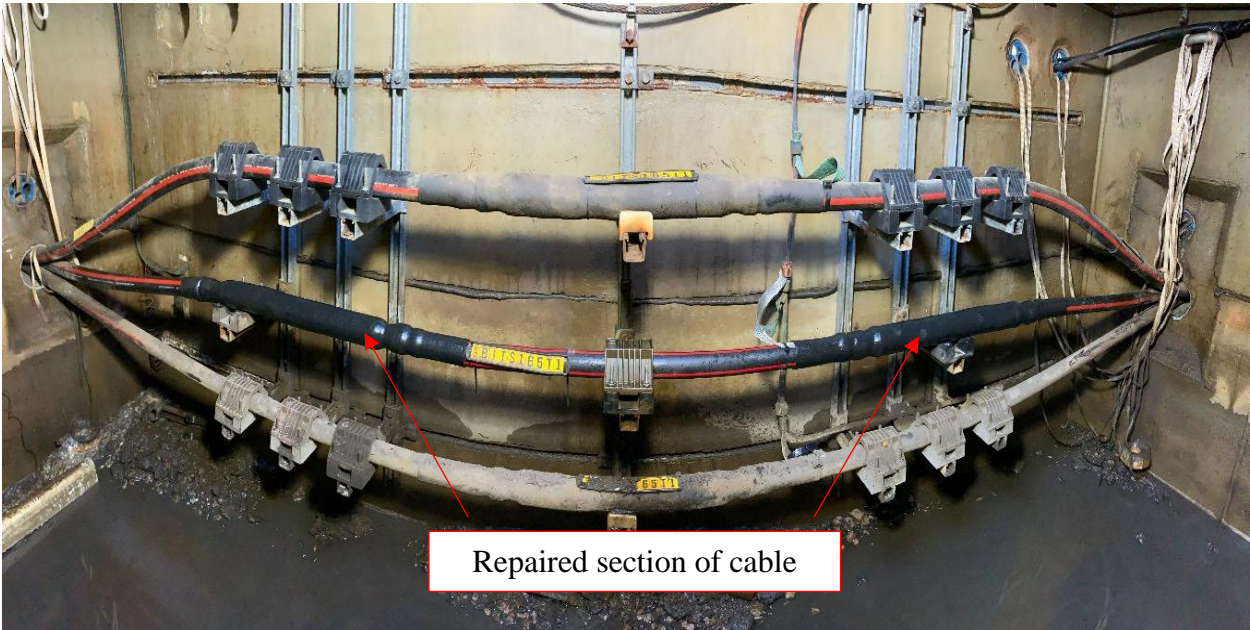
<sup>7</sup> These are the same generators used previously, on a full-time basis, to supply all the electricity to Block Island prior to the BITS installation. These generators now serve as backup generation in emergency events, or planned BITS maintenance outages.

<sup>8</sup> GPS in decimal format 41.4315,-71.481578

Below: Figure 2 shows additional pictures of the failed electrical splice in manhole 9024 on Point Judith Road



Below: Figure 3 shows a wide-angle photo of the failed electrical splice in manhole 9024 on Point Judith Road after repair.





Below: Figure 4 shows a Google Maps image of where the Dillon's Corner substation and manhole 9024 are located.



See Appendix A for a detailed breakdown of how RIE restored electric service.

### **Changes to the Design/Layout**

The utilities were asked if they were planning on changing the design/layout of any of its facilities or equipment to help mitigate the chance of a recurrence of these events in the future.

Since only RIE's equipment failed, only RIE responded as set forth below:

- *The Company is planning to install Smart Navigator LM HV DFCI directional faulted circuit indicators with smart controllers on the 160T1 and 165T1 overhead sections on Block Island. The Smart Navigators LM HV DFCI will communicate fault data to Rhode Island Energy's Energy Management System ("EMS") and fault information can then be used to help improve fault locating, response times, and restoration efforts.*
- *Additionally, the Company is investigating the installation of Schweitzer SEL-T401L relays on the BITS. These relays utilize travelling wave technology to improve fault location accuracy.*

## **Lessons Learned**

Rhode Island Energy explained that the following were lessons learned from this event:

- *Best practice for Rhode Island Energy Operations personnel to continue to work closely with Community and Customer Relations, including key account managers, during emergency response efforts.*
- *Annual refresher training on BITS Emergency Response and O&M Manual helps facilitate safe and efficient emergency response efforts. The latest training was held on Wednesday, February 1, 2023, at Rhode Island Energy’s facility located at 280 Melrose Street in Providence, Rhode Island.*
- *Expand the BITS Emergency Response and O&M Manual to include a written response plan based on season, time of day, and weather conditions.*
- *There are space and scheduling limitations associated with use of the Block Island Ferry. The Company is evaluating other alternatives to get Rhode Island Energy personnel, trucks, and equipment to Block Island for emergency outage events.*
- *Consider utilizing BIUD<sup>9</sup> contractor for restoration support on Block Island. This would require the contractor to complete the proper training and testing to be listed on the appropriate Clearance and Control list.*
- *There are significant Bureau of Ocean Energy Management/environmental requirements associated with repair of the submarine cable.*
- *Distance to Fault Relays (“DTF”) located at Dillon’s Corner Substation No. 165 and Block Island Substation No. 160 provided inaccurate information regarding the location of the fault. DTF relays are typically not extremely accurate for fault location, because they use static system conditions entered by the user to plot the distance to the fault and not actual dynamic values. Also, they are generally not as reliable for fault locating on mixed construction systems, such as BITS which is comprised of land cable, submarine cable, and overhead construction.*

BIPCo explained that the following were lessons learned from this event:

- *They have since obtained an emergency line of credit in the amount of \$500,000 for emergency fuel procurement for long term cable outages.*

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<sup>9</sup> RIE referred to Block Island Utility District d/b/a Block Island Power Company (“BIPCo”) as “BIUD” in its response

## **Cost of Restoration**

This outage created expenses for both RIE and BIPCo, and lost revenues for Orsted, the owner of the offshore wind turbines.

- **RIE's Response:**  
*Approximate cost of 165T1 cable testing: \$25,000*  
*Approximate cost to review substation and overhead equipment: \$5,000*  
*Approximate cost of cable repairs in Manhole ("MH") 9024 Point Judith Road: \$10,000*
- **BIPCo's Response**  
2,897 gallons of diesel fuel were used to run its generators during the cable outage. This was estimated to be about \$4,000 based on BIPCo's accounting treatment of the fuel inventory.
- **Orsted Wind Offshore Wind Turbines**  
It is unknown how much this outage cost the offshore wind turbines; however, the turbines cannot sell electricity during the outage.

## **Training**

This event brought into question how often training occurs for events like this.

RIE explained:

- *Overhead ("OH") and UG<sup>10</sup> Lines personnel routinely perform switching, grounding, installation of conductors/cables, and splicing on both "Blue-Sky" days and during emergency response. Substation and Operations personnel routinely install and test substation equipment. Rhode Island Energy personnel also attend Annual Expert Training, which includes how to respond to events both safely and professionally.*
- *Rhode Island Energy has also held emergency response training for its underground transmission systems including the BITS. The most recent training for the BITS on February 1, 2023, included a review of emergency response and the BITS O&M manual.*

BIPCo explained that it normally trains for these events.

## **Additional Information**

RIE and BIPCo were both asked to share any other information that they believed to be important to the Division's understanding of the situation, its probability of reoccurrence, and appropriate steps that can be taken to minimize the likelihood of this type of failure occurring in the future:

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<sup>10</sup> "UG" refers to Underground



**RIE response:**

- *The Company is planning to enlist the assistance of the National Electric Energy Testing Research and Application Center to perform a dissection and analysis of the failed cable splice removed from MH 9024 Point Judith Road, Narragansett, Rhode Island to determine the cause of the failure.*

**BIPCO's response:**

- *RI Energy's response to this event was identical to the first.<sup>11</sup> It responded quickly and communicated throughout the incident to the other interested parties.*

## **Division Conclusion & Recommendations**

The evidence suggests that the likely cause of this outage was a failed cable splice on the mainland near the intersection of Point Judith Road and Woodruff Avenue in Narragansett, Rhode Island. RIE had the resources readily available to investigate, make the necessary repairs, and re-energize the BITS. The failed cable splice has been sent out to the National Electric Energy Testing Research and Application Center to perform a dissection and analysis to determine/confirm the cause of the failure.

The cost of this outage exceeded \$44,000. The cost to RIE to repair the outage was approximately \$40,000, excluding the un-estimated commercial losses suffered by the offshore wind farm (the RIE report mentioned \$40,000.00 in costs<sup>12</sup>), and BIPCo incurred costs for 2,897 gallons of diesel fuel for the backup generators (which equates to approximately \$4,000 based on its inventory method). BIPCo has taken an additional measure to be better prepared for a long-term power outage by obtaining a \$500,000 emergency line of credit for emergency generator fuel procurement. The lost revenue for Orsted was not identified, but clearly the windfarm cannot realize the maximum revenue from wind generation when it is unable to deliver energy to the mainland.<sup>13</sup>

The Division also observes that RIE's "Distance to Fault Relays" located at the Dillon's Corner Substation and the Block Island Substation were inaccurate in terms of identifying the location of this cable splice fault.<sup>14</sup> Therefore, RIE is planning to install directional faulted circuit indicators with smart controllers on the 160T1 and 165T1 overhead sections on Block Island, which will provide the capability for communicating fault data to RIE's Energy Management System

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<sup>11</sup> This is in reference to the November 18, 2022, Block Island Cable Outage. Refer to Division Investigation report EC-2022-39. That report can be found on the Division's website: [www.ripuc.ri.gov](http://www.ripuc.ri.gov)

<sup>12</sup> Approximately \$25,000 for cable testing, approximately \$5,000 cost to review substation and overhead equipment, approximately \$10,000 cost of cable repairs in MH9024 Point Judith Road.

<sup>13</sup> More importantly, RI and the region cannot realize the maximum clean energy benefits from wind generation when the BITS cable is out.

<sup>14</sup> From Appendix A, page 5 of 7, #14g: Distance to Fault Relays ("DTF") located at Dillon's Corner Substation No. 165 and Block Island Substation No. 160 provided inaccurate information regarding the location of the fault. DTF relays are typically not extremely accurate for fault location, because they use static system conditions entered by the user to plot the distance to the fault and not actual dynamic values. Also, they are generally not as reliable for fault locating on mixed construction systems, such as BITS, which is comprised of land cable, submarine cable, and overhead construction.

(“EMS”) which can then be used to help improve fault locating, response times, and restoration efforts. Additionally, RIE is investigating the installation of Schweitzer SEL-T401L relays on the BITS. These relays utilize travelling wave technology that can help to improve fault location accuracy.

The Division agrees with RIE that it should engage (if it has not already) the assistance of the National Electric Energy Testing Research and Application Center (“NEETRAC”) to perform a dissection and analysis of this failed cable splice to determine the actual cause of the failure. This analysis should also evaluate whether the cable support methods were adequate and provide assurance that there was not a deficiency in the strain relief on the cable at the splice point. The results from the dissection and analysis should then be used to determine if other splices on the BITS require inspection, testing, or maintenance. If other splices do require attention, a plan must be put in place by RIE and executed to prevent further unplanned outages.<sup>15</sup>

RIE is **required** to provide the report and analysis it receives from NEETRAC with respect to the failed cable splice to the Division upon receipt of that report and analysis. The Division requested that RIE also consider the recommendations below. RIE has already reviewed the Division’s recommendations, and its responses are indicated below.

1. Consider installing fault locators at multiple locations on the BITS. These fault locators offer load reading capability and the ability to communicate with SEL relays for enhanced protective coordination. These fault locators can communicate in a manner to allow the breaker/relay to have either a non-reclose feature or reclose feature depending on whether the fault is detected on the cable or is on the overhead portion of the system. These options could potentially reduce outage time.

*RIE Response: Rhode Island Energy is investigating installation of Smart Navigator directional faulted circuit indicators (“DFCI”) with smart controllers on the 160T1 and 165T1 overhead sections of the BITS on Block Island. Directional fault indicators installed on either end of the overhead (“OH”) section would provide a visual indication of whether a fault occurred within the OH section. The Smart Navigator DFCI can also be set up to communicate fault data directly to Rhode Island Energy’s Energy Management System (“EMS”). The OH sections on Block Island would still need to be patrolled to confirm the fault was located on the OH, prior to re-energizing either the cable from Dillon’s Corner Substation to Block Island Substation or the cable from Block Island Substation to Deepwater Wind’s (“DWW”) offshore wind turbines. Additionally, Rhode Island Energy is investigating the installation of advanced devices on the BITS which may utilize travelling wave or similar technology that may improve fault location accuracy.*

The Division appreciates RIE’s response and planned corrective actions.

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<sup>15</sup> The Division also requested BIPCo review the report and recommendations. BIPCo had no substantive comments and indicated the report accurately describes the event and lessons learned.

2. Based on the NEETRAC analysis/evaluation of the existing cable support methods, the Division is requesting that RIE make all changes to add additional strain relief and vertical supports as necessary to all splices.<sup>16</sup>

*RIE Response: NEETRAC analysis was limited to cable dissection and root cause analysis of the failed cable splice located in manhole (“MH”) 9024 Point Judith Road, South of South Pier Road, Narragansett, Rhode Island. Delivery of NEETRAC’s Splice Failure Root Cause Analysis Final Report to Rhode Island Energy is expected on Friday, May 5, 2023. Preliminary findings provided by NEETRAC on Friday, April 28, 2023, indicates the failure was caused by workmanship errors during the installation of the splice. The root cause of the failure was moisture entering the splice from the cable metallic shield and grounding strap caused by failure to apply mastic. The moisture caused corrosion leading to partial discharging, tracking, and eventual failure of the cable splice. Rhode Island Energy is presently investigating existing cable support methods.*

The Division appreciates RIE’s response, and the Division would request the company include in the January 2024 report referenced below, more detail of the investigation into the existing cable support methods. The Division is also **requiring** RIE to review and identify the source of the workmanship issues and implement corrective actions. Please detail these corrective actions or corrective plan in the January 2024 report.

3. Perform immediate thermal/infrared imaging on all splices and terminations, during time of maximum load, and also create a cyclical program for this testing.

*RIE Response: As a result of the preliminary findings provided by NEETRAC, thermal/infrared imaging and visual inspections were scheduled for all mainland and Block Island MHs. Rhode Island Energy completed thermal/infrared imaging and visual inspection of all the splices on the 3301 and 165T1 mainland cable on Monday, May 1, 2023, and all the 160T1 and 165T1 splices located on Block Island on Tuesday, May 2, 2023. Circuit load on the 160T1 and 165T1 circuits cable primarily can be attributed to the output of DWW’s offshore wind farm. Preliminary findings from imaging and visual inspection have identified areas of concern, which the Company will address in coordination with BIUD. Given the significant fluctuation in output of the offshore windfarm during any given day, Rhode Island Energy cannot guarantee that thermal infrared imaging will occur during maximum load on the cable. Rhode Island Energy will as recommended evaluate a recurring program for thermal/infrared imaging and visual inspection of the BITS cable.*

The Division appreciates RIE’s response and corrective actions and would ask that if an opportunity arises to perform the thermal/infrared imaging during a period of peak load, that RIE complete the testing and include those results in the January 2024 report referenced below.

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<sup>16</sup> Figure 3 shows that the bottom and top cables have three (3) strain relieves/vertical supports on each side of the splices, however the middle cable (which was recently repaired) only has one strain relief in the middle with no strain relief on the outside of the splices and less vertical supports. Cable splice strain reliefs and supports are crucial to splice longevity and integrity.

As in the November 18, 2022, outage, the Division notes that RIE and BIPCo worked together efficiently and effectively to resolve this outage. Additionally, as of the date of this report, RIE has already completed the following:

1. Replaced 18 polymer dead-end insulators on Block Island with porcelain type insulation.
2. Completed thermal/infrared imaging at the Block Island Substation and the OH structures located on Block Island, and no abnormalities were found.
3. Arrangements were made with Interstate Navigation to get equipment and personnel on the Block Island Ferry during normal business hours for emergency restoration.
4. Identified and engaged rental car and truck use for emergency events.
5. Identified and engaged air service to transport personnel and tools during emergency events.
6. Scheduled Clearance and Control training of Block Island personnel.
7. Completed thermal/infrared imaging on all underground facilities serving Block Island.
8. Completed internal emergency response refresher training for the BITS.

Finally, RIE is required to provide an update to the Division in January 2024 in the form of a report, providing the status of upgrades and improvements to the BITS, and any new or relevant information related to transmission cable outages. Once the Division has reviewed this report, it will determine if future reports are warranted.

## Appendix A

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March 2, 2023

### VIA ELECTRONIC MAIL

Robert D. Bailey, P.E.  
Rhode Island Division of Public Utilities and Carriers  
89 Jefferson Boulevard  
Warwick, RI 02888

**RE: EC-2023-2 – Block Island Power Outage on January 18, 2023  
The Narragansett Electric Company d/b/a Rhode Island Energy’s  
Report Responding to the Division’s Letter Dated January 31, 2023**

Dear Mr. Bailey:

On behalf of The Narragansett Electric Company d/b/a Rhode Island Energy (“Rhode Island Energy” or the “Company”), attached is the electronic version of Rhode Island Energy’s report in response to a letter to the Company from the Division of Public Utilities and Carriers (“Division”) dated January 31, 2023, in the above-referenced matter.

The Company’s report consists of responses to the 24 questions posed by the Division in its January 31, 2023 letter regarding the Block Island Power Outage that occurred on January 18, 2023.

Thank you for your attention to this matter. If you have any questions, please contact me at 401-578-2700.

Very truly yours,

A handwritten signature in blue ink that reads "Celia B. O'Brien".

Celia B. O'Brien

### Attachment

cc: John Spirito, Division  
Anthony Manni, Division  
Joseph Shilling, Division  
David Bonenberger, Rhode Island Energy



**1. What event occurred?**

The 165T1 Circuit Breaker feeding the Block Island submarine cable locked out at Dillon’s Corner Substation and Block Island Substation. Deepwater Wind (“DWW”) tripped offline. Block Island Utility District d/b/a Block Island Power Company (“BIUD”) tripped offline and went on generation.

**2. What was the exact cause of this event?**

The outage was caused by a failed cable splice in manhole (“MH”) 9024 Point Judith Road, Narragansett, Rhode Island.

**3. Was this related to the outage that occurred on November 18, 2022?**

No, this outage was not related.

**4. Please provide pictures of the cause.**

The following are pictures of the failed cable splice in MH 9024 Point Judith Road, Narragansett, Rhode Island.



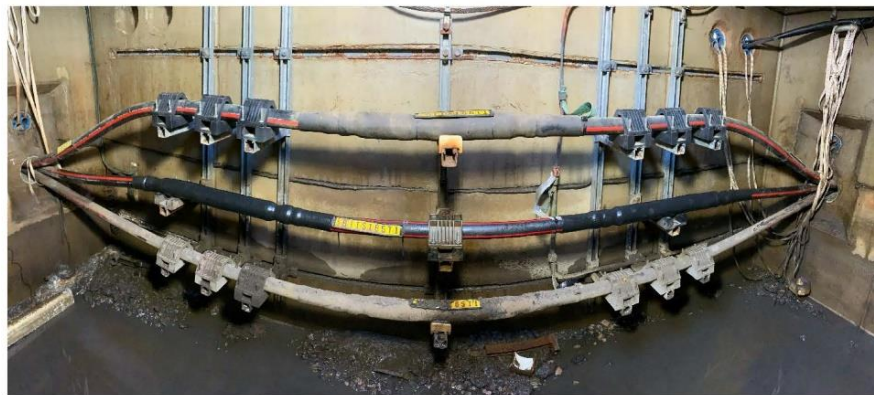
*Figure 1 MH 9024 Point Judith Road*



*Figure 2 MH 9024 Point Judith Road*

**5. Please provide pictures of the repairs.**

The following picture shows cable repairs in MH 9024 Point Judith Road, Narragansett, Rhode Island.



*Figure 3 MH 9024 Point Judith Road*

**6. What was the exact location of the cause of this event (please provide GPS decimal coordinates if possible)?**

The exact location of the cause was MH 9024 Point Judith Road, South of South Pier Road, Narragansett, Rhode Island. Global Positioning System (“GPS”) degrees, minutes, and seconds (“DMS”) coordinates are 41° 25’ 53.40” N (Latitude), 71° 28’ 53.68” W (Longitude).

**7. What was the approximate time and date of this event?**

The duration of the event was from Wednesday, January 18, 2023, at 7:06 pm (loss of power to BIUD and DWW off-shore wind farm) to Thursday, January 19, 2023, at 9:20 pm (BIUD transferred from generation back to Rhode Island Energy’s<sup>1</sup> feed).

**8. Were any injuries reported? If there were injuries, what were the injuries and what is the current status of the injured?**

There were no injuries associated with the failure or the emergency restoration effort.

**9. What were the weather conditions at the time of this event?**

Weather on Block Island, Rhode Island was partly cloudy with a high of 49°F and a low of 37°F on Wednesday, January 18, 2023.

**10. Was this an unusual event, or a common occurrence?**

This was not an unusual event. Cable faults occur on underground electric systems. This was the first outage attributed to a cable failure on the Block Island Transmission System (“BITS”).

**11. Does Rhode Island Energy plan on changing the design/layout of any of its facilities or equipment to help mitigate these events in the future?**

The Company is planning to install Smart Navigator LM HV DFCI directional faulted circuit indicators with smart controllers on the 160T1 and 165T1 overhead sections on Block Island. The Smart Navigator LM HV DFCI will communicate fault data to Rhode Island Energy’s Energy Management System (“EMS”) and fault information can then be used to help improve fault locating, response times, and restoration efforts.

Additionally, the Company is investigating the installation of Schweitzer SEL-T401L relays on the BITS. These relays utilize travelling wave technology to improve fault location accuracy.

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<sup>1</sup> The Narragansett Electric Company d/b/a Rhode Island Energy (“Rhode Island Energy” or the “Company”).

**12. Did Rhode Island Energy have all the resources available to begin making immediate repairs, or were outside resources needed?**

Rhode Island Energy had resources readily available to investigate, make necessary repairs, and re-energize the BITS.

**13. Please explain how power was restored to the customers and how long it took.**

- a. 01/18/2023, 19:06: 165T1 circuit breakers locked out at Dillon’s Corner Substation and Block Island Substation. This resulted in loss of power to BIUD and DWW’s off-shore wind farm.
- b. 01/18/2023, 19:08: Rhode Island Energy’s Control Center informed BIUD of the outage and informed them that they should go on generation when able.
- c. 01/18/2023, 19:18: BIUD transferred to generation and fully restored power to all customers.
- d. 01/19/2023, 08:00 (approximate): Rhode Island Energy crews arrive on Block Island to begin patrol of overhead lines and commence with switching/tagging of the 165T1 circuit.
- e. 01/19/2023, 09:49: Rhode Island Energy’s Control Center granted clearance to Underground (“UG”) Lines and Substation Operations and Maintenance (“O&M”) departments to test the underground cable originating at Dillon’s Corner Substation in Narragansett, Rhode Island.
- f. 01/19/2023, 18:34: Rhode Island Energy’s UG Lines and Substation O&M departments released clearance after UG Lines completed cable repairs in MH 9024 Point Judith Road, Narragansett, Rhode Island.
- g. 01/19/2023, 21:10: 165T1 circuit was re-energized from Dillon’s Corner Substation to Block Island Substation and determined to be ready for load.
- h. 01/19/2023, 21:13: Rhode Island Energy’s Control Center notified BIUD that it was okay to transfer from generation back to normal utility power.
- i. 01/19/2023, 21:16: Rhode Island Energy’s Control Center notified DWW that Rhode Island Energy was ready to energize the cable to DWW’s off-shore wind farm upon verification from DWW.
- j. 01/19/2023, 21:19: Rhode Island Energy re-energized cable to DWW off-shore wind farm.
- k. 01/19/2023, 21:20: BIUD confirmed that they were back on utility power.

**14. What lessons were learned from this event?**

- a. Best practice for Rhode Island Energy Operations personnel to continue to work closely with Community and Customer Relations, including key account managers, during emergency response efforts.
- b. Annual refresher training on BITS Emergency Response and O&M Manual helps facilitate safe and efficient emergency response efforts. The latest training was held on Wednesday, February 1, 2023, at Rhode Island Energy’s facility located at 280 Melrose Street in Providence, Rhode Island.
- c. Expand the BITS Emergency Response and O&M Manual to include a written response plan based on season, time of day, and weather conditions.
- d. There are space and scheduling limitations associated with use of the Block Island Ferry. The Company is evaluating other alternatives to get Rhode Island Energy personnel, trucks, and equipment to Block Island, Rhode Island for emergency outage events.
- e. Consider utilizing BIUD contractor for restoration support on Block Island. This would require the contractor to complete the proper training and testing to be listed on the appropriate Clearance and Control list.
- f. There are significant Bureau of Ocean Energy Management/environmental requirements associated with repair of the submarine cable.
- g. Distance to Fault Relays (“DTF”) located at Dillon’s Corner Substation No. 165 and Block Island Substation No. 160 provided inaccurate information regarding the location of the fault. DTF relays are typically not extremely accurate for fault location, because they use static system conditions entered by the user to plot the distance to the fault and not actual dynamic values. Also, they are generally not as reliable for fault locating on mixed construction systems, such as BITS which is comprised of land cable, submarine cable, and overhead construction.

**15. What is the approximate cost to repair the damage?**

Approximate cost of 165T1 cable testing: \$25,000  
Approximate cost to review substation and overhead equipment: \$5,000  
Approximate cost of cable repairs in MH 9024 Point Judith Road: \$10,000

**16. Was there any equipment failure?**

A cable splice failed in MH 9024 Point Judith Road, Narragansett, Rhode Island.

**17. Please provide a high-level timeline listing the repair process for this event.**

Please refer to the Company’s response to Question 13, above.



**18. Was the damaged equipment near the end of its life cycle?**

No, a cable splice is expected to last as long as the cable. Medium voltage extruded dielectric cables made in the 1980s and later have a life expectancy of 40 years or more.

**19. What was the date and time on which the Block Island subsea cable was put back into service?**

- a. 01/19/2023, 21:10: 165T1 circuit was re-energized from Dillon’s Corner Substation to Block Island Substation and determined to be ready for load.
- b. 01/19/2023, 21:13: Rhode Island Energy’s Control Center notified BIUD that it was okay to transfer from generation back to normal utility power.
- c. 01/19/2023, 21:19: Rhode Island Energy re-energized cable to DWW off-shore wind farm.
- d. 01/19/2023, 21:20: BIUD confirmed that they were back on utility power.

**20. Did this event cause any critical infrastructures to lose power? If yes, for how long?**

This event caused the loss of power to BIUD and DWW’s off-shore wind farm. Normal utility power was restored to both BIUD and DWW’s off-shore wind farm 26 hours and 14 minutes after the start of the outage.

**21. Was the outage isolated, or did it impact all of BIUD?**

The outage impacted the supply to BIUD and DWW’s off-shore wind turbines.

**22. Does Rhode Island Energy regularly train for this type of incident or similar incidents?**

Overhead (“OH”) and UG Lines personnel routinely perform switching, grounding, installation of conductors/cables, and splicing on both “Blue-Sky” days and during emergency response. Substation and Operations personnel routinely install and test substation equipment. Rhode Island Energy personnel also attend Annual Expert Training, which includes how to respond to events both safely and professionally.

Rhode Island Energy has also held emergency response training for its underground transmission systems including the BITS. The most recent training for the BITS on February 1, 2023, included a review of emergency response and the BITS O&M manual.

**23. Did any devices fail to do their job to protect the subsea cable from tripping offline?**

The protective relays appear to have operated as designed.

**24. Please feel free to share any other information that you believe is important to our understanding of the situation, its probability of reoccurrence, and appropriate steps to take to better avoid this type of failure in the future.**

The Company is planning to enlist the assistance of the National Electric Energy Testing Research and Application Center to perform a dissection and analysis of the failed cable splice removed from MH 9024 Point Judith Road, Narragansett, Rhode Island to determine the cause of the failure.

## Appendix B



**BLOCK ISLAND  
UTILITY DISTRICT**

dba Block Island Power Company  
P.O. Box 518  
Block Island, Rhode Island 02807

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DIVISION OF PUBLIC UTILITIES & CARRIERS

Engineering Section  
Mr. Robert D. Bailey, P.E.  
89 Jefferson Boulevard  
Warwick, Rhode Island 02888  
401-941-4500

February 28, 2023

Re: EC-2023-2 Block Island Power Outage on January 28, 2023

Dear Mr. Bailey:

The Block Island Utility District's responses to the Divisions' inquiry into the Block Island submarine cable outage that occurred on January 18, 2023 are included below:

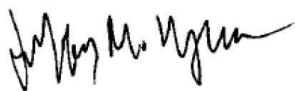
1. What event occurred?  
On January 18, 2023, at 19:07 the submarine cable tripped at RI Energy's Wakefield Substation, sending transfer trips to the 34.5 kV feeder breaker inside Rhode Island's Block Island substation.
2. When did BIUD learn of this outage?  
Immediately when the lights went out at 19:07.
3. How long does it take for the on-island generation to serve load?  
11 Minutes.
4. Any difficulties with the generators?  
No.
5. How many generators were used at one time?  
Two.
6. In total, how much fuel was consumed?  
2,897 Gallons.
7. Did BIUD make need to make arrangements to refill fuel?  
No.
8. How does BIUD transition from island generation back to the cable -is it seamless to customers or does it require another outage?  
Automatic synch-check which is seamless and does not require an outage.

9. What was the exact cause of this event?  
I will defer to RI Energy to answer this question.
10. Was this related to the outage that occurred on November 18, 2022?  
I will defer to RI Energy to answer this question.
11. Please provide pictures of the cause.  
BIUD does not have access to this.
12. Please provide pictures of the repairs.  
BIUD does not have access to this.
13. What was the exact location of the cause of this event (please provide GPS decimal coordinates if possible)?  
BIUD does not have access to this information.
14. What was the approximate time and date of this event?  
As previously stated in Question 1, On January 18, 2023, at 19:07.
15. Were any injuries reported?  
No.
16. What were the weather conditions at the time of this event?  
Calm.
17. Was this an unusual event, or a common occurrence?  
This is the 3<sup>rd</sup> unplanned cable trip in the last twelve months.
18. Does BIUD plan on changing the design / layout of any of its facilities or equipment to help mitigate these events in the future?  
No.
19. Did BIUD have all the resources available to begin making immediate repairs, or were outside resources needed?  
BIUD had no repairs to make.
20. Please explain how power was restored to the customers and how long it took.  
Internal generation was started and the power was restored by 19:18.
21. What lessons were learned from this event?  
BIUD has since obtained an emergency line of credit in the amount of \$500,000 for emergency fuel procurement for long term cable outages.
22. What is the approximate cost to repair the damage?  
BIUD does not have access to this information.

23. Was there any equipment failure?  
I will defer to RI Energy to answer this question.
24. Please provide a high-level timeline listing the repair process for this event.  
I will defer to RI Energy to answer this question.
25. Was the damaged equipment near the end of its life cycle?  
I will defer to RI Energy to answer this question.
26. What was the date and time on which the Block Island subsea cable was put back into service?  
January 19, 2023 at 21:20.
27. Did this event cause any critical infrastructures to lose power? If yes, for how long?  
The entire island was off for 11 minutes.
28. Was the outage isolated or did it impact all of BIUD?  
The entire island was affected.
29. Does BIUD regularly train for this type of incident or similar incidents?  
Yes.
30. Did any devices fail to do their job to protect the subsea cable from tripping offline?  
I will defer to RI Energy to answer this question.
31. Please feel free to share any other information that you believe is important to our understanding of the situation, its probability of reoccurrence, and appropriate steps to take to better avoid this type of failure in the future.  
RI Energy's response to this event was identical to the first. They responded quickly and communicated throughout the incident.

Please do not hesitate to ask any follow-up or clarifying questions.

Respectfully,



Jeffery M. Wright, President  
Block Island Utility District DBA  
Block Island Power Company (BIPCO)