Government of the Republic of Trinidad and Tobago

Minister of Public Utilities

MPU: 2/1/70 Vol I

May 29, 2023

The Honourable Brigid Mary Annisette-George, MP
Speaker of the House
Speaker's Chambers
Office of the Parliament
Parliamentary Complex
Cabildo Building
St. Vincent Street,
Port of Spain.

Dear Honourable Speaker,

RE: The Eleventh Report of the Public Administration and Appropriations Committee on an Examination into the Island Wide Power Outage and Blackout that occurred on February 16, 2022

I refer to your letter dated April 24, 2023, Parl.: 5/6/23 regarding the captioned subject matter.

In accordance with your request, I have enclosed for your consideration, responses to recommendations/comments from the Public Administration and Appropriations Committee on an examination of into the Island Wide Power Outage and Blackout that occurred on February 16, 2022.

As instructed via your letter, I have also forwarded an electronic copy of the responses to coth@ttparliament.org for your consideration.

I look forward to your favourable feedback on this matter.

Yours Sincerely,

Marvin Gonzales

Marvin Gonzales, M.P
Minister

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

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Please Quote Our Reference on Your Reply

May 18th, 2023

Ms. Nicolette Duke
Permanent Secretary
Ministry of Public Utilities
One Alexandra Place
#1 Alexandra Street
St. Clair
PORT OF SPAIN

Dear Permanent Secretary Duke

RE: The Eleventh Report of the Public Administration and Appropriations Committee on an Examination into the Island Wide Power Outage and Blackout that occurred on February 16, 2022

Reference is made to your email dated April 4th, 2023, regarding the captioned subject matter.

Enclosed is the Commission's responses and the requisite appendices to the questions outlined in your correspondence.

Yours respectfully
TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

K Ramsook

Kelvin Ramsook
GENERAL MANAGER

Response requested by the Ministry of Public Utilities for the Examination into the Island Wide Power Outage and Blackout that occurred on February 16, 2022

Report Ref	Follow up Question	Response
1.0 The Challenges Faced by Citizens during the Islandwide Blackout		
1.1	**T&TEC, TGU, PowerGen and TPL respectively should report to Parliament by May 31, 2023 including the following:** **i. Details of the actions taken individually or in collaboration with other public entities to tackle the immediate issues faced by citizens at the time of the blackout;**	T&TEC focussed on re-energization and restoration of the grid: i. The grid operators, under its System Control and Generation Interface Department, immediately initiated restart activities with the power stations from which all system recoveries must originate, parallel with the conditioning and configuration of the interconnecting power grid to stably and sustainably receive energy from the power stations, when it would become available. For this extreme condition, co-ordination with the system's fuel supplier, NGC, was also necessary. ii. Personnel of the Transmission Maintenance and Distribution Departments were deployed to critical substations to assist with necessary switching operations. iii. Personnel of the Protection and SCADA Department used the SCADA system to identify the faulted circuits and confirm the circuits were opened. The grid operator personnel were informed and within half hour informed the power station to commence restoration. iv. Please see the attached report on the timeline for communications in Appendix 1, as submitted to the 2022 Independent Cabinet Appointed Investigating Committee.
1.1	**ii. An assessment of the readiness in February 2022 of existing plans to tackle the difficulties caused by the blackout:**	<u>Technical</u> Plans for system recovery, by both T&TEC and the Independent Power Producers, when reviewed in retrospect, were found to be generally fit for purpose, but for certain narrow, specific, but critical technical inadequacies, concerning restart sequences in power stations, which were revealed in the course of the system recovery efforts. <u>Communication</u> The extended time frame and the extensive nature of the outage, highlighted gaps in systems for communicating with the public in such situations. Procedures have since been updated to close those gaps.

Response requested by the Ministry of Public Utilities for the Examination into the Island Wide Power Outage and Blackout that occurred on February 16, 2022

Report Ref	Follow up Question	Response
		Please see Crisis Communications Guidelines and Response Plan (Appendix 2). The assessment also revealed that there is need for improvement in the communication with the respective Independent Power Producers and T&TEC personnel. Notwithstanding the concerns expressed and identified, subsequent to the event and even prior to the completion of the report by the Independent Cabinet Appointed Committee, the Commission instituted a number of initiatives/changes to address these shortcomings.
1.1	**iii. The lessons learnt from the issues arising from the blackout;**	i. The test conducted on the black start prior to the incident were inadequate because the synchronising of the units to the energised bus does not show its ability to handle transformer magnetizing inrush current upon the course of a system recovery. ii. It is essential to periodically test and rehearse the entire process and the system of power station recovery, including its human elements. iii. The power stations are to ensure that there exists fully functional black start capability at all times at their facilities. iv. That grid operators and power station operators are to conduct frequent simulation training in the restoration to ensure the necessary procedures are performed properly when needed. v. That the ODPM should be informed and kept updated of any island wide blackout and the restoration activities respectively. vi. The need to quickly complete the second 220 kV double circuit line from Union Estate to Gandhi Village substation. vii. The need to have a dedicated Incident Manager at the System Control and Generation Interface Department.
1.1	**iv. Details of the improvements made, if any, to existing systems since the blackout.**	i. For each island, an elaborate, detailed and comprehensive power system recovery procedural guide has been developed, balancing technical specificity and general guiding principles, given that while all

Response requested by the Ministry of Public Utilities for the Examination into the Island Wide Power Outage and Blackout that occurred on February 16, 2022

Report Ref	Follow up Question	Response
		system recoveries share some common characteristics, each is unique. This procedure also seeks to control the interactional environment within the control room during a system recovery. ii. In addition to the periodic testing of black start units at power stations, which pre-existed the blackout, procedures for the testing and rehearsal of the entire power station recovery process at each power station has been developed in collaboration with the Independent Power Producers, to be carried out at a frequency of not less than once per year. Such tests have commenced. These test procedures also constitute a portion of the technical basis upon which the power stations have developed/updated their station recovery procedures. iii. Telephone extensions of T&TEC's IP-based EPABX directly to the control room of each power station in the system have been established. This telephone traffic flows on T&TEC's own island-spanning fibre optic network, so is dependent upon neither the public telephone network nor the IPPs' PBXs. iv. ODPM received direct connections to T&TEC's Control Room via a satellite phone and a base station from the trunk radio system v. Completion of the 2nd 220kV Double Circuit Line vi. Relocation of the majority of the line crossings under the Union- Gandhi 220 kV double circuit line.
1.2	**T&TEC, TGU, PowerGen and TPL should each provide Parliament by May 31, 2023 with an assessment of the readiness of the improved systems to address difficulties likely to be caused by potential future blackouts by May 31, 2023, based on some form of stress test or other measurable mechanism.**	As a result of the improvements made to systems in direct response to lessons learnt in the February 2022 blackout, T&TEC is confident that recovery from any similar future event (i.e. similar in the sense that the initial cause of the blackout leaves the power system, including its fuel supply, physically intact and functional) would be materially complete in 2 – 3 hours. The most material factor leading to the lengthening of the blackout was repeated unsuccessful power station restart. New procedures addressing this issue and its causes have been developed, practiced, and tested.
2.0 Lack of Documented Power System Restoration Procedure		

Response requested by the Ministry of Public Utilities for the Examination into the Island Wide Power Outage and Blackout that occurred on February 16, 2022

Report Ref	Follow up Question	Response
2.1	**T&TEC should submit a roadmap for the creation and implementation of a power system restoration procedure to be utilised in the event of future outages to Parliament by May 31, 2023;**	For each island, an elaborate, detailed and comprehensive power system recovery procedural guide has been developed and disseminated to system operations personnel of TTEC and the IPPs, and the formal testing of T&TEC operating personnel's knowledge of same has commenced. **See attached** in Appendix 3.
3.0 The 12 and a half hours Delay in the Restoration of Full Power due to the issues with Black Start Machines		
3.1	**T&TEC should submit a report to Parliament by May 31, 2023 including the following:** **i. measures implemented to ensure that the black start units of the IPPs are kept in a state of readiness and tested frequently to ensure startup; and**	i. Each generating station is now required to declare the availability status of their black start generators once per shift (thrice per day). ii. The ability to start one (1) black start generator is tested at each power station no less frequently than once per month. iii. The systems and procedure to black start each generating station from one of its black start units is tested no less frequently than once per year. iv. A second black start unit has been acquired by ContourGlobal Trinity Power for their Brechin Castle Power Station and commissioned. **There is a concern that must be expressed with respect to the Pt. Lisas Power Station having only one (1) black start unit.**

Response requested by the Ministry of Public Utilities for the Examination into the Island Wide Power Outage and Blackout that occurred on February 16, 2022

Report Ref	Follow up Question	Response
3.1	**ii. the penalties, if any, faced by the IPPs for the unavailability or non-functional black start machines during the island wide outage.**	The PPA's all require that black start capability be maintained throughout the contract period, but none establishes specific sanction or penalty for failure to do so.
4.0 The Current Design of T&TEC's Electrical Transmission and Distribution System		
4.1	**T&TEC should submit an update to Parliament by May 31, 2023 on:** **i. the progress of the construction of the Second Union-Gandhi 220kV double circuit Tower line . The update should include a timeline with an identified completion date.**	**This 2nd 220 kV double circuit line was commissioned on 17th April 2023.**

Response requested by the Ministry of Public Utilities for the Examination into the Island Wide Power Outage and Blackout that occurred on February 16, 2022

Report Ref	Follow up Question	Response
4.1	**ii. a detailed report of the additional upgrades that are currently underway to ensure efficiency in the transmission and distribution of electricity in Trinidad and Tobago.**	i. Reinforcement of the Central subtransmission Ring which serves the North-South Corridor from Chaguanas to Couva/Pt. Lisas. ii. Upgrade of the Southeast Subtransmission ring which serves that corner of Trinidad (Mayaro, Galeota etc.) from 33 kV to 66 kV iii. Upgrade of the O'Meara Subtransmission ring which serves the Arima/Five Rivers/ Arouca/West Trincity district from 33 kV to 66 kV iv. Reinforcement of the Inner West Subtransmission Ring which serves the near western and northwestern suburbs of Port-of-Spain. v. Establishment of additional transmission capacity into Port of Spain and the northwestern peninsula. vi. Replacement of aged transformers and switchgears at several distribution substations. vii. Implementation of a loop scheme distribution automation system on the distribution network
5.0 Enterprise Risk Management Policy and Risk Register		
5.1	**T&TEC should submit copies of the following to Parliament by May 31, 2023:** **i. The Enterprise Risk Management Policy; and**	**See attached document of the policy in Appendix 4.**

Response requested by the Ministry of Public Utilities for the Examination into the Island Wide Power Outage and Blackout that occurred on February 16, 2022

Report Ref	Follow up Question	Response
5.1	ii. The Risk Register.	See attached document in Appendix 5.
6.0 Lack of Sufficient Communication by T&TEC to the Public regarding the nature of the problem and the progress made to restore the electrical supply to the nation		
6.1	T&TEC should review its Communications policy with a view to including standardized communication procedures to be followed in the event of an island wide blackout and submit an update to Parliament by May 31, 2023;	Please see Crisis Communications Guidelines and Response Plan in Appendix 2.
6.2	T&TEC should submit a report to Parliament by May 31, 2023, on the ways in which it intends to work with the relevant stakeholders such as the Ministry of National Security and the ODPM to expand its mass communication efforts in the event of future blackouts;	The Commission held meetings with various representatives of the ODPM and discussed procedures for the future. Please see Crisis Communications Guidelines and Response Plan.
7.0 Implementation of recommendations made by the Report		
7.1	T&TEC should make every effort to fully adhere to the recommendations made by the Cabinet-appointed Committee and submit a timeline for the implementation of these recommendations (see attached Appendix 1) to Parliament by May 31, 2023; and	See attached report in Appendix 6.

Response requested by the Ministry of Public Utilities for the Examination into the Island Wide Power Outage and Blackout that occurred on February 16, 2022

Report Ref	Follow up Question	Response
7.2	**T&TEC should submit a report to Parliament by May 31, 2023 setting out its plans to work with the requisite stakeholders (TGU, TPL, MEEI and MPU) to action the recommendations made by the Cabinet appointed Committee.**	There is a steering committee that has been set up and for which meetings were held regarding the institutionalization of the recommendations and discussion of the findings arising from the report by the Cabinet Appointed Committee.

TIMELINE FOR COMMUNICATIONS WEDNESDAY 16TH FEBRUARY 2022

In the wake of the island-wide outage (Trinidad) On February 16th 2022, several updates were issued to the public via traditional and digital/ social media. In total 12 communiques were issued, using a combination of platforms to circulate the information, in light of the fact that traditional broadcast and communication systems were largely affected by the outage.

Additionally, updates were shared directly with the public via Facebook. Updates at 6.23 p.m. and 9.35 p.m. included tags to TTT Live Online, CNC3 Television, Trinidad and Tobago CCN TV6, Trinidad and Tobago T&T Guardian, Trinidad Express Newspapers and Trinidad and Tobago Newsday to increase the visibility of the messages by their followers.

The following is the sequence of events and times communiques were issued.

- **12:52 PM**—Head Office building experienced a brief loss of electricity and quick restoration with generator power.

- **12:55 PM to 1:07 PM**—Attempts to contact key persons at Mt Hope to verify the status of situation were unsuccessful as internal and cellular lines were down. (Attempted to utilise both Bmobile and Digicel phones lines. Email communication was also unavailable.)

- **Approx 1:25 PM**—Telephone and Internet communication was restored and it was confirmed that the nature of the problem was island-wide and linked to generation/ under frequency.

1. **1:31 PM**—Post to Facebook advising on a disturbance on the system; Call Centre lines malfunctioning and listing alternate phone contacts.
    a. *Customers are advised that we are experiencing a major disturbance on the System and are working to restore supply within the shortest possible time.*
    b. *The cause of the incident is, at this time, unknown.*
    c. *Our 800 numbers are currently down, however, customers can contact the Call Center at 794-4823 or 794-7264. Please note due to high call volumes you will experience some delays.*
    d. *An update will be provided as soon as more information is available.*
    e. *We apologise for the inconvenience caused.*

2. **1.57 PM**—Facebook update on a possible restoration time of 2-3 hours as IPPs have been directed to restart their generators

    UPDATE: RESTORATION OF SUPPLY
    The Independent Power Producers (IPPs) are currently restarting the generators to allow a gradual restoration of supply. This process will take approximately 2-3 hours.
    Our 800 numbers are currently down, however, customers can contact the Call Center at 794-4823 or 794-7264. Please note due to high call volumes you will experience some delays.
    We once again apologise for the inconvenience.

3. **2:00 PM**—Commenced distribution of verbal update (voice messages) to traditional media via WhatsApp regarding disturbance of unknown cause, status of phone lines and working to restore as quickly as possible.

   TRANSCRIPT OF VOICE MESSAGE

   Good afternoon I can confirm that at approximately 12.50 p.m. there was a major disturbance on the electricity system which disrupted supply to our customers in Trinidad.

   The cause of the problem is unknown at this time but our engineers as well as our Independent Power Producers are working assiduously to restore the supply in the shortest possible time. What is happening right now is that the Independent Power Producers are restarting all their generators; this is a process that takes some time and it is going to lead to a gradual restoration of supply to all customers. The process to restart and to get the customers back on supply incrementally will take approximately 2 to 3 hours.

   Our 800 numbers, our hotline, is currently affected, however customers can contact us at 794-4823 or 794-7264. Our social media page, Facebook, is also being updated with information and customers can check in there for further updates. Additional updates will be forwarded to the media as required, thank you.

   These releases were issued to the following media houses (including major TV and press) via WhatsApp

   1. MCTV
   2. i95.5
   3. CNC3
   4. Trinidad Express
   5. Trinidad Guardian
   6. TV6
   7. TTT
   8. Trend/Loop
   9. 103 FM

4. **2:34 PM**—Facebook update on call centre lines back in operation

   a. *UPDATE: CALL CENTER NUMBERS ARE BACK UP*

   b. *Our Call Center numbers 800-TTEC (8832) and 800-BULB (2852) are back up. Customers can also continue to use 794-4832 or 794-7264 to make trouble reports.*

5. **2:40 PM**—Emailed media release regarding disturbance of unknown cause, status of phone lines and expected restoration within 2-3 hours.

   It should be noted that while this release was being drafted discussions were ongoing to determine the extent of the problem and the possible restoration time, so that it could be included. This delayed the issuance of the release.

Emailed media releases were issued to 24 media houses:

1. CL Communications (several)
2. CNC3 (several)
3. Trinidad Express (several)
4. Trinidad Guardian (several)
5. Heritage Radio
6. IETV
7. i95.5 (several)
8. Newsday (several)
9. 103fm
10. Power 102
11. Radio Trinbago 94.7 fm
12. The Street 91.9 FM
13. Trinidad and Tobago Radio Network Ltd. (96.1 W.E.F.M. & Radio 107.7 fm)
14. TV6 (several)
15. WACK 90.1 FM
16. 100.5 fm
17. Isaac 98.1 (several)
18. AZP News (several)
19. TTT
20. Trend media/ Loop (several)
21. Hott 93
22. MCTV
23. WESN TV
24. News @ 7

6. **Approx 5:30 PM**—Internal confirmation that generators at Penal has been restarted and some surrounding communities were back up. Delayed issuing immediate update in anticipation that the main IPP would be back up soon after and we could advise on widescale restoration.

7. **6:23 PM**— Update to Facebook regarding the start of restoration in Penal and surrounding areas.
   Update #3
   We can report that limited restoration started at approximately 5.00 p.m.
   Some customers in Penal, Gandhi village and environs in Central Trinidad were brought back on supply.
   The process of restarting the generators requires time and is very gradual. Unfortunately, in this instance the process is taking longer than anticipated and it will be a few more hours before all customers are back on supply.
   We acknowledge the distress this is causing and we are working closely with the Independent Power Producers to complete the process.
   We thank you for your continued patience.

8. **6.30 PM**— Verbal update to media via WhatsApp regarding limited restoration in Penal and surrounding areas.

   Phone communication remained unreliable, but posts to FB continued whenever new information was available.

9. **7: 15—**The Hon. Minister and General Manager participated in live interviews on CNC 3 advising that based on the progress thus far, restoration would take approximately 5 hours.

10. **7:35 PM**—Update to Facebook on progress of restoration

    Update #4

    Restoration is continuing gradually and customers in some parts of San Fernando, including Lady Hailes and Gulf View are back on supply.

    We again thank you for your continued patience.

11. **9:35 PM**—Update to Facebook on progress of restoration

    Dear valued customers, we continue to support the efforts of our Independent Power Producers to get power back onto to grid for distribution by T&TEC. While restoration is moving slower than initially hoped, more customers (communities in closest proximity to the generating plants) are back up.

    Most customers from Penal to Pt Lisas are now on supply. We continue to gradually push power further north, west and east. We anticipate that, barring any unforeseen circumstances, those customers should be back on in approximately two hours.

    We again apologise for the extended outage. Be assured that we are working as quickly as possible to get you back on supply.

12. **11:07 PM**—Update to Facebook
    At this time all the IPPs have started their generators and MOST customers from Penal to Mt Hope are back on supply. Barring unforeseen circumstances, we expect to restore supply to the rest of the island (east, further north and west) by 1:00 a.m.
    Attached was a copy of the final media release which was issued for the night.

13 **11:07 PM—**Media Release emailed and WhatsApp'ed to the media regarding 1:00 a.m. expected completion.

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

CORPORATE COMMUNICATIONS DEPARTMENT

Crisis Communication Guidelines and Response Plan

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Abbreviations

ACCM- Assistant Corporate Communications Manager

CCA- Corporate Communications Assistant(s)

CCM- Corporate Communications Manager

COO- Chief Operating Officer

CTO-Chief technical Officer

GM- General Manager

ESF- Emergency Support Facilitator

HSEM- HSE Manager

MET- Meteorological Service of Trinidad and Tobago

MoP- Member of the Public

MPU- Ministry of Public Utilities

NEOC- National Emergency Operation Centre

ODPM- office of Disaster Preparedness and Management

PSA- Public Service Announcement

Snr HSEC- Senior HSE Co-ordinator

Introduction

The role of the Corporate Communications Department is to ensure effective and timely communication flows between T&TEC and its stakeholders, to enhance the Commission's reputation as an efficient, caring and customer focused organisation.
Effective, timely communications flows are critical in the management of a crisis, to bring calm to the public.
This handbook outlines T&TEC's crisis communications response and staff roles and responsibilities.

Crisis responses will be guided by a Crisis Team under the guidance of the General Manager. The team will also comprise the Chief Operating Officer, Corporate Communications Manager and the Assistant Corporate Communications Manager.
The preparation and release of information to internal and external stakeholders is the responsibility of the Corporate Communications Department. Internal communiques may require collaboration with the Human Resources Department. Information shared with all publics should be clear, consistent and credible and done at regular intervals.

A crisis is dynamic, and management of each situation may require action that cannot be pre-prescribed. However, in managing a crisis event, the response of the Corporate Communications Department will be driven by the following priorities:

- Positioning T&TEC (and the ODPM in cases that warrant ODPM's involvement) as THE official, reliable, timely, credible source of information
- Minimising harm to people (provision of information on safety)
- Mitigating/minimising reputational impact
- Supporting staff with critical information to assist with their decision making when responding to non-work related national crises.

Crisis definition

T&TEC defines a crisis as an event or development that has the potential to harm people, property and the reputation of the Commission or, indirectly, the Government, and requires immediate co-ordinated action among internal and external parties to manage and minimise harm.

A crisis can occur suddenly, or it could begin as a small problem that escalates to greater proportions. It can stem from natural sources (e.g., adverse weather),

human triggers (e.g., customer service, serious or fatal accidents) or mechanical causes (e.g., generation failure, gas curtailment).

Event Alert Codes

CODE YELLOW

Issue with limited potential for wide-spread harm. Can be handled with individual communication. **(Escalating crises)**

Monitor and escalate response/ action as necessary.

CODE ORANGE

Issue with moderate Area impact with potential for significant harm if not properly managed. **(Escalating and sudden crises)**

Monitor and activate plans for communication with the ODPM and public communications

CODE RED

Issue with Wide Area/ national impact. **(Sudden Crises)**

Activate plans for communication with the ODPM and public communications.

ODPM will determine if NEOC will be activated.

Procedures

Escalating Crises

EVENT CODE: **YELLOW** to **ORANGE**

Adverse weather- Yellow to Orange alerts **(moderate to high risk) and Hurricane/Storm Warning/ Watch**

In the event that adverse weather interrupts internet and or telecommunications services, the Manager-Information Systems and the Manager Communications and Networking will be responsible for directing the response to restore internal and external IT and telecommunications systems.

Head Office, Mt Hope and most of T&TEC operating centres are outfitted with backup generators to restore electricity within seconds, in the event of a loss of power at the Commission's facilities.

Restoring channels of communication is a priority to allow the Commission to share information with the public.

ACTIVITY	ACTION	RESPONSIBLE PERSON
EVENT CODE RED		
Following the issuance of a Tropical Storm Watch alert	The General Manager (GM) will determine and advise Divisional Heads and Managers on the activation of the Emergency Operations Centre.	GM
	The Corporate Communications Manager (CCM) will issue an email to all staff and via work chat groups on behalf of the GM, advising of actions to be taken. All Chief Officers will verbally advise HODs and their staff of actions to be taken.	
	The Corporate Communications Manager (CCM) will report to the Operations Centre in Mt Hope	**CCM**
Activation of the NEOC by the ODPM	Emergency Support Facilitators (ESF) to the ODPM will report to the NEOC to act as in-person liaisons between T&TEC and the ODPM	**ESFs (HSEM, Snr HSEC)**

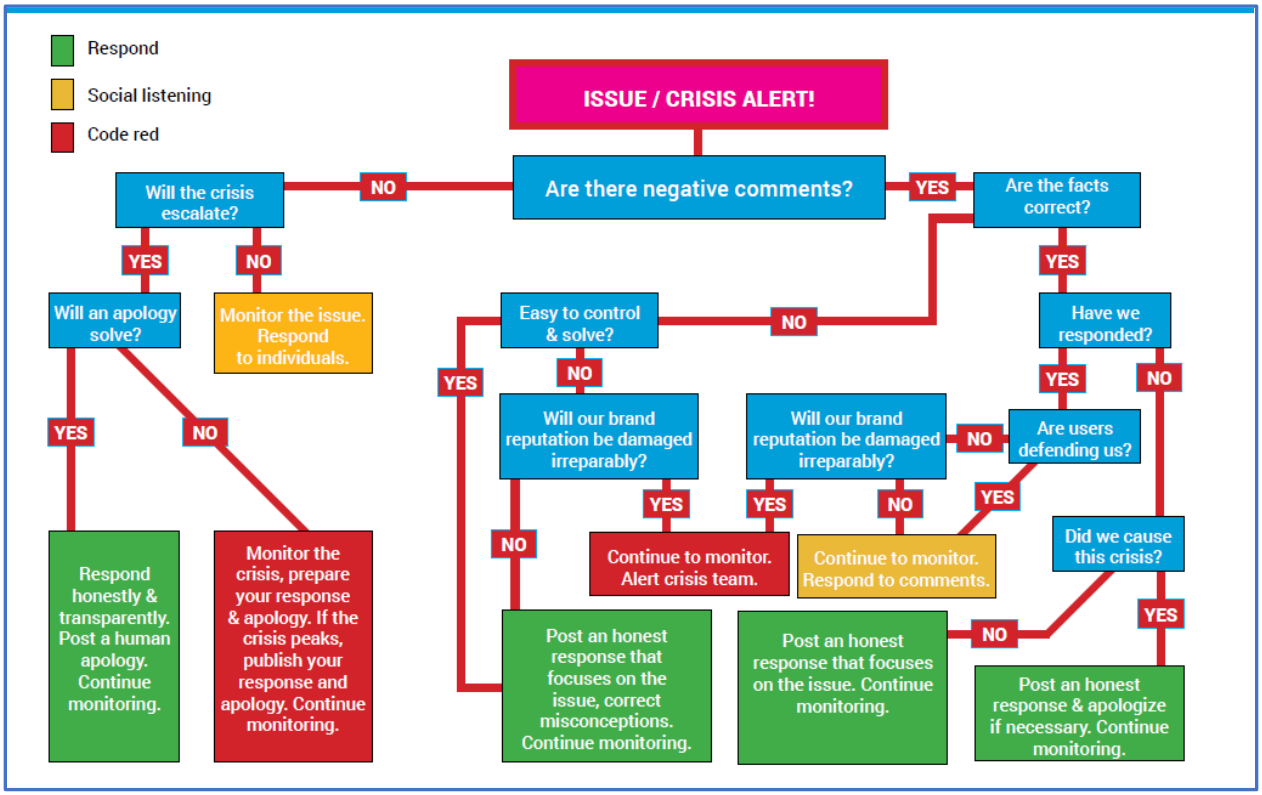
ACTIVITY	ACTION	RESPONSIBLE PERSON
T&TEC's Operations Centre will not be activated in the following conditions, however the response actions are applicable to BOTH Adverse Weather Alerts and Storm/ Hurricane conditions.		
Adverse weather **ORANGE** alert received by e-mail from the Meteorological Services of Trinidad and Tobago (Met Office)	Distribution Support to roster additional staff to cover shifts	**DSM/ Call Centre Supervisor**
	Designated Corporate Communications staff will be assigned to temporary shift work (at Mt Hope)	**CCAs**
	Corporate Communications to: Issue media release and social media post regarding yellow alert and possible impact on T&TEC's systems. Post social media tips regarding electricity safety during and after adverse weather. Post reminder of call centre numbers, including a note on possible increased call volumes and delayed response times.	**ACCM**
	Liaise with HR to develop employee messages, issue messages and assist with providing feedback to employees as requested by HR.	**CCO**
	Designated IS staff will activate the "emergency updates" tab on the website	**Systems Analysts**
	Emergency Support Facilitators to the ODPM will be on standby to issue updates via email and/or phone	
EVENT CODE ORANGE		
MET Office YELLOW to RED ALERTS 50% increase in call volume to the call centre and or increased adverse weather activity	Distribution Areas will be instructed to start entering outage/ restoration information on the shared outage report sheet.	**CCM**
	Corporate Communications staff will extract relevant data in one-hour intervals or as directed by the CCM, convert it to the required formats and disseminate as follows: • Share with the ODPM, Government	**CCAs**

ACTIVITY	ACTION	RESPONSIBLE PERSON
	Communications and media via email • Post to social media platforms • Forward to IS for updating the website Staff will also monitor social media platforms and media listening dashboard for sentiment and engagement and take action accordingly: • Reports- forward via email to the call centre and supervisors to update the TR system • Comments that go against community standards- delete or hide • Respond to relevant comments to provide clarity or answer questions where necessary • Escalate other matters to the CCM/ ACCM Draft supplemental statement on the impact of the adverse weather and restoration efforts and hold. Note: The Corporate Communications Manager, in conjunction with the General Manager, will determine if any supplemental information should be issued to the public	**ACCM**
In the event outages triggered by adverse weather are expected to go past night fall	Contact the TTPS with updates on the status of outages and restoration times.	**???**

Social media or customer service matters

The chart below outlines the actions for the progression of an escalating social media or customer service crisis.

ACTIVITY	ACTION	RESPONSIBLE PERSON
EVENT CODE YELLOW TO RED		
Monitor social media channels and Social Listening dashboard	Highlight escalating/ trending issues or issues that could become a trend.	**CCA**
Individual issues with little potential for wide-spread public impact.	Respond privately to the individual. If the issue was raised publicly and the response can be beneficial to the public (e.g., give clarity on a procedure) respond publicly.	**CCA**
Determine the facts of matter	Speak with relevant HOD/ Supervisor to gather details to prepare a holding statement	**CCAs/ ACCM**
	Prepare holding statement and alert Crisis Team	**CCAs/ ACCM**
	Post statement and email to traditional media if required	**CCAs/ ACCM**
Determine next steps	Determine the potential for harm and appropriate responses- will a statement suffice; media interviews/ media conference; public relations	**Crisis Team**



Sudden Crises

Significant system disturbance, Member of the public/ employee accident

Note: T&TEC has lodged a two-way radio with the ODPM's operation centre, which is connected to T&TEC's control room's channel. Either party can initiate communication.

After a significant system disturbance that has interrupted internet and or telecommunications services, the Manager-Information Systems and the Manager Communications and Networking will be responsible for directing the response to restore internal and external IT and telecommunications systems.

Head Office, Mt Hope and most of T&TEC operating centres are outfitted with backup generators to restore electricity within seconds, in the event of a loss of power at the Commission's facilities.

Restoring channels of communication is a priority, to allow the Commission to share information with the public.

ACTIVITY	ACTION	RESPONSIBLE PERSON
EVENT CODE RED		
Underfrequency scheme operates and/or 10% of customers in Trinidad OR Tobago loose supply.		
	Within 15 mins, CCM is advised of the details of the issue.	GM
	Alert the ODPM control room via radio of the situation and provide periodic updates. *If/ when required, public information will be issued by the ODPM and/or T&TEC Communications*	Shift Control Engineer
	Verbally alert ODPM's Communications liaisons, T&TEC's ESFs and ACCM of the initial incident.	CCM
	Verbally alert ODPM Operations Centre	ESF
	Verbally alert TTPS	**(TBC)**
	Prepare public statement	CCM
	Verbally alert T&TEC's call centre supervisor, Head Office Operators and Corporate communications Staff	ACCM
	Verbally alert Distribution Operators	Emergency Engineer **(TBC)**
	Within 15 mins of being informed, issue public statement on the issue. *Updates should be issued in one-hour intervals, at minimum.* Channels- • Email media release to all media, ODPM, Government	CCM and designates

ACTIVITY	ACTION	RESPONSIBLE PERSON
EVENT CODE RED		
	communications. MPU, Call Centre and Corporate Communications staff. • Social media, T&TEC Mobile App ticker tape, Call Centre PBX welcome message , Website • WhatsApp messages, including audio recordings where applicable, to media and ODPM ***NB 99% of media houses no longer use fax machines and have identified email or WhatsApp as their preferred medium.*** ***All other staff will be alerted via public updates.***	
If the outage is expected to last more than two hours If the outage is expected to last more than four hours, past normal working hours Designated corporate communications staff will be assigned to temporary shift work (at Mt Hope).	Instruct the Distribution Areas to start entering outage/ restoration information on the shared outage report sheet.	CCM/ACCM
	Corporate Communications staff will extract relevant data in one-hour intervals or as directed by the Corporate Communications Manager, convert it to the required formats and disseminate as follows: • Share with the ODPM, Government Communications and media via email • Post to social media platforms • Forward to IS for updating the website Call Centre supervisor will extract information to	CCAs

ACTIVITY	ACTION	RESPONSIBLE PERSON
EVENT CODE RED		
	update Mobile app and PBX welcome message Staff will also monitor social media platforms and media listening dashboard for sentiment and engagement and take action accordingly: • Reports- forward via email to the call centre and supervisors for updating the TR system • Comments that go against community standards- delete or hide • Respond to relevant comments to provide clarity or answer questions where necessary • Escalate other matters to the CCM/ ACCM	
	Using the approved media statement draft short message for broadcast to the public through ODPM's Everbridge system or emergency SMS. [1] **Character limit 160.** ***SMS to be issued if outage is expected to last more than four hours***	ACCM
With one hour of outage	Convene discussion with ODPM's Operations	**GM and/ or CTO**

[1] The Everbridge system was being tested by the OPDM as late as August 2022. The service will be marketed and citizens will have to opt-in to receive messages. It will allow push notifications via email, SMS, social media **and other channels. Initial briefings indicate that the service will be VOIP based, which would present some limitations if internet services are compromised by a large, extended outage.**
The Emergency SMS system provided by the TSTT and Digicel is guided by MOUs between the companies and the ODPM.

ACTIVITY	ACTION	RESPONSIBLE PERSON
EVENT CODE RED		
	Manager or CEO to discuss the severity of the issue and inform national security and NEOC's response. ***If the NEOC is activated, T&TEC's ESF will report to its command centre.***	ESF
	Provide advanced updates to T&TEC's ESF at the NEOC command centre, to inform national disaster response.	Incident Commander or designate
When power is fully restored	Issue "wrap up" media release advising of full restoration	CCM or designates
If the NEOC is activated the ODPM will take primary responsibility for providing general public information updates. T&TEC will retain responsibility for information on the progress of restoration at the community level, though this will also be shared with the ODPM/NEOC		
With one hour of a daylight outage that is expected to go past two hours	ODPM will issue pre-recorded safety PSAs. T&TEC- post social media reminder of call centre numbers, including a note on possible increased call volumes and delayed response times	ODPM Communications ACCM
Daylight outage that is expected to go into dusk or an outage that has occurred just before dusk	ODPM will issue pre-recorded safety PSAs for "Afternoon"	ODPM Communications
Daylight outage that is expected to go into night or has occurred at night	ODPM will issue pre-recorded safety PSAs for "Night"	ODPM Communications

ACTIVITY	ACTION	RESPONSIBLE PERSON
EVENT CODE RED		
and is expected to go past two hours		
In the event of a total system failure the following additional procedures will apply		
	ODPM personnel will report to the studios of TTT to receive public information updates via radio or Satellite phone [2]from the CCM or GM. The TTT network will be the primary source for dissemination of information. (TBD) T&TEC will continue to try to issue updates to the other media via all other means, in the likelihood that telecommunications services return intermittently. If necessary, the Minister of Public Utilities will deliver a public statement with the technical assistance of the Ministry of Communications and TTT.	
Member of the public/ employee accident	CCM is verbally alerted on the incident	GM/COO/Head Security
	Prepare media statement and hold release pending	CCM

[2] NB Satellite phone are preferred to radio for extended conversation, such as will be required for media/public briefings. The ODPM's Communications unit does not currently (August 2022) have a satellite phone

ACTIVITY	ACTION	RESPONSIBLE PERSON
EVENT CODE RED		
	discussion with the crisis team.	

APPENDIX 1 —EMERGENCY MESSAGE TEMPLATES

All Users email regarding the yellow alert

All staff are advised that the MET office has issued an Adverse Weather Alert - YELLOW LEVEL.

This alert comes into effect at [time and date] for [locations]

Staff are reminded to be safe and follow the advice of the MET office and the ODPM during the passage of the weather system

[insert a copy of the alert]

[Insert links to MET, TTEC and ODPM social media pages]

All Users email regarding adverse weather conditions

All staff are advised that the Office of Disaster Preparedness and Management (ODPM) has issued an advisory on approaching adverse weather due [insert reason given by ODPM].

Staff are reminded to be safe and follow the advice of the MET office and the ODPM during the passage of the weather system

[insert a copy of the alert]

[Insert links to MET, TTEC and ODPM social media pages]

Media Release and Social Media Post Re Weather Alert

CUSTOMER ADVISORY

T&TEC wishes to advise its customers that the Met Service has issued an Adverse Weather Alert – Yellow level. This alert comes into effect at [time and date] for [locations].

Adverse weather may impact T&TEC's above ground system, leading to fallen lines, poles and flooding of equipment. T&TEC's crews are on the alert to respond to any issues in the quickest possible time based on the severity of the impact. Our call centre remains open but please note that due to increased call volumes during such events you may experience delayed response times.

Follow us on facebook @TTElectricityCommisison and stay tuned to the media for further updates.

To make a report, call 800 TTEC (8832) or 800 BULB (2852)

Underfrequency scheme activates and/or 10% of customers in Trinidad OR Tobago loose supply

Advisory on Large Area Electricity Outage

T&TEC wishes to advise the public that at **[time]** it experienced a [significant] fault on its system stemming from **[identify initial cause].**

As a result, there was automatic shedding of load across Trinidad [the country—if Tobago is also affected] and several areas are currently without an electricity supply, including the list following.

The Commission is speaking with the power producer to determine the nature of the issue and the time for restoration.

An update will be provided at **[hour]** or sooner.

Some of the affected areas include: **[list areas]**

ODPM pre-recorded PSA scripts

Within one hour of a daylight outage that is expected to go past two hours

The public is advised that a power outage is affecting a large number of areas across the country. T&TEC is working to resolve the matter in the shortest possible time. The ODPM and T&TEC would like to share the following safety tips:

1. Motorists are advised to drive cautiously and to be on the alert at traffic lights and intersections.
2. If you currently have a back-up power supply, charge your devices.
3. Minimise opening refrigerators and freezers to reduce the risk of food spoilage.
4. Keep battery powered radios and emergency lights handy.
5. Periodically check on neighbours and persons in need of assistance.
6. Disconnect major appliances and electronics to avoid damage from electrical surges.
7. Activate your plan for power dependent medical devices.
8. Stay tuned to official sources for updates.

"Afternoon"

Daylight outage that is expected to go into dusk or an outage that has occurred just before dusk

This is an update on the power outage that is affecting a large number of areas across the country. The ODPM and T&TEC would like remind persons to remain prepared while the power outage is being resolved.

1. Motorists are advised to drive cautiously and to be on the alert at traffic lights and intersections.
2. Disconnect major appliances and electronics to avoid damage from electrical surges.
3. Minimise opening refrigerators and freezers to reduce the risk of food spoilage.
4. Keep battery powered radios and emergency lights handy.
5. Ensure you have an emergency kit with enough food and water.

6. Ensure you have a backup source for powering medical equipment and items for animal care.
7. During nightfall, if you are not required to go outdoors, refrain from doing so.
8. Keep external doors locked and refrain from leaving windows without burglar proofing open.
9. Periodically check on neighbours and persons in need of assistance.
10. The public is advised to avoid loitering during nightfall.

All agencies are working together to restore essential services as soon as possible. Let us continue to work together to keep each other safe.

"Night"

Daylight outage that is expected to go into night or has occurred at night and is expected to go past two hours

This is an update on the power outage that is affecting a large number of areas across the country. The ODPM and T&TEC would like remind persons to remain prepared while the power outage is being resolved.

1. Motorists are advised to drive cautiously and to be on the alert at traffic lights and intersections.
2. During nightfall, if you are not required to go outdoors, refrain from doing so. The public is advised to avoid loitering.
3. Keep external doors locked and refrain from leaving windows without burglar proofing open.
4. Periodically check on neighbours and persons in need of assistance.
5. Keep major appliances and electronics disconnected to avoid damage from electrical surges.
6. Utilise your emergency food and water supplies.
7. Keep battery powered radios and emergency lights handy.
8. Ensure you have a backup source for powering medical equipment and items for animal care.
9. Utilise Battery Powered Radio to remain updated from officials.

All agencies are working together to restore essential services as soon as possible. Let us continue to work together to keep each other safe.

Media statement Re incident with MoP

The Trinidad and Tobago Electricity Commission (T&TEC) has launched an investigation into the death of a member of the public, by electrocution/ into incident where a member of the public received an electric shock.

Initial reports indicate that **[at time] [name, age, address]** was **[describe activity the person was engaged in and the sequency of events]**. Senior officials and estate police from T&TEC visited the scene and **[expressed sympathy to relatives/ spoke to witnesses].**

Injury to members of the public under such circumstances is an ongoing concern for T&TEC. We wish to use this opportunity to again remind persons to be vigilant and perform necessary safety checks when working around overhead lines. Keep ladders, scaffolding, roof beams, oversized materials of any type and body parts at least 15 feet from electricity poles and lines. Coming into contact with, or close to, overhead lines can cause electric shock or electrocution (death).

Contact Sheet

Corporate Communications Manager

- 735-5271
- Ext 2170

Assistant Corporate Communications Manager

- 620-5093
- Ext 2180

Mt Hope Call Centre

- D: 645-7914
- D: 645-8616
- Ext 4012
- tttroublereports@ttec.co.tt

Control Room

- Ext 4440

Telecomm Exts

- North- 1511, 1512, 1770
- East- 7500
- Central-9500, 9501, 9502, 9503
- Tobago- 5410, 5412
- South 3640, 3650, 3645

Commercial Officer

- Ext 4620

Commercial Co-ordinator

- Ext 4650

Procedure for System Restoration Following a Blackout on the Island of Trinidad

SYSTEM CONTROL PROCEDURES

T&TEC-OP-SCGI-01

PROCEDURE FOR SYSTEM RESTORATION FOLLOWING A BLACKOUT ON THE ISLAND OF TRINIDAD

1.0 PURPOSE

The purpose of this procedure is the documentation of sequences of action to be taken and general principles and guidelines to be followed, in the restoration of the T&TEC Transmission and Subtransmission System following a complete Blackout on the island of Trinidad.

2.0 SCOPE

This procedure is applicable to the restoration of the power system in Trinidad by Shift Control Personnel of the System Control and Generation Interface Department, with assistance from IPP Control Room Team Leaders, under the instruction of the Incident Commander (Shift Control Engineer), following an Islandwide Blackout.

3.0 RESPONSIBILITIES

3.1 The Manager - System Control and Generation Interface and the Senior Engineer – Control shall have overall responsibility for ensuring compliance with this procedure.

3.2 The Incident Commander shall have responsibility for directing the system restoration.

4.0 REFERENCES

4.1 T&TEC Safety Rules

5.0 DEFINITIONS

5.1 Authorized Person – Shall have the meaning given to it in the T&TEC Safety Rules.

5.2 Blackout – The unplanned condition of a large portion of, or the entirety of a power system, in which no generating units[1] are synchronized to it, and thus it is completely de-energized, and service to all customers therein has ceased.

5.3 Clear – To execute switching operations upon a power system bus that result in in all circuit breakers of that bus, save its bus-section and bus coupler circuit breakers, being in the open position.

5.4 Competent Person – Shall have the meaning given to it in the T&TEC Safety Rules.

5.5 Incident Commander – That sole person who, during the system restoration following a Blackout, shall issue instructions of a system operational nature concerning the restoration, including instructions on the deployment of field personnel and instructions to the IPP Team Leaders, as described in this Procedure; and whom shall be responsible for determining the course of the restoration.

5.6 IPP Control Room – The Main Control Room at the IPP facilities, from which IPP Team Leaders will execute instructions from the Incident Commander.

5.7 Incident Technical Liaison – At any time during the system restoration, of the following officers, the first in the order here listed:

- The Senior Engineer – Control
- The Manager – System Control and Generation Interface
- The Engineering Controller
- The Chief Technical Officer
- The General Manager

who is at that time present in the Control Room and who shall pro tem, perform the role described in Clause 10.9 of this procedure.

[1] Herein the term "generating unit" is to be understood to include non-rotating or asynchronously rotating generating sources such as renewable energy sources.

5.8 Non-Operating Recorder – A person with electrical power system engineering knowledge and familiarity with the T&TEC power system, but not responsible for any of the activities involved in the system restoration. This person shall be responsible for recording the times of occurrence and particulars of significant events of the Blackout and restoration, for the purpose of preliminary reporting on the disturbance, such as is often required before all of the events of a Blackout and its restoration can be entered in the Shift Control Log.

5.9 NGC Control Room – The Main Control Room at NGC, from which the NGC Team Leader will liaise with the Incident Commander.

5.10 ODPM – Office of Disaster Preparedness and Management.

5.11 System Control Room (Control Room) – That location from which the Incident Commander will execute the system restoration.

5.12 Team Leader (IPP or NGC) – That person at each IPP Control Room or the NGC Control Room as the case may be having responsibilities most analogous to those of the Incident Commander.

6.0 PROCESS OWNERS

6.1 The Manager- System Control and Generation Interface

7.0 RESOURCES

7.1 T&TEC's Transmission Grid SCADA System

8.0 OUTPUTS

8.1 Safe, orderly, secure and rapid restoration of the power system in Trinidad and its resynchronization with the Tobago power system.

9.0 ASSUMPTIONS

9.1 The natural gas fuel supply is fully available from the inception of the restoration, onward.

9.2 The transmission and subtransmission SCADA system remains available throughout the restoration.

9.3 Normal operational voice communication channels i.e. direct telephone lines to the IPP Control Rooms and the UHF radio system remain available throughout the restoration.

10.0 PROCEDURE

10.1 Immediately upon the occurrence of a major system disruption believed to possibly be a Blackout on the island of Trinidad, the Shift Control Engineer on duty at the time of occurrence shall become the Incident Commander. Upon each shift change following the occurrence of the Blackout, the Senior Engineer – Control *may* replace the Incident Commander with the Shift Control Engineer coming on shift.

10.2 Shift Control Personnel shall verify the following:

i. That there are indeed no Commission or IPP-operated generating units in Trinidad synchronized to the T&TEC system, i.e. a Blackout has occurred on all of the island.

ii. That the power system on the island of Tobago has separated from the power system in Trinidad and continues to operate stably. Should customer service in Tobago be also affected, [T&TEC- OP-SCGI-02] shall apply.

iii. That the gas fuel supply is available at all generating facilities in Trinidad.

iv. That the SCADA system remains operable at all transmission substations

10.3 In the event of a Blackout on the island, the Incident Commander shall immediately inform the General Manager, the Manager – System Control and Generation Interface and the Senior Engineer – Control. The Manager – System Control and Generation Interface shall, in turn, immediately inform the Engineering Controller and all members of the Senior Executive.

10.4 The Incident Commander shall, via the customary operational interface, inform the Operations Manager-ODPM that there has been a Blackout.

10.5 The Incident Commander or the Senior Engineer – Control, shall appoint a Control Engineer as Non-Operating Recorder or, in the absence of same, any duly qualified person made available for the role by the Manager – System Control and Generation Interface. The Senior Engineer – Control may, as necessitated by circumstance, replace the Non-Operating Recorder by means of appointment to the role of any other duly qualified person made available for the role by the Manager – System Control and Generation Interface.

10.6 The Incident Commander shall, via the customary operational interface, inform the Team Leader at each IPP Control Room that there has been a Blackout.

10.7 The Incident Commander shall inform the Team Leader at the NGC Control Room of the Blackout through the customary operational interface.

10.8 The Incident Commander shall have the authority to exclude from the System Control Room all T&TEC Personnel not appearing on the following list:

The Manager-System Control and Generation Interface

Commissioners of T&TEC

The General Manager

The Chief Technical Officer

The Engineering Controller

The Manager – Protection and SCADA

Senior Engineers of the Protection and SCADA Department

The Senior Engineer – Control

At the commencement of the restoration, the Incident Commander shall strictly limit presence in the Control Room to this list. The Manager – System Control and Generation Interface may however, thereafter grant entry into the Control Room to personnel whose assistance he deems necessary in the restoration.

10.9 In order to maintain an environment in the Control Room in which the Incident Commander can bring his/her full and uninterrupted attention to the system restoration, all verbal communication between the Incident Commander and other persons in the Control Room shall be via the Incident Technical Liaison. The Incident Technical Liaison shall act so as to support the maintenance of an atmosphere of quiet and order in the Control Room.

10.10 The Shift Control personnel shall Clear, or request of the IPP Control Room Team Leaders that they Clear, the following buses:

i. Union Estate 220 kV
ii. Penal 66 kV
iii. Penal 33 kV
iv. Brechin Castle 132 kV
v. Pt. Lisas 132 kV
vi. Pt. Lisas 66kV
vii. TGU 220 kV
viii. Contour Global Trinity Power 132 kV

In the relevant verbal communication to the IPPs, the term "Clear" shall be explicitly used.

10.11 All substation capacitor bank circuit breakers shall be opened.

10.12 The Incident Commander, in conjunction with personnel from the Protection and SCADA Department, shall, to the extent possible, determine whether a short circuit fault condition initiated the disturbance leading to the Blackout, or whether any short circuit fault condition has developed during the course of the disturbance, and verify that the faulted apparatus have been separated from the rest of the system by the opening of relevant circuit-breakers, and if not, effect such action.

10.13 The Incident Commander shall determine from each IPP Control Room Team Leader whether there are any generating units operating at full-speed no-load (FSNL), i.e. running but not synchronized. The Incident Commander shall instruct these generating facilities to keep any FSNL units in that state pending further instruction. The Incident Commander shall instruct the Team Leader at all other generating facilities to commence to black-start a generating unit, in accordance with the IPP's black start restoration procedure and prepare to perform a dead-bus energization of their high-voltage bus using that unit.

10.14 The Incident Commander shall instruct all Distribution Area Duty Personnel and Telecom Operators that in no reconfiguration of their distribution networks, shall feeders from different substations be paralleled, until further notice by the Incident Commander.

10.15 The Incident Commander shall request of the Transmission Maintenance Department and Distribution Areas as necessary, that they deploy available Authorized Persons, and Competent Persons, if necessary, to critical substations.

10.16 The Incident Commander shall instruct each generating facility at which there are FSNL units, to perform a dead bus energization of the high-voltage bus to which those

units' generator step-up transformers are normally connected, using only one FSNL unit for each such bus, any other FSNL units being held in reserve. These high voltage buses should be energized to nominal voltage at a frequency slightly above nominal [2] in anticipation of loading. Where possible, a small block of prospective demand, as electrically local as possible to the high voltage bus to be energized as per this Clause 10.16 or Clause 10.17 below, and estimated to amount to on the order of 3 % to 10 % of the capacity of the generating unit with which the dead bus energization is to be achieved, shall be identified and connected to that high voltage bus prior to its energization.[3]

10.17 The Incident Commander shall instruct the IPP Control Room Team Leader at each generating facility at which any generating unit has been successfully black-started to similarly energize the high-voltage bus to which the generator step-up transformer of the black-started generating unit is connected.

10.18 The prime mover control mode of each unit energizing a high voltage bus as per 10.16 or 10.17 above must be placed in a frequency sensitive mode (droop control) and its excitation control must be placed in automatic voltage regulator (AVR) mode.

10.19 General Principles of Sequential Grid Re-energization:

i. Generating facilities at which a high voltage bus has been energized as per 10.16 or 10.17 above, or subsequently energized by means of the procedure described below (all referred to as "source generating facilities"), are used as sources of start-up power for generating facilities at which no high-voltage bus has as yet been energized ("target generating facilities").

ii. Power pathways for the purpose of energizing target generating facilities from source generating facilities are established. Initially, power pathways should preferentially consist of 33 kV and 66 kV overhead circuits and shorter 132 kV

[2] Approximately 60.25 Hz.
[3] This is to provide a small stabilizing load for the generating unit that will first energize the source generating facility.

overhead circuits, rather than longer 132 kV overhead circuits, 220 kV overhead circuits or underground cable circuits.[4]

iii. At the target generating facility, it is very preferable that the power pathway terminate on a circuit breaker across which synchronization can be performed.[5]

iv. Initial power pathways should be energized in stages as follows:

a. The chosen pathway is sectioned by opening circuit breakers along its length, thereby creating sections generally one circuit long.

b. The pathway is built out, one section at a time, from the source facility.

c. Where possible, at the end of a section about to be energized more distant from the source generating facility, a small block of prospective demand, estimated to amount to on the order of 3 % to 5 % of the synchronized generating capacity on the energized electrical island containing the source generating facility, is identified and connected to the section. In this and in the initial loading of high voltage buses at source generating facilities as per Clause 10.16, preference shall be given to the Critical Customer Demands included herein as Attachment C and any other customer demand as directed by the Senior Executive via the Incident Technical Liaison.

d. The section, with its prospective end-demand, is then energized from the source generating facility, via the pathway, thus far built-out and energized.

e. Appropriate adjustments in generating unit excitation and of distribution and/or transmission transformer tap-changers are then made for voltage and reactive power management. Further, the speed setpoint(s) of the generating unit(s) on the power island containing the source generating facility are

[4] Unloaded transmission circuits, energized at one end only, normally exhibit at the far end, voltages greater than that at the source end. All other things being equal, the percent voltage rise is more pronounced in higher voltage circuits and in cable circuits than in overhead circuits. The guidance given here is therefore to reduce the probability of disruptive over-voltage on circuit re-energization.

[5] This, so that, should an unenergized generating facility (the target facility) become energized by blackstart during the establishment of the initial power pathway to it from an earlier-energized facility (the source facility), the two could be synchronized via the pathway, thus making unnecessary the retrograde measure of de-energizing the high voltage bus at the target facility, simply in order to interconnect the two facilities.

adjusted to bring the system frequency slightly above 60 Hz in anticipation of the next incremental imposition of demand.

f. Steps c through e above are repeated until the line terminals of the terminal breaker at the target generating facility have been energized.

g. If at this time the high voltage bus at the target generating facility is still de-energized, it is energized by closing that circuit breaker after appropriate checks that the high voltage bus is indeed cleared. If, however, the target generating facility has achieved self-energization by blackstart, a synchronization at that circuit breaker is executed. A list of the high voltage circuit breakers equipped with synchronizing capability is included as Attachment B.

v. Once an initial power pathway is established as per (ii) through (iv) of this Clause 10.19, it is strengthened by the energization and loading of circuits in parallel with the initial pathway. In this strengthening phase the use of pathways of higher nominal voltage result in much greater strengthening, so should be preferred, with reduced regard to circuit length.

Suggested/preferred power pathways for various combinations of source and target generating facilities are tabulated in Attachment A, with reference to the routes numbered in Figure A1 thereof.

vi. Energization and loading of transformers:

This section describes practice to be followed in the energization of transformers pursuant to Sections i through v above.

a. Particularly during the early loading of source generating facilities, where a transformation at a T&TEC or IPP-owned substation is to be energized, only one transformer in that transformation should be energized at any one time. Likewise, only one generator step-up transformer should be energized at any one time. [6]

[6] These in order to minimize the magnetizing inrush current that would be imposed on lightly loaded generating capacity.

b. Particularly during the early loading of source generating facilities, where a large transmission or interbus transformer that is normally electrically local to a generating facility is to be energized, it may be preferable that it be energized the "electrically long way around": Rather than energizing the transformer directly from the source bus, as much line impedance as is reasonably feasible should be inserted between the source of energization and the transformer. This approach is illustrated by way of examples in Attachment D.

c. Prior to energizing any transformer at one set of its terminals, care should be taken to set its taps so as to minimize the possibility of overvoltage on the other set(s) of terminals. Further, where the terminals of the other set of windings are essentially open-circuited and are not connected to system neutral,[7] such energizations are not to be performed unless it is *certain* that these otherwise isolated terminals would **not** be energizing any set or sets of potential transformers, or other essentially unloaded transformers of similarly small capacity connected phase to earth.[8]

d. Where customer load will be energized upon energization of the transformer, care should be taken to set its taps to minimize the probability of unacceptable over- or under-voltages being imposed on customers.

e. Prior to loading an already energized transformer, care should be taken to set its taps so as to minimize the unnecessary flow of reactive current through the transformer (i.e. to minimize the circulation of reactive currents with other transformers).

vii. Until each generating facility has been synchronized,[9] should the aggregate demand served on any electrical island exceed ¾ the synchronized capacity on

[7] i.e. delta, and star windings the neutral of which is not connected to earth.

[8] As this arrangement would create conditions conducive to potentially very destructive ferroresonance.

[9] Or deemed unnecessary for serving the anticipated post-restoration system demand

that island, consideration should be given to synchronizing an additional generating unit to that island.

viii. Throughout the restoration, in addition to that returned pursuant to other parts of this Procedure, customer service should be returned as rapidly as prudently possible, with preference being given to the critical demand listed in the appendix and as directed by the Senior Executive via the Incident Technical Liaison, but always in discrete blocks, energized one at a time, each generally not larger than 10 % of the generating capacity synchronized on the given island.

10.20 The island of Tobago shall be resynchronized with the Trinidad system when, in the judgement of the Incident Commander, the latter has materially regained its pre-disturbance level of system security.

11.0 ATTACHMENTS

A. System Restoration Power Pathways

B. High Voltage Circuit Breaker Synchronizing Capability

C. List of Critical Demands

D. Examples of energization of large transformers electrically close to generating facilities with inserted circuit impedance for the reduction of inrush current seen by generating units there

Attachment A: System Restoration Power Pathways

Suggested /Preferred† System Restoration Power Pathways between Generating Facilities						
Source Bus / Target Bus	**TGU**	**Trinity**	**PowerGen Penal (66 kV)**	**PowerGen Penal (33 kV)**	**PowerGen Pt. Lisas (132 kV)**	**PowerGen Pt. Lisas (66 kV)**
TGU		8, 5, 4, 3, 2, 1.	15, 14 9, 4, 3, 2, 1.	13, 14 9, 4, 3, 2, 1 (See Note 1).	7, 5, 4, 3, 2, 1.	As immediately left (See Note 1).
Trinity	1, 2, 3, 4, 5, 8.		11 or 12, 10, 6, 8. 9, 5, 8.	As immediately left (See Note 1)	7, 8.	As immediately left (See Note 1).
PowerGen Penal (66 kV)	14, 15 1, 2, 3, 4, 9.	8, 5, 9. 8, 6, 10, 11 or 12.		Note 1	7, 5, 9. 7, 6, 10, 11 or 12.	As immediately left (See Note 1).
PowerGen Penal (33 kV)	14, 13 As per above (See Note 1)	As per above (See Note 1)	Note 1		As per above (See Note 1)	As immediately left (See Note 1).
PowerGen Pt. Lisas (132 kV)	1, 2, 3, 4, 5, 7.	8, 7.	11 or 12, 10, 6, 7. 9, 5, 7.	As immediately left (See Note 1)		Note 1
PowerGen Pt. Lisas (66 kV)	As per above (See Note 1)	As per above (See Note 1)	As per above (See Note 1)	As immediately left (See Note 1)	Note 1	
Note 1: Via the interbus transformers at the facility						

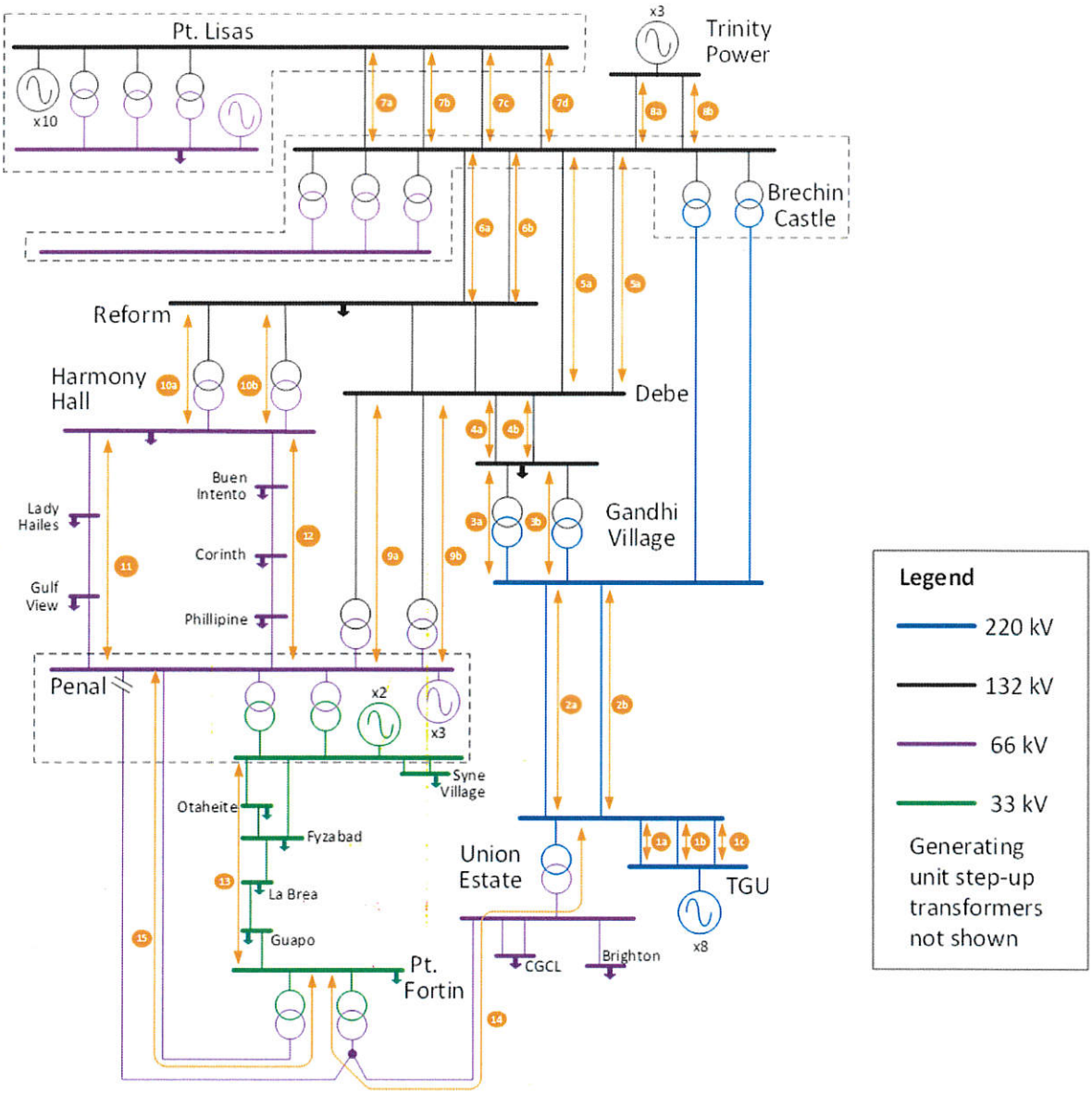


Figure A1: Suggested System Restoration Power Pathways

Attachment B: High Voltage Circuit Breaker Synchronizing Capability

CIRCUIT BREAKERS WITH SYNCHRONIZING CAPABILITIES AT POWERGEN PENAL			
		FUNCTIONAL	
		YES	NO
POWERGEN PENAL 13.8 kV	Penal 6 Generator Breaker	✓	
	Penal 7 Generator Breaker	✓	
	Penal 8 Generator Breaker	✓	
	Penal 9 Generator Breaker	✓	
	Penal 10 Generator Breaker	✓	
POWERGEN PENAL 33 kV	Syne Village #1		✗
	Syne Village #2		✗
	Santa Flora		✗
	Fyzabad		✗
	Otaheite		✗
	Interconnector #2 Transformer		✗
	Interconnector #3 Transformer		✗
POWERGEN PENAL 66 kV	Phillipine	✓	
	Gulf View	✓	
	Debe #2 Transformer	✓	
	St. Mary's	✓	
	Pt. Fortin #2	✓	
	Debe #1 Transformer	✓	
POWERGEN PENAL 66 kV SECTION/COUPLERS	Top Bus Section	✓	
	Bottom Bus Section	✓	
	Bus Coupler	✓	

CIRCUIT BREAKERS WITH SYNCHRONIZING CAPABILITIES AT TGU POWER STATION			
		FUNCTIONAL	
		YES	NO
TGU 13.8 kV CIRCUIT BREAKERS	TGU#12 Generator Breaker	✓	
	TGU#13 Generator Breaker	✓	
	TGU#21 Generator Breaker	✓	
	TGU#22 Generator Breaker	✓	
TGU 220 kV CIRCUIT BREAKERS IN TGU's SWITCHYARD	Circuit Breaker 10	✓	
	Circuit Breaker 20	✓	
	Circuit Breaker 30	✓	
	Circuit Breaker 35	✓	
	Circuit Breaker 40	✓	
	Circuit Breaker 50	✓	
	Circuit Breaker 55	✓	
	Circuit Breaker 60	✓	
	Circuit Breaker 70	✓	
	Circuit Breaker 75	✓	
	Circuit Breaker 80	✓	
	Circuit Breaker 90	✓	
	Circuit Breaker 95	✓	
	Circuit Breaker 100	✓	
	Circuit Breaker 110	✓	
	Circuit Breaker 115	✓	
	Circuit Breaker 120	✓	

CIRCUIT BREAKERS WITH SYNCHRONIZING CAPABILITIES AT POWERGEN PT. LISAS			
		FUNCTIONAL	
		YES	NO
POWERGEN PT. LISAS 13.8 kV	PTLS#3 Generator Breaker	✓	
	PTLS#5 Generator Breaker	✓	
	PTLS#6 Generator Breaker	✓	
	PTLS#7 Generator Breaker	✓	
	PTLS#9 Generator Breaker	✓	
	PTLS#10 Generator Breaker	✓	
	PTLS#11 Generator Breaker	✓	
	PTLS#12 Generator Breaker	✓	
	PTLS#13 Generator Breaker	✓	
	PTLS#14 Generator Breaker	✓	
POWERGEN PT. LISAS 132 kV	Brechin Castle #1 (405)	✓	
	Brechin Castle #2 (205)	✓	
	Brechin Castle #3 (1805)	✓	
	Brechin Castle #4 (140)		✗
	Bamboo #1 (1005)	✓	
	Bamboo #2 (1205)	✓	
	Bamboo #3 (1405)	✓	
	Bamboo #4 (1605)	✓	
	Bus Coupler #1 (130)		✗
	Bus Coupler #2 (230)		✗
	Bus Section North #1 (120)		✗
	Bus Section North #2 (220)		✗
	Bus Section South #1 (160)		✗
	Bus Section South #2 (260)	✓	
	132/66 kV Transformer #1 North GCB (1TN)		✗
	132/66 kV Transformer #1 South GCB (1TS)		✗
	132/66 kV Transformer#2 North GCB (2TN)	✓	
	132/66 kV Transformer#2 South GCB (2TS)		✗
	132/66 kV Transformer #3 GCB (145)		✗

CIRCUIT BREAKERS WITH SYNCHRONIZING CAPABILITIES AT CONTOUR GLOBAL TRINITY POWER LTD.

		FUNCTIONAL	
		YES	NO
TRINITY POWER LTD. 13.8 kV	TPL#1 Generator Breaker	✓	
	TPL#2 Generator Breaker	✓	
	TPL#3 Generator Breaker	✓	
TRINITY POWER LTD. 132 kV	Brechin Castle #1	✓	
	Brechin Castle #2	✓	
	Bus Section #1	✓	
	Bus Section #2	✓	

CIRCUIT BREAKERS WITH SYNCHRONIZING CAPABILITIES AT COVE POWER STATION

		FUNCTIONAL	
		YES	NO
COVE POWER STATION MEDIUM VOLTAGE 13.8 kV	CPS #1 Generator Breaker	✓	
	CPS #2 Generator Breaker	✓	
	CPS #3 Generator Breaker	✓	
	CPS #4 Generator Breaker	✓	
	CPS #5 Generator Breaker	✓	
	13.8/66 kV Step Up Transformer #1 (BAO901)	✓	
	13.8/66 kV Step Up Transformer #2 (BAO902)	✓	
	Bus Section (BAB901)	✓	

Attachment C: Critical Loads

Northern Area:

Priority	Customer	Sources of Supply			
		Preferred Feeder	Preferred Substation	Alternate Feeder	Alternate Substation (Can be same as Preferred Substation)
1	Parliament (Red House)	Nelson Exchange	Edward St	Upper St Vincent St via CHIC	NEALCO
	Parliament (Cabildo House)	Nelson Exchange	Edward St	Lower Edward St	NEALCO
	Prime Minister's Official Residence (Diplomatic Centre)	RMU in SS Yard	Belmont SS	Boissiere Vge	Carmaille Rd
	President's Official Residence	RMU in SS Yard	Belmont SS	Boissiere Vge	Carmaille Rd
	President's Personal Residence	PT Valley/Cocorite	Westmoorings	St Lucien Rd South	Deigo Martin
	Port Of Spain General Hospital	POSGH	Keate St SS	Queens Pk East	Belmont
	T&TEC Head Office	Park St Rad # 1	Master Sub	Park St Rad # 2	Master Sub
	St James Infirmary	George Cabral	Boundary St	1.Lower Bournes 2. To Boundary St SS via RMU	1.Boundary St 2.Mucurapo SS
	St Clair Medical	St Clair	OWP	Hayes St	OWP
	Westshore Medical	To Boundary St SS via RMU in Yard	Mucurapo	Westmall	Westmoorings SS
	Seven Day Adventist Hospital	George Cabral	Boundary St	Pt Valley/Cocorite	Westmoorings SS
	Guardian Media Limited	Abercromby St	Woodford Sq 6.6kV	Min of Sport	Ind Sq Central
	Express House	Govt Campus	Wasa Beetham	George St	Abattoir
	Newsday	Pembroke St via Hodgkinson	Woodford Sq 6.6kV	To Woodford Sq SS via Republic Bank	Park St
	Trinidad & Tobago Television	St Clair	OWP	St James	Mucurapo
	St Ann's Hospital	Vallot St	Cascade	Boissiere Vge	Carmaille Rd
2	Government Campus Plaza	MOE	Edward St	BIR	Edward St
	NAPA	NAPA	Keate St	New St via Princess Court	Keate St
	Ministry of Finance & Planning	Ind Sq West	Edward St	Ind Sq West via South Quay	Abattoir
	Central Bank	Ind Sq West	Edward St	Ind Sq West via South Quay	Abattoir
	Judiciary (Magistrate Court)	Upper St Vincent St via CHIC	NEALCO	St Vincent St via Cyrile Duprey	Woodford Sq 12kV
	Hall of Justice	Hall of Justice # 1	Woodford Sq 12kV	Hall of Justice # 2	Woodford Sq 12kV
	Industrial Court	London St via Caribbean Sales	Master Sub	Standard Life	Ind Sq West
	Victoria Keys	Pt Valley/Cocorite	Westmoorings	George Cabral	Boundary St
	Trinidad & Tobago Defence Force	Industrial	Chaguaramas		
	Police Headquarters	Lower Edward st	NEALCO	Nelson Exchange	Edward St
	River Side Plaza	Picadilly St	Abattoir	West	Laeventille
	Fire Services Head Quarters	Wrightson Rd	Wrightson Rd	Waterfront Rad	WASA Beetham
	WASA 33kV Substation				
	National Library	Upper St Vincent St via CHIC	NEALCO	Nelson Exchange	Edward St
	National Operations Center	NAPA	Keate St	RMU in SS Yard	Belmont SS
	Port of Spain Prison	POSGH	Keate St SS	Pembroke St	Keate St
	Ministry of Health - Head Office	Upper St Vincent St via CHIC	NEALCO	Pembroke St	Keate St
	Ministry of Education - Head Office	Parkade	NEALCO		
	Ministry of Public Utilities - Head Office	St Clair	OWP	St James	Mucurapo
	Cumberland Hill Stations	Upper Bournes	Boundary St	Patna	Boundary St
	Ministry of National Security - Head Office	Abercromby St via Temple Court	Woodford Sq 12kV	Lower Edward St	NEALCO
	CARPHA	Delhi St	Boundary St	Boissiere Vge	Carmaille Rd
	Port of Spain Regional Corporation - City Hall	Public Library	Woodford Sq 6.6kV		

Southern Area:

Priority	Customer	Feeder
1	San Fernando General Hospital	Harris Promenade
	Point Fortin Hospital	Point Fortin
	Ministry of Health – Area Hospital	Princes Town
	Ministry of Health – Hospital	Point Fortin
	Siparia Health Centre	San Francique
	Mayaro District Hospital	Radix
	Gulf View Medical Complex	Gulf View
	Southern Medical Services	St James
	Surgi-Med Medical	St James
	Victoria Nursing Home	St James
	NGC Beach field	Trintoc
	BP Amoco Energy Company of Trinidad And Tobago	Amoco
	WASA – Navet	Navet
	Heritage Petroleum - Pointe-a-Pierre	Point Fortin

Eastern Area:

Priority	Customer	Type of Customer	Feeder	Substation	Notes
1	Eric Williams Medical Sciences Complex	Hospital - Public	33 kV circuit from Mt. Hope Substation		
	Medical Associates	Hospital - Private	Farm Road	Mt. Hope	
	St. Augustine Private Hospital	Hospital - Private	St. John's Road	St. Augustine	
	University of The West Indies	School - University	33 kV circuit from St. Augustine Substation		
	Arima General Hospital	Hospital - Public	Subero Street	Malabar	Backup Supply: Railway Rd feeder out of Malabar S/S. Manual switching required on RMU
	Sangre Grande Hospital	Hospital - Public	Ojoe Road	Sangre Grande	
	Airport Authority of Trinidad & Tobago	Airport	AATT Substation supplied from 66 kV bus at Piarco S/S		
	Stanley P Ottley Building	TTEC	Ramgoolie Trace	Mt. Hope	Backup Supply: IOB feeder at Mt Hope S/S. Remote switching on RMU
	Distribution East	TTEC	Tumpuna Road	Malabar	Backup supply: La Horquetta feeder out of Santa Rosa S/S. Manual switching required on RMU
	WASA North Oropouche WTP	WASA	North Oropouche-WASA 33 kV circuit		
	WASA Brazil Arena Dam	WASA	O'Meara-Brazil Arena 33 kV circuit		
	WASA Caroni Arena Dam	WASA	Caroni Arena 66 kV bus		
	WASA Hollis Dam	WASA	Valencia	Wallerfield	

Central Area

Priority	Customer	Customer Source of Supply & Substation		House Supply for Substation	
		Normal Feeder	Alternate Feeder	Main	Alternate
1	PPGPL				
	Desalcott				
	T&TEC Central Area Office	California from Pt Lisas S/S	Carlibay from M5000 S/S		Carlibay 12kV
	DeNovo				
	Couva District Health Centre	Grant Street from BC S/S	UTT from BC S/S	Auxiliary TF	
	Couva Medical/ Training Facility	Couva Childrens Hospital from Couva S/S	UTT from BC S/S	Calcutta 12kV	
	Chaguanas Health Centre	Montrose from Chag East S/S	Penco Lands from Longdenville	Chaguanas 12kV	Auxiliary TF
	Chaguanas Police Station	Ramsaran from Chag East S/S	Chaguanas from Chag East S/S	Chaguanas 12kV	Montrose 12kV
	Couva Police Station	Grant Street from BC S/S	Carlibay from M5000 S/S	Auxiliary TF	Atlantic 12kV
	Freeport Police Station	Freeport from Central S/S	Calcutta from Couva S/S	Freeport 12kV	Calcutta 12kV
	Caroni Police Station	Caroni from Bamboo S/S		Caroni 12kV	
	Cunupia Police Station	Munroe Road from Charlieville S/S	Jerningham Junction from Charlieville S/S	Narsaloo Ramaya 12kV	
	Gran Couva Police Station	Couva Childrens Hospital from Couva S/S		Calcutta 12kV	
	Brasso Police Station	Edinburgh from Londenville S/S		Auxiliary TF	
	Longdenville Police Post	Penco Lands from Longdenville S/S		Auxiliary TF	
	Synergy/ Crime Watch office	Endeavour Mall from Endeavour S/S		Lange Park 12kV	Biljah 12kV
	Medical Associates	Montrose from Chag East S/S	Lange Park from Endeavour S/S	Chaguanas 12kV	Montrose 12kV
	Freeport Medical	Freeport from Central S/S		Freeport 12kV	
	Rampersad Medical	Freeport from Central S/S		Freeport 12kV	
	WASA Savonetta	Phoenix Park from Savonetta S/S	Bulk Sugar from Savonetta S/S	Bulk Sugar 12kV	
	WASA Taitt Madoo	Calcutta from Couva S/S	St Marys from Central S/S	Calcutta 12kV	Freeport 12kV
	WASA Carlsen Field	Edinburgh from Londenville S/S	Carlsenfield from Chag East S/S	Auxiliary TF	Chaguanas 12kV
2	T&TEC Supplies Department	Dow Village from BC S/S	Phoenix Park 12kV from Savonetta	Auxiliary TF	Bulk Sugar 12kV
	License Office	Caroni from BambooS/S		Caroni 12kV	
	Ministry of Agriculture	Narsaloo Ramaya from Charlieville S/S		Narsaloo Ramaya 12kV	
	Phoenix Park Fire Station	Phoenix Park from Savonetta S/S	Bulk Sugar from Savonetta S/S	Bulk Sugar 12kV	
	Chaguanas Fire Satation	Biljah from Endeavour S/S	Narsaloo Ramaya from Charlieville S/S	Lange Park 12kV	Narsaloo Ramaya 12kV
	Ato Boldon Stadium	Preysal from Couva S/S	Couva Childrens Hospital from Couva S/S	Calcutta 12kV	
	T&TEC Chaguanas Service Centre	Ramsaran from Chag East S/S	Chaguanas from Chag East S/S	Chaguanas 12kV	Montrose 12kV
	T&TEC Couva Service Centre	Grant Street from BC S/S	UTT from BC S/S	Auxiliary TF	
	National Operations Center Radar	Edinburgh from Longdenville S/S		Auxiliary TF	

Attachment D: Examples of energization of large transformers electrically close to generating facilities with inserted circuit impedance for the reduction of inrush current seen by generating units there

1. Energization of the 132/66 kV T/F #1 at Penal Power Station from an energized Penal 66 kV bus (Rest of System is de-energized):

   Rather than energizing this transformer by closing the Debe #1 66 kV circuit breaker at Penal, pathway 11 or 12, followed by pathways 10, 16 and 9 are energized so that the transformer is energized at its 132 kV terminals

2. Energization of a 66/33 kV "interconnector" transformer from an energized Penal 33 kV bus (Rest of System is de-energized):

   Rather than energizing this transformer by closing the 33 kV transformer circuit breaker, pathway 13 is energized, followed by pathway 15. The transformer is then energized at its 66 kV terminals.

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SYSTEM CONTROL PROCEDURES

T&TEC-OP-SCGI-02

PROCEDURE FOR SYSTEM RESTORATION FOLLOWING A BLACKOUT ON THE ISLAND OF TOBAGO

1.0 PURPOSE

The purpose of this procedure is to document the sequence of actions to be taken, general principles and guidelines to be followed, in the restoration of the T&TEC Transmission and Subtransmission System, following a complete Blackout on the island of Tobago.

2.0 SCOPE

This procedure is applicable to the restoration of the power system in Tobago by Shift Control Personnel of the System Control and Generation Interface Department, with assistance from Cove Control Room Personnel and Authorized Persons, under the instruction of the Incident Commander (Shift Control Engineer), following an Islandwide Blackout.

3.0 RESPONSIBILITIES

3.1 The Manager - System Control and Generation Interface and the Senior Engineer – Control shall have overall responsibility for ensuring compliance with this procedure.

3.2 The Incident Commander shall have responsibility for directing the system restoration.

4.0 REFERENCES

4.1 T&TEC Safety Rules

5.0 DEFINITIONS

5.1 Authorized Person – Shall have the meaning given to it in the T&TEC Safety Rules.

5.2 Blackout – The unplanned condition of a large portion of, or the entirety of a power system, in which no generating units[1] are synchronized to it, and thus it is completely de-energized, and service to all customers therein has ceased.

5.3 Clear – To execute switching operations upon a power system bus that result in in all circuit breakers of that bus, save its bus-section and bus coupler circuit breakers, being in the open position.

5.4 Competent Person – Shall have the meaning given to it in the T&TEC Safety Rules.

5.5 Cove Control Room – The Control Room in Tobago from which the Cove Shift Operator will liaise with the Incident Commander

5.6 Cove Shift Operator – That person at the Cove Control Room having responsibilities most analogous to those of the Incident Commander.

5.7 Incident Commander – That sole person who, during the system restoration following a Blackout, shall issue instructions of a system operational nature concerning the restoration, including instructions on the deployment of field personnel and instructions to the Cove Shift Operator, as described in this Procedure; and whom shall be responsible for determining the course of the restoration.

5.8 Incident Technical Liaison – At any time during the system restoration, of the following officers, the first in the order here listed:

- The Senior Engineer – Control
- The Manager – System Control and Generation Interface
- The Engineering Controller
- The Chief Technical Officer
- The General Manager

[1] Herein the term "generating unit" is to be understood to include non-rotating or asynchronously rotating generating sources such as renewable energy sources.

who is at that time present in the Control Room and who shall pro tem, perform the role described in Clause 10.9 of this procedure.

5.9 Non-Operating Recorder – A person with electrical power system engineering knowledge and familiarity with the T&TEC power system, but not responsible for any of the activities involved in the system restoration. This person shall be responsible for recording the times of occurrence and particulars of significant events of the Blackout and restoration, for the purpose of preliminary reporting on the disturbance, such as is often required, before all of the events of a Blackout and its restoration can be entered in the Shift Control Log.

5.10 NGC Control Room – The Main Control Room at NGC, from which the NGC Team Leader will liaise with the Incident Commander.

5.11 NGC Team Leader – That person at the NGC Control Room having responsibilities most analogous to those of the Incident Commander.

5.12 TEMA – Tobago Emergency Management Agency.

5.13 System Control Room (Control Room) – That location from which the Incident Commander will execute the system restoration.

6.0 PROCESS OWNERS

6.1 The Manager- System Control and Generation Interface

7.0 RESOURCES

7.1 T&TEC's Transmission Grid SCADA System

8.0 OUTPUTS

8.1 Safe, orderly, secure and rapid restoration of the power system in Tobago and its resynchronization with the Trinidad power system.

9.0 ASSUMPTIONS

9.1 The natural gas and diesel fuel supplies are fully available from the inception of the restoration, onward.

9.2 The transmission and subtransmission SCADA system remains available throughout the restoration.

9.3 Normal operational voice communication channels i.e. direct telephone lines to the Cove Control Room and the UHF radio system remain available throughout the restoration.

10.0 PROCEDURE

10.1 Immediately upon the occurrence of a major system disruption believed to possibly be a Blackout on the island of Tobago, the Shift Control Engineer on duty at the time of occurrence shall become the Incident Commander. Upon each shift change following the occurrence of the Blackout, the Senior Engineer – Control may replace the Incident Commander with the Shift Control Engineer coming on shift.

10.2 Shift Control Personnel shall verify the following:

i. That there are indeed no Commission-operated generating units in Tobago synchronized to the T&TEC system and that the island is not being energized via the Toco Link/Milford Bay #1 33 kV Submarine Cable.

ii. That the gas fuel supply is available at the Cove generating facility in Tobago.

iii. That the diesel fuel supply is available at the Cove generating facility in Tobago.

iv. That the SCADA system remains operable at all transmission substations.

10.3 In the event of a Blackout on the island, the Incident Commander shall immediately inform the General Manager, the Manager – System Control and Generation Interface and the Senior Engineer – Control. The Manager – System Control and Generation Interface shall, in turn, immediately inform the Engineering Controller and all members of the Senior Executive.

10.4 The Incident Commander shall inform the Contingency Planning Officer-TEMA that there has been a Blackout in Tobago.

10.5 The Incident Commander or the Senior Engineer – Control, may appoint a Control Engineer as Non-Operating Recorder or, in the absence of same, any duly qualified person made available for the role by the Manager – System Control and Generation Interface. The Senior Engineer – Control may, as necessitated by circumstance, replace the Non-Operating Recorder by means of appointment to the role of any other duly qualified person made available for the role by the Manager – System Control and Generation Interface.

10.6 The Incident Commander shall, via the customary operational interface, inform the Cove Shift Operator at the Cove Control Room and the Senior Engineer-Cove Power Station that there has been a Blackout.

10.7 The Incident Commander shall inform the Team Leader at the NGC Control Room of the Blackout through the customary operational interface.

10.8 The Incident Commander shall have the authority to exclude from the System Control Room all T&TEC Personnel not appearing on the following list:

- The Manager-System Control and Generation Interface
- Commissioners of T&TEC
- The General Manager
- The Chief Technical Officer

- The Engineering Controller
- The Manager – Protection and SCADA
- Senior Engineers of the Protection and SCADA Department
- The Senior Engineer – Control

At the commencement of the restoration, the Incident Commander shall strictly limit presence in the Control Room to this list. The Manager – System Control and Generation Interface may however, thereafter grant entry into the Control Room to personnel whose assistance he deems necessary in the restoration.

10.9 In order to maintain an environment in the Control Room in which the Incident Commander can bring his/her full and uninterrupted attention to the system restoration, all verbal communication between the Incident Commander and other persons in the Control Room shall be via the Incident Technical Liaison. The Incident Technical Liaison shall act so as to support the maintenance of an atmosphere of quiet and order in the Control Room.

10.10 The Shift Control personnel shall Clear, or request assistance from Cove Control Room personnel and deployed Authorised Persons to clear the following buses:

- Cove 13.8 kV
- Cove 66 kV
- Milford Bay 33kV
- Scarborough 12 kV

10.11 The Incident Commander, in conjunction with personnel from the Protection and SCADA Department, shall, to the extent possible, determine whether a short circuit fault condition initiated the disturbance leading to the Blackout, or whether any short circuit fault condition has developed during the course of the disturbance, and verify that the faulted apparatus have been separated from the rest of the system by the opening of relevant circuit-breakers, and if not, effect such action.

10.12 The Incident Commander shall request of the Tobago Distribution Area as necessary, that they deploy available Authorized Persons, and Competent Persons, if necessary, to Milford Bay, Courland Bay, Scarborough and Studley Park sub-stations.

10.13 The Incident Commander shall instruct the Tobago Telecom Operator and all Tobago Distribution Area Duty Personnel that in no reconfiguration of their distribution networks, shall feeders from different substations be paralleled, until further notice by the Incident Commander.

10.14 The Incident Commander shall determine from the Cove Shift Operator if there are any generating units at Cove Power Station operating at full-speed no-load (FSNL), i.e., running but not synchronized. The Incident Commander shall instruct the Cove Shift Operator to keep any FSNL units in that state pending further instruction. Otherwise, the Incident Commander shall instruct the Cove Shift Operator to commence to black-start a generating unit and prepare to perform a dead-bus energization of the Cove 13.8 kV bus.

10.15 The Incident Commander shall instruct the Cove Shift Operator to perform a dead bus energization of the Cove 13.8 kV bus using any one of the units running by virtue of clause 10.14, all other such units being held in reserve. The Cove 13.8 kV bus should be energized to nominal voltage at a frequency slightly above nominal in anticipation of loading.

10.16 Where possible, a small block of prospective demand at Cove 66/12 kV sub-station, estimated to amount to the order of 3 % to 10 % of the capacity of the generating unit with which the dead bus energization is to be achieved, is identified and connected. All other demand at Cove 66/12 kV sub-station shall be disconnected.

10.17 The prime mover control mode of each unit energizing a high voltage bus as per 10.15 above must be placed in a frequency sensitive mode (droop control) and its excitation control must be placed in automatic voltage regulator (AVR) mode.

10.18 The Tobago 66 kV system shall be energized to the 66 kV circuit-breakers at Milford Bay Sub-station, with load taken up at Cove 66/12 kV sub-station.

10.19 The Incident Commander shall instruct the Cove Shift Operator to synchronize all FSNL generating units held in reserve, one at a time, and as generation capacity increases, supply to customer loads shall be restored accordingly.

10.20 The Incident Commander shall instruct the Cove Shift Operator to start, run up and synchronize all other available generating units at Cove not mentioned in 10.19 above, one at a time, and as generation capacity continually increases, the Incident Commander shall continue the process to restore supply to customer loads.

10.21 Throughout the restoration process, customer service should be returned as rapidly as prudently possible, with preference being given to the critical demands listed in the appendix and as directed by the Senior Executive via the Incident Technical Liaison.

10.22 The island of Tobago shall be resynchronized with the Trinidad system when, in the judgement of the Incident Commander, the former has materially regained its pre-disturbance level of system security and the latter is in a state of readiness

11.0 ATTACHMENTS

A. High Voltage Circuit Breaker Synchronizing Capability

B. List of Critical Demands

Figure A1: Suggested System Restoration Power Pathways

Attachment B: High Voltage Circuit Breaker Synchronizing Capability

CIRCUIT BREAKERS WITH SYNCHRONIZING CAPABILITIES IN TOBAGO			
		FUNCTIONAL	
		YES	NO
COVE POWER STATION 13.8 kV	CPS #1 Generator Breaker	✓	
	CPS #2 Generator Breaker	✓	
	CPS #3 Generator Breaker	✓	
	CPS #4 Generator Breaker	✓	
	CPS #5 Generator Breaker	✓	
	13.8/66 kV Step Up Transformer #1 (BAO901)	✓	
	13.8/66 kV Step Up Transformer #2 (BAO902)	✓	
	Bus Section (BAB901)	✓	
SCARBOROUGH 12 kV BUS	SPS#7 12 kV Circuit-Breaker	✓	
	12 kV Bus Section #1 Circuit-Breaker	✓	
	12 kV Bus Section #2 Circuit-Breaker	✓	
	66/12 kV Transformer #1 12 kV Circuit-Breaker	✓	
	66/12 kV Transformer #1 12 kV Circuit-Breaker	✓	

Attachment C: Critical Loads

Tobago Area:

Priority	Customer	Average Feeder Loads (MVA)	Customer Source of Supply & Substation		House Supply for Substation	
			Normal Feeder	Alternate Feeder	Main	Alternate
1	Scarborough Hospital	3.2	Claude Noel @ Scarborough S/S	Milford @ Scarborough S/S	Auxilliaries off North RMU @ Scarborough S/S	South RMU @ Scarborough S/S
	Arthur NR Robinson International Airport	1.62	Crown Point @ Milford Bay S/S	Kilgwyn @ Milford Bay S/S	RMU off Crown Point Feeder @ Milford Bay S/S	
	Prime Minister's Official Residence	2.23	John Dial @ Scarborough S/S	Lower Windward @ Studley Park S/S	Auxilliaries off North RMU @ Scarborough S/S	South RMU @ Scarborough S/S
	President's Official Residence	3.04	Northside @ Scarborough S/S	John Dial @ Scarborough S/S	Auxilliaries off North RMU @ Scarborough S/S	South RMU @ Scarborough S/S
	French Fort Communications Tower	2.23	John Dial @ Scarborough S/S	Northside @ Scarborough S/S	Auxilliaries off North RMU @ Scarborough S/S	South RMU @ Scarborough S/S
	Port Authority of Trinidad and Tobago (Terminal Building)	2.7	Milford @ Scarborough S/S	Claude Noel @ Scarborough S/S	Auxilliaries off North RMU @ Scarborough S/S	South RMU @ Scarborough S/S
	Port Authority of Trinidad and Tobago (Ramp)	2.86	Bacolet @ Scarborough S/S	Milford @ Scarborough S/S	Auxilliaries off North RMU @ Scarborough S/S	South RMU @ Scarborough S/S
	Scarborough Police Station	2.86	Bacolet @ Scarborough S/S	John Dial @ Scarborough S/S	Auxilliaries off North RMU @ Scarborough S/S	South RMU @ Scarborough S/S
	Moriah Police Station	2.88	Arnos Vale @ Courland Bay S/S	Northside @ Scarborough S/S	Mt. Irvine @ Courland Bay S/S	Union @ Courland Bay S/S
	Crown Point Police Station	1.62	Crown Point @ Milford Bay S/S	Kilgwyn @ Milford Bay S/S	RMU off Crown Point Feeder @ Milford Bay S/S	
	Shirvan Police Station	3.09	Friendship @ Cove S/S	Mt. Irvine @ Courland Bay S/S	Plantation @ Cove S/S	
	Trinidad and Tobago Coast Guard (Tobago Base)	2.7	Milford @ Scarborough S/S	Plantations @ Cove S/S	Auxilliaries off North RMU @ Scarborough S/S	South RMU @ Scarborough S/S
	Scarborough Health Center	2.23	John Dial @ Scarborough S/S	Bacolet @ Scarborough S/S	Auxilliaries off North RMU @ Scarborough S/S	South RMU @ Scarborough S/S
	WASA Hillsborough Dam	2.23	John Dial @ Scarborough S/S	Lower Windward @ Studley Park S/S	Auxilliaries off North RMU @ Scarborough S/S	South RMU @ Scarborough S/S
	WASA Courland Water Works	1.89	Union @ Courland Bay S/S	Mt. Irvine @ Courland Bay S/S	Mt. Irvine @ Courland Bay S/S	Union @ Courland Bay S/S
	National Gas Company of Trinidad & Tobago	2.6	Plantation @ Cove S/S		Plantation @ Cove S/S	
	Radio Tambrin	2.86	Bacolet @ Scarborough S/S	John Dial @ Scarborough S/S	Auxilliaries off North RMU @ Scarborough S/S	South RMU @ Scarborough S/S
	TRICO/Channel 5 News	4.12	Shirvan @ Cove S/S	Claude Noel @ Scarborough S/S	Plantation @ Cove S/S	
2	Tobago House of Assembly Chamber	3.04	Northside @ Scarborough S/S	John Dial @ Scarborough S/S	Auxiliaries off North RMU @ Scarborough S/S	South RMU @ Scarborough S/S
	Judiciary of Trinidad and Tobago (Tobago Supreme Court)	2.86	Bacolet @ Scarborough S/S	John Dial @ Scarborough S/S	Auxiliaries off North RMU @ Scarborough S/S	South RMU @ Scarborough S/S
	Tobago House of Assembly Main Administration Building	3.04	Northside @ Scarborough S/S	John Dial @ Scarborough S/S	Auxiliaries off North RMU @ Scarborough S/S	South RMU @ Scarborough S/S
	Scarborough Magistrate Court	2.86	Bacolet @ Scarborough S/S	John Dial @ Scarborough S/S	Auxiliaries off North RMU @ Scarborough S/S	South RMU @ Scarborough S/S
	TSTT Scarborough Exchange	2.86	Bacolet @ Scarborough S/S	John Dial @ Scarborough S/S	Auxiliaries off North RMU @ Scarborough S/S	South RMU @ Scarborough S/S
	Shaw Park Cultural Complex	2.7	Milford @ Scarborough S/S	Plantation @ Cove S/S	Auxiliaries off North RMU @ Scarborough S/S	South RMU @ Scarborough S/S

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

ENTERPRISE RISK MANAGEMENT POLICY

1.0 INTRODUCTION

All organisations are exposed to risks. "Risk" can be defined as the effect of uncertainty on objectives. An effect is a deviation from the expected and can be positive, negative or both and can address, create or result in opportunities and threats.

Enterprise Risk Management (ERM) is an integrated approach to proactively manage risks which can potentially affect the achievement of the organisation's objectives. Managing risk is a key governance and management function and is an integral part of all of the Commission's processes and operations. ERM is a systematic, structured, inclusive, consultative, timely and iterative process responsive to external and internal changes. All employees are actively and directly involved in the Commission's risk management processes and operations.

2.0 PURPOSE

2.1 To ensure that all current and future risk exposure to the Commission are identified, assessed, mitigated and managed.

2.2 To promote an enterprise wide approach by integrating risk management processes into business strategy, project management, organizational processes, decision making, audit and compliance and general governance functions

2.3 To provide appropriate, consistent and transparent ownership and accountability for risk mitigation

2.4 To enable the design and implementation of treatment plans and controls that are resourced effectively to mitigate risks and are structured to promote the effective realisation of objectives

2.5 To recognise that the timely and accurate monitoring, review, communication and reporting of risk is critical to providing mechanisms for effective management of risk occurrences and consequences

2.6 To govern overall, the Commission's risk management activities in support of the achievement of corporate objectives, to protect stakeholders and the entities' assets, and ensure financial sustainability.

3.0 SCOPE

This policy applies to all personnel for which the Commission is responsible: management; employees; contractors; customers; and visitors to the facilities under the Commission's purview. Detailed risk management procedures already exist to cover specific aspects of the Commission's operations including, but not limited to: health, safety and the environment; substance abuse; and procurement.

3.1 Principles of Risk Management

In order to fulfil the objectives of the policy and to lay a strong foundation for the development of an integrated risk management framework, the policy outlines the following guiding principles of risk management:

- All business decisions will be made with the prior information and acceptance of risks involved
-The risk management policy will help in the enhancement and protection of business value from uncertainties, consequent losses and unutilised opportunities.
-All employees aid in the process of risk identification and monitoring and shall be made aware of risks in their respective domains and their mitigation measures
-The risk mitigation measures adopted by the Commission shall be effective in the long term and to the extent possible, be embedded in the business processes of the Commission
-Risk appetite /tolerance levels will be regularly reviewed and may be adjusted by changes in relevant factors including the company's objectives, strategies or resources
-The occurrence, progress and status of all risks will be promptly reported and appropriate actions will be taken thereof.

3.2 ERM Framework

The ERM framework refers to a set of components that provide the foundation for designing, implementing, monitoring, reviewing and continually improving risk management throughout the Commission. The framework adopted by the Commission is based on the "Risk Management – Guidelines" developed by the International Organization for Standarization (ISO 31000:2008 Second Edition)

4.0 RISK GOVERNANCE

This governance structure embodies rules, practices and processes by which the Commission is directed and controlled, and also outlines the accountability levels for ERM within the Commission as follows:

4.1 Board of Directors

-Understand the Commission's risk philosophy and concur with its risk appetite
-Know the extent to which management has established effective enterprise risk management processes of the organization
-Review the entity's portfolio of risk and consider it against the entity's risk appetite.
-Be apprised of the most significant risks and whether management is responding accordingly

4.2 Risk and Audit Committee

-approve the risk management framework, methodologies, overall policies and roles/responsibilities
-verify risks are being managed within organisation's overall risk appetite
-address escalated risk issues

4.3 **General Manager and Senior Executives**

-Leading the setting of strategic objectives for the Commission

-Inspire and foster cultural change in support of ERM as a value and best practice for the Commission

-Lead management discussions with the Board regarding institutional strategy and risk philosophy

-Review and approve recommendations for the ERM department (taking into consideration accompanying independent assessment from Board members) regarding the development and implementation of the ERM program, ERM policy, institutional risk philosophy, institutional risk or opportunities with sufficient impact on the Commission's strategic objectives to warrant development of risk response plans, and proposed response plans for these risks

-Approve the risk ratings of all risks

-Review ERM progress reports as required

-Ensure all risks are satisfactorily addressed.

4.4 **Risk Oversight Committee**

-drive establishment of risk management culture

-validate most significant risks, assign risk owners to these risks, approve action plans and resource allocation for monitoring/controlling of these risks

-review risk exposure at the corporate level and escalate risks in excess of approved risk tolerance levels to Board Sub-committees

4.5 **Heads of Department**

-Demonstrate full commitment to ERM as a value and best practice

-Support the GM and Senior Executives, Risk and Audit Committee, ERM department in creating the appropriate internal environment and institutional culture for ERM

-Through a continuous assessment process, periodically identify risk and opportunities that may affect the achievement of department / Commission's objectives

- As responsible officials, assess and manage institutional and emerging risks under the oversight of the Board

-Assess and manage unit level risk within department level plans, budgets and resource

-prepare and update the risk matrix

-propose strategies to mitigate risks

-populate risk reporting templates

-monitor remediation of risks

-Include a discussion of risks and opportunities relevant to the mission of the department or the Commission as well as the status of any response to such risks or opportunities, in their annual workplan and budget submission

4.6 **Internal Audit**

-Provide assurance to the Board and the GM on the effectiveness of the key risk management process, including the evaluation, reporting and management of key controls to mitigate identified risks

-Consult and advise on identifying and responding to risks and on the effectiveness of the risk assessment process

-conduct risk based audits

4.7 **ERM Department**

-Provide ERM guidance/technical support to the Management and Staff

-Work with HR to develop and deliver ERM training and educational material for all audiences and to conduct risk assessment workshops and interviews

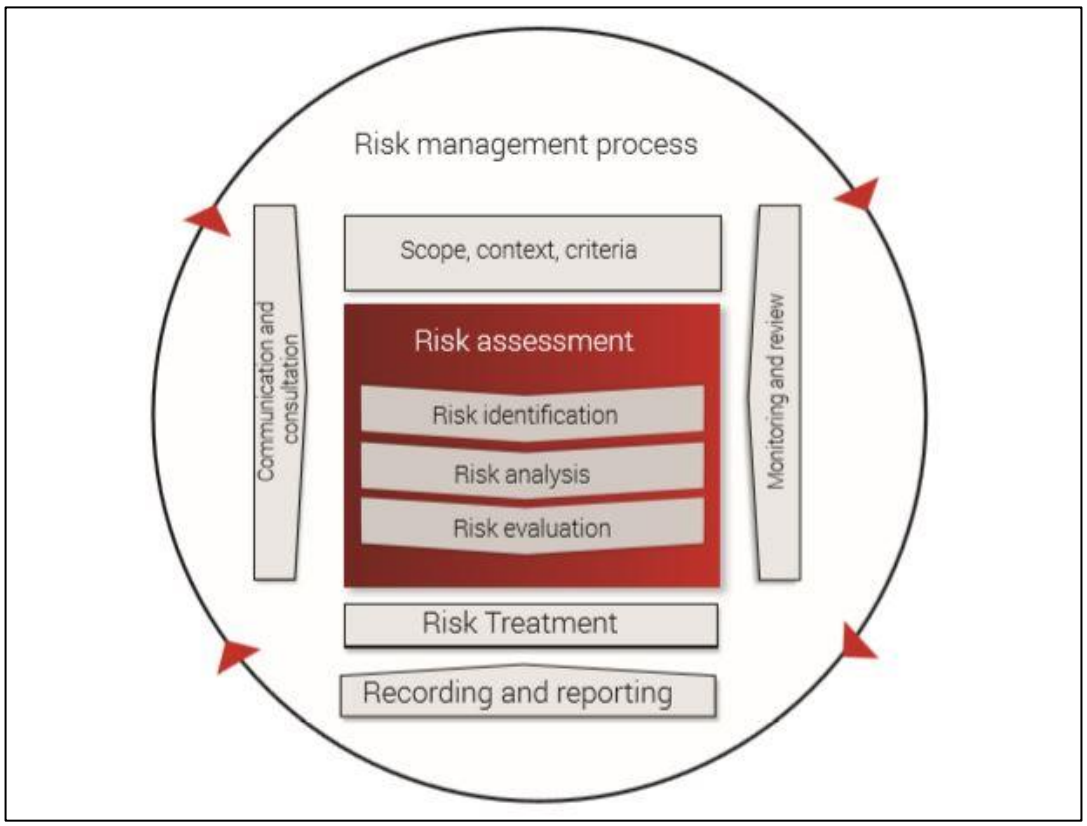
-Create and support the use of tools and processes to identify, analyse, evaluate, respond to and report on risks and ensure the consistent implementation of the ERM program across the Commission
-Assist in the development of risk response plans and advise risk owners
-Manage the Commission's risk register

5.0 ERM PROCESSES AND GUIDELINES

T&TEC shall factor risk management into all aspects of its operations including strategic planning, performance management, audit assurance, business continuity planning and project management.

The ERM processes and guidelines provide supporting information to Management aimed at ensuring that risks are actively identified, analysed, evaluated and treated in the pursuit of the Commission's objectives.

Against this background, the key process constituents of the ERM are:



Details of the risk management processes are available in the Commission's ERM Framework.

6.0 RISK REGISTER

6.1 A risk register shall be maintained and detail *inter alia*:

-description of risk
-risk reference number (Departmental and Commission)
-the probability of the risk occurring
-the severity should the event actually occur
-Risk rating of risk
-mitigation plan (actions and timelines taken in advance to eliminate or reduce the probability and / or severity of the event)
-the accountable official responsible person

6.2 The reason for the removal of any risk from the risk register must be clearly documented.

7.0 REPORTING

7.1.1 The Commission shall present to the Board/Sub Committee timely and appropriate reports on its risk management activities and its risk profile as is appropriate to ensure good governance.

7.1.2 The Commission shall present to the Board/Sub Committee bi-monthly reports on the status of implementation of treatment plans to address all "very high" risks.

7.1.3 Relevant reports should be submitted to the Senior Executives, Risk Oversight Committee and the ERM Department in a determined, timely manner to ensure the effective functioning of the ERM process.

8.0 RISK APPETITE

The Commission shall clearly articulate its risk appetite. Risk Appetite is the amount of risk that the Commission is willing to pursue or retain in pursuit of its objectives. In other words, the Commission will take risks which do not result in a breach of its risk appetite.

Risk appetite shall form an integral part of the risk management framework to demonstrate common understanding of same and to consistently measure and treat risk.

The Commission's risk appetite statements will be articulated under three key parameters:

(i) Financial and commercial parameters which provide the threshold in terms of:

-impact on annual budgeted revenue
-impact on annual budgeted profit / loss
-impact on budgeted cost / cost of completion in the case of projects in the construction stage
-aged debtors

(ii) Reliability and availability parameters which provide the threshold for:
-CAIDI (Customer Average Interruption Duration Index) hours
-SAIDI (System Average Interruption Duration Index) hours
-SAIFI (System Average Interruption Frequency Index) %
-ASAI (Average Service Availability Index) %
-Number of outages greater than 10 hours
-Spinning reserve

(iii) Reputation parameters with respect to specific stakeholders:
-Government of the Republic of Trinidad and Tobago (Ministries / Departments / Organizations)
- key customers
-key vendors
-employees
-media/general public

(iv) Other qualitative parameters regarding
-environment, health and safety
-business disruption / project delays
-legal issues
-position with regulator

9.0 REFERENCES AND RELATED DOCUMENTS

Reference/ Statutory References	ISO 31000 Risk Management – Guidelines
Associated Policies	T&TEC's ERM Framework T&TEC's General Instructions
Attachments	Risk Likelihood Assessment Table Risk Impact Assessment Table Risk Rating Matrix

10.0 APPENDICES

Risk Likelihood Assessment Table

Rating	Descriptor	Parameters
1	Low	≥ 50% chance of strategic objective /action being achieved very / surprised if risk event were to occur
2	Moderate	26-49% chance of strategic objective /action being achieved risk event approaching a toss up
3	High	5 -25% chance of strategic objective /action being achieved surprised if risk event did **NOT** occur
4	Very High	<5% chance of strategic objective /action being achieved very surprised if risk event did **NOT** occur

Risk Impact Assessment Table

Rating	Descriptor	Parameters
1	Low	Almost no/insignificant financial impact No/minimal HSE impact Not likely to adversely impact /minimal adverse impact to T&TEC's strategic objectives Negligible change/minor negative effect in customer satisfaction or relationship No/minor media coverage of event
2	Moderate	Notable financial impact Moderate HSE impact moderate adverse impact to T&TEC's strategic objectives moderate customer dissatisfaction or strain on customer relationship some media coverage of event
3	High	Material financial impact Serious HSE impact serious adverse impact to T&TEC's strategic objectives significant customer dissatisfaction and loss of customer relationship national media coverage of event
4	Very High	Threatens T&TEC's solvency severe HSE impact severe adverse impact to T&TEC's strategic objectives majority of customers lost persistent national and international media coverage of event

Risk Rating Matrix

RISK RATING

1-3 Low Risk			Severity (Risk Impact)			
4-6 Moderate Risk			Low (L)	Moderate (M)	High (H)	Very High (VH)
8-11 High Risk						
12 and Above Very High Risk			1	2	3	4
Probability (Risk Likelihood)	Very High (VH)	4	4	8	12	16
	High (H)	3	3	6	9	12
	Moderate (M)	2	2	4	6	8
	Low (L)	1	1	2	3	4

APPENDIX 5

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

RISK REGISTER 2023

Item No.	Departments	Issue Summary	Risk	Sub Risk	Risk Impact	Score	Risk Likelihood	Score	Risk Rating	Mitigant Name	Mitigant Description	Status of implementation as at 30th April 2023
1	All Departments	Covid-19	HSE/Financial/Business Continuity	Pandemic	H	3	L	1	3	Covid Protocols	Develop Pandemic protocols, conduct employee training and awareness sessions, install barriers to prevent congregating, conduct continual sanitizing of workspaces and enforce protocols	Completed
2	Commercial	The debt owed by the Public Sector is high and collection rate is low	Financial	Liquidity	L	1	H	3	3	Correspondences /Meetings	Hold discussions and issue correspondence to the relevant Ministries /Government agencies with respect to the amounts outstanding, with varying levels of success.	Ongoing
3	Corporate Communications	Popularisation of social media can lead to the wide spread of dissemination of negative customer service experiences	Process & Operations	Reputational	M	2	M	2	4	Procure Services	Procure the services of a company for traditional and social monitoring Responsible Official : Corporate Communication Manager	Completed
4	Engineering	Inability to process large call volumes (more than 96 customer calls concurrently) in the advent of major system disturbances.	Operational	Customer Service & Interactions	VH	4	M	2	8	Infrastructure Upgrade	1. Install additional T1 lines 2. Improve capacity ports on PBX system	Planned
5	Engineering	Total Failure of TSTT communications network impacting on customers' ability to contact the Commission	Operational	Customer Service & Interactions	H	3	L	1	3	Infrastructure Upgrade	1. Procure additional mobile phones from second telecom provider 2. Use of additional lines to PBX from second telecom provider	Work in Progress
6	COVE P/S	Lack of HAZOP study for the expansion of plant & introduction of Natural Gas operations leading inadequate awareness of potential hazards	Operational	Supply Reliability	M	2	M	2	4	HAZOP Analysis	A consultant will be engaged to implement a HAZOP study at the Cove and Scarborough PS.	Planned
7	Distribution Central	Potential risk of exposure to hazardous gases on the Pt. Lisas Industrial Estate. A shelter in place and operating guidelines for employees working in the Industrial Estate have been established	Health, Safety & Environment (HSE)	Workplace Safety	M	2	M	2	4	Revised procedures	Update procedure and processes	Work in Progress
8	Engineering	Within the SCADA, System Control and Communication systems, there are a number of single failure points that have been identified but no action plan has been documented	Process & Operations	Supply Reliability	M	3	L	1	3	Communication Network upgrade	Review of the system design and implement redundancy	Planned
9	Engineering	The current communication fiber network is 15 years old and approaching the end of its life cycle and saturation level for transporting data	IT	Hardware	H	3	M	2	6	Communication System Expansion	Replacement and expansion of fibre optic links and upgrade of data core and access equipment.	Work in Progress
10	Engineering	Failure of Transmission Grid	Business Continuity	Customer Service and Interactions	VH	4	L	1	4	Procure items	The Customer Contact Centre and the server systems continues to be outfitted with generators and UPS to provide alternative power in the event of an outage. -Develop procedures for Recovery from Blackout and Major System Interruption (completed). -Develop written procedure for testing black start machines (completed) -Recovery drills to be done with Power Station (ongoing) -Develop crisis communications plan (completed)	Ongoing
11	Engineering	Loss of a major Communications site will result in loss of Communications to a segment controlled by that site. - Response for major site loss Chimborazo, Cumberland, Main offices.	Operational Technology	Hardware	H	3	M	2	6	Infrastructure Upgrade	1. Install new System Core to establish a robust and resilient IP Core that maintains a 100 % uptime for at least loss of 2 entire core sites. 2. Introduce greater number of Radio transmission sites to expand radio coverage to difficult radio areas and to reduce the area of coverage loss due to loss at of one Radio Site. 3. Repair of access road to Chimborazo	Work in Progress

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

RISK REGISTER 2023

Item No.	Departments	Issue Summary	Risk	Sub Risk	Risk Impact	Score	Risk Likelihood	Score	Risk Rating	Mitigant Name	Mitigant Description	Status of implementation as at 30th April 2023
12	Engineering	Loss of connectivity to public, Loss of the Contact Centre. - Loss of part or all services form Service providers. E.g. loss of phone lines from TSTT	Operational Technology	System	H	3	L	1	3	Infrastructure Upgrade	Replacement of all old TSTT technology. Upgrade from Copper to Fibre services with full migration to SIP	Work in Progress
13	Engineering	Loss of Communication via Cellular system from TSTT and/or Digicel	Operational Technology	System	H	3	L	1	3	Infrastructure Upgrade	1. Improve the coverage of the in-house Trunk Radio system in event of external system loss 2. Procure additonal satellite phones.	Work in Progress
14	Engineering	Lack of generation capacity in Port of Spain and Environs	Supply Risk	Supply Reliability	H	3	L	1	3	Infrastructure Upgrade	Construction of 2-132 kV circuits from Brechin Castle Substation to Bamboo Substation	Planned
15	Finance	The organisation only has partial insurance coverage for theft and loss.	External	External Theft & Fraud	M	2	M	2	4	Risk Assessment	A risk assessment is to be performed in conjunction with the Insurance Brokers.	Work in Progress
16	IS	There is one person in the IS department with the knowledge to administrate the majority of the IT systems	People & Culture	Key Person	M	2	M	2	4	Cross-Training and Key Function Backup	1. Two employees to be assigned to learn and shadow all the functions performed by key employees . 2. All system administrators to be cross trained in these functions. 3. Work procedures on all functions to be documented.	Completed
17	Legal	The last amendment to the T&TEC Act was in 2009 to bring PowerGen on board. There are a number of amendments that need to be passed for T&TEC to function effectively in the present and future global environment (RE industry and FIT policy)	Political	Government Overrides & Interventions	M	2	H	3	6	Amendment to the T&TEC Act	Review the T&TEC Act and forward suggested amendments to relevant parties	Work in Progress
18	Legal	Legislative compliance not robustly monitored throughout the Commission leading to inadvertent breaches that may not be captured in a timely manner.	Health, Safety & Environment (HSE)	HSE Processes & Operations	M	4	M	2	8	Compliance Notices	Quarterly periodic reminders issued to the various Areas/Departments with respect to compliance.	Ongoing
19	Metering	Meter testing equipment must be checked and recalibrated in a timely manner to ensure accuracy of meters and other critical items to ultimately guaranteed accurate revenue.	Process & Operations	Process and Product Management	H	3	L	1	3	Testing Schedule	1. Review current schedule and update to ensure that required test are included 2. Monitior to ensure that schedule is being followed 3. conduct periodic audits to check adherance to schedule	Ongoing
20	Metering	AMI System communication loss	Process & Operations	Hardware	M	2	M	2	4	Acquire mobile collectors	1. Acquire mobile collectors to enable meters reads via drive by Deadline date: December 2023	Work in Progress
21	Regulatory & Compliance	Untimely submission of reports leading to deferred annual rate reviews or adjustments.	Financial	Financial Reporting & Controls	H	3	M	2	6	Tariff Rate	Submit the 2022-2026 Business Plan to the MPU for their review and feedback and forward to the RIC for consideration.	Completed
22	Security	There is no policy or programme in place for continuous firearm training and practice	People & Culture	Adequacy	M	2	H	3	6	Continuous Training and Range Practice	(1) Certify In House Instructors so that they are readily available and cost effective for regular training - to be completed by 4th quarter 2023. Responsible Official - Assistant Head Security. (2) Finalize and implement training schedule,-Firearm Refresher bi-annually. Responsible Official - Assistant Head Security.	Ongoing
23	Security	There are psychometric testing of precepted officers prior to employment but not thereafter leading to risk of ill personnel not being detected and creating safety risks to staff and customers	People & Culture	Workplace Safety	H	3	H	3	9	Employees Welfare	Psychometric testing recommended on a needs basis.	Work in Progress
24	Security	Firearm training of the contract security officers to be audited.	Process & Operations	Information Management	H	3	H	3	9	Firearm Competency (Certification)	Contract security to submit training records for review bi-annually.	Work in Progress
25	Security	Threat and Vulnerability assessments of substations are not conducted on a continuous basis. As such there may be areas of vulnerability that are not recognized on a timely manner	Process & Operations	Process and Product Management	M	2	M	2	4	Threat and Vulnerability Assessment Audit	(1) Conducted bi-annual security evaluations . (2) Continuous weekly Patrols and Electronic monitoring by Estate Police are conducted .	Ongoing

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

RISK REGISTER 2023

Item No.	Departments	Issue Summary	Risk	Sub Risk	Risk Impact	Score	Risk Likelihood	Score	Risk Rating	Mitigant Name	Mitigant Description	Status of implementation as at 30th April 2023
26	SUPPLIES	A number of security cameras are non functional at King Village, the main warehouse	Process & Operations	Internal Theft & Fraud	H	3	H	3	9	Install security cameras	Install adequate security cameras and system of maintenance thereafter	Work in Progress
27	SUPPLIES	Material Preservation - Insufficient covered storage	External	Environmental Hazards	M	2	M	3	6	Construct additional coverage	1. Long term solution - Erection of covered storage at site. Deadline date : 2026. 2. In the short term, 3 sheds to be constructed to store materials by Dec 2023 Responsible official : Procurement and Supplies Mgr. Deadline date: Dec 2024	Work in Progress
28	SUPPLIES	Inadequate stock of critical items to ensure availablity for Disaster Preparedness	External	Disaster Risks	H	3	L	1	3	Secure location, procure stock	1. Secure location to be identified to hold critical stocks. Deadline date: June 2022 2. Procure critical stock by Dec 2024	Ongoing
29	SUPPLIES	Insufficient procurement competency and capacity	Resource	People (Capacity and Competency)	H	3	M	2	6	Recruit staff	Recruitment of additional Engineers for evaluation of tenders/RFQ	Work in Progress
30	TD&ES	Inadequate performance under single line contingencies and inability to meet future load growth for the existing Milford Bay/Courland Bay/Scarborough 33kV ring	Construction	Project	H	3	L	1	3	System Upgrade	Establishment of a 66kV subtransmission system in Tobago via the establishment of Bacolet Substation and Cove/Bacolet 66kV circuits	Planned
31	TxM	Loss of supply to the Bamboo 132 kV substation bus	Construction	Project	H	3	L	1	3	System Upgrade	In the event of an extended outage to the Bamboo 132 kV substation: 1.the short term plan will be activated to re-configure the overhead lines to restore supply to customers in North, East and parts of Central Distribution Areas. 2. Long term : establishment of 'Bamboo Bypass'	Planned
32	TxM	Loss of supply to the Bamboo - San Rafael #1 and #2 132 kV circuits (simultaneously)	Process & Operations	Process and Product Management	H	3	L	1	3	Transmission Contingency Plan	Preparation of a contingency plan for restoration of circuits.	Work in Progress

LEGEND

Risk Assessment 4x4 Matrix					Risk Rating
LIKELIHOOD	4	8	12	16	Very High
	3	6	9	12	High
	2	4	6	8	Medium
	1	2	3	4	Low
	SEVERITY				

Response requested by the Ministry of Public Utilities for the Examination into the Island Wide Power Outage and Blackout that occurred on February 16, 2022

Appendix I - Recommendations made by the Cabinet appointed Committee and Association of Professional Engineers of Trinidad and Tobago (APETT)

Item No.	Action Item	Response Update
Recommendations made by the Cabinet appointed Committee		
1	**Another 220 kV circuit should be built connecting the Union Substation to the Gandhi substation. It would be prudent that this new circuit does not use the same route as the existing Union to Gandhi circuit.**	When this recommendation was made the design was substantially completed and construction of the new circuit was already in progress. However, it must be noted that the optimal route was chosen based on the impact to landowners, soil condition, terrain, etc.
2	**An emergency response plan must be developed as a matter of urgency for the power system operation. This response plan must include an incident commander who is an aptly trained point person who would be vested with the authority and responsibility for the restoration of the grid during the duration of the emergency.**	These response plans being one for Trinidad and the other for Tobago were both approved in July 2022, and disseminated. Their incorporation into operator training and assessment has commenced.
2	**An annual independent power system resilience review and power system risk assessment shall be performed to identify power system vulnerabilities that can lead to catastrophic power system failure. This should be reviewed by an independent technical standing Committee.**	In addressing this recommendation, the Commission wishes to advise that the Commission has completed its Business Continuity Plan and Risk Register for which its infrastructure is a critical subset. The Commission has also written to the respective IPPs on this vulnerability issue and will seek to engage an independent body to review the system resilience.
3	**Power system restoration procedures must be developed, discussed and disseminated. Once confirmed, a printed copy of these procedures must be readily available and lodged in each control room. These procedures should be periodically reviewed for improvement and updated after changes to available generation plant retirements or additions.**	Two restoration plans, one for Trinidad, the other for Tobago, were approved in July 2022 and disseminated and posted. Their incorporation into operator training and assessment has commenced.

Response requested by the Ministry of Public Utilities for the Examination into the Island Wide Power Outage and Blackout that occurred on February 16, 2022

Item No.	Action Item	Response Update
4	**A perusal of the logs and a review of the communication amongst the operators highlighted the need for improved understanding of the power system operation under emergency conditions. Appropriate technical training for IPP operators as well as T&TEC operators including joint rehearsal of emergency incidents scenarios is highly recommended. This may be facilitated with appropriately developed software simulations of varying scenarios.**	T&TEC has commenced investigations with its SCADA system vendor into the specification and budget for an offline training simulator for operating personnel. Meanwhile tabletop training simulations are being developed.

Response requested by the Ministry of Public Utilities for the Examination into the Island Wide Power Outage and Blackout that occurred on February 16, 2022

Item No.	Action Item	Response Update
5	**Amongst its other recommendations for the industry, the Union stated that all future PPAs negotiated so that T&TEC pays for "power used" as opposed to the current "take or pay" system:** **i. the construction of a strategically located power plant close to the Barataria Exchange where key power lines are located, thus decentralizing the country's power generation from the south of the island;** **ii. increased authority to the Interface Committee whereby random inspections can be done at the IPPs to ensure that the declared daily assets were indeed functional and in a state of readiness;** **iii. ensuring that all IPPs have functional black start machines as CGTP was under no obligation via its PPA to have one;** **iv. ensuring that the compulsory acquisition of lands is hastened so that T&TEC can construct the second 220 kV transmission line along the "right way" from TGU to Gandhi sub-station;** **v. that T&TEC revisit the construction of all "underbuilt" along critical transmission lines;** **vi. and the government appoint the requisite Boards for T&TEC and PowerGen.**	Please see the attached document wherein is outlined the basis of the structure of the existing PPA's. Notwithstanding, the Commission is not opposed to alternative contract structures, so long as they result in lower total cost of generated energy without material degradation of system reliability/security. i. The Commission has long held, even prior to the decommissioning of the Port of Spain B power station in 2016 that the next expansion of generating capacity **must** be located in the East-West corridor and electrically west of Bamboo substation and therefore near the location contemplated. Current demand growth projections indicate that this addition would be required circa 2030. ii. In the PPAs, adequate authority is established for T&TEC to inspect and demand data from the power stations. Since the blackout, this has been used in demanding that T&TEC representatives be present on-site for the testing of black start capabilities. The verification of generating capacity declared by IPPs is provided for in the PPAs, and is utilised by the Commission. However, any misdeclaration in generating capacity results in an adjustment of the capacity payment to the IPP. iii. In point of fact, the relevant PPA imposes upon CGTP an obligation to maintain available black start capability at Brechin Castle Power Station. That obligation was not being fulfilled on the day of the blackout. CGTP has since restored their black start unit to service and have procured and commissioned a second black start unit. Both of these units are tested once every two (2) months (one (1) each month) and the entire station re-energization process is tested once per year. iv. While all the acquisitions of all of the parcels have not been finalized, the 2nd 220kV double circuit line was commissioned on 17th April 2023. v. Review and reconfiguration of circuits underbuilt of the critical 220 kV circuits have been completed. vi. Not applicable.

Response requested by the Ministry of Public Utilities for the Examination into the Island Wide Power Outage and Blackout that occurred on February 16, 2022

Item No.	Action Item	Response Update
Recommendations made by the Association of Professional Engineers of Trinidad and Tobago (APETT)		
6	**There should be at least one generating unit at each facility on load rejection. This capability should be periodically tested, results documented and shared.**	The feasibility of, and technical requirements for achieving this recommendation are being reviewed in collaboration with the IPPs
7	**An islanding scheme of the power system, where the power system is separated into several independent regions with supporting generation, should be developed and implemented as a matter of priority.**	The feasibility of, and technical requirements for achieving this recommendation are being reviewed in collaboration with the IPPs
8	**A review of the battery condition of the control networks within the substations should be urgently conducted. The reports confirmed a significant number (<80%) of low battery alarms within minutes of the outage.**	The battery system comprise of a AC supply, rectifier and the DC batteries. On the day of the outage the AC supply was lost and the Battery Charger AC Status Fail alarms were triggered throughout the system. The charge on the DC batteries remained healthy at the majority of substation allowing the Control room personnel to switch remotely late in the evening of the said day.
9	**At the power generating facilities, the emergency DC supply should be reviewed to ensure that the operational voltage levels for critical machinery is appropriately maintained.**	Response required from the Power Generating Facilities, not applicable to T&TEC.
10	**From the audio recordings, many calls were channeled through the IPPs' PBX leading to operational delays. The use of this channel should be reviewed.**	Telephone extensions of T&TEC's IP-based EPABX directly to the control room of each power station in the system have been established. This telephone traffic flows on T&TEC's own island-spanning fibre optic network, so same is dependent upon neither the public telephone network nor the IPPs' PBXs.
12	**An island wide power failure event should be now labelled a special case of a "Natural Disaster". This would ensure that, when triggered, it shall initiate emergency protocols of all players utlilised in such an event. In this way, the ODPM will now take over the social management of the event leaving T&TEC to concentrate on the coordinated restoration of power.**	T&TEC engaged the ODPM, arranged a communication network and included that the ODPM be informed of any island wide blackout in its restoration procedure. The ODPM has committed to work in collaboration with T&TEC to address the social management /pubic communication of such an event.

Response requested by the Ministry of Public Utilities for the Examination into the Island Wide Power Outage and Blackout that occurred on February 16, 2022

Item No.	Action Item	Response Update
13	**A national committee should be established comprising the power sector, WASA, the NGC, the communication providers, national security agencies, ODPM and the TTPS to relook at national disasters (including its definition) and the management of such scenarios. National disaster should not just be seen as due to nature.**	The Committee was established with an initial meeting held August 9th 2022 with a subset of the institutions identified including NGC, and the IPPs given the focus was on power generation and distribution. The other members are invited to attend a meeting in May 2023.

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

NOTE TO MEMBERS OF THE COMMISSION

UPDATE ON IMPLEMENTATION OF RECOMMENDATIONS -
ISLAND WIDE POWER OUTAGE
ON FEBRUARY 16TH 2022

Enclosed is the latest update on the implementation of all recommendations made by the Cabinet appointed Committee's report, on the investigation of the island wide outage on February 16th 2022.

The Minutes of the Steering Committee Meetings are also attached.

K. Ramsook

Kelvin Ramsook
GENERAL MANAGER

Enc.

November 9th 2022

Status Update on Recommendations from the report completed by the Cabinet Appointed Committee to investigate the causes of the Islandwide Power Outage on Wednesday 16th February 2022

Action	Officer	Status Update
Completion of the 220kV Union -Gandhi line. The request is that the present circuit does not follow the same route. A report is to be written on same.	300 - Provide an update on the existing line and indicate if an alternate line, a significant distance from the existing line , was possible and at what cost. 47/73 completed 27/73 towers erected	Construction works of the 220 kV double-circuit, bundled-conductor tower Line from Union Estate 220/66 kV Substation to the Gandhi Village 220/132/12 kV Substation are ongoing. Approximately 56% of total works were completed. A total of 21 towers have been erected to date and 44/73 tower foundations was completed.
Develop an emergency response plan for Power System Failure which must incorporate an incident commander.	300, 440 - To confirm 440 as the Incident Manger	Completed. The procedure highlights that the Shift Control Engineer on duty at the time of the Blackout shall become the Incident Commander.
Identify Power System vulnerabilities that can lead to catastrophic failures.	Independent Technical Standing Committee	These discussion are held at the Independent Technical Steering Committee meetings. Refer to the attached the minutes of the two meetings held in August and October 2022. (The next meeting will be held in November 2022)
Develop a Power System Restoration Procedures	440	Completed. Procedure: T&TEC-OP-SCGI-01 & T&TEC-OP-SCGI-02 Issue Date: 2022-03-31
Develop a proper communication protocol between the T&TEC control centre and the IPPs' control centres	440 - Have direct lines at the IPPs' locations	Direct lines were successfully implemented at CG Trinity Power Limited and PowerGen' s Penal and Pt. Lisas Power station on 25th October 2022, 26th October 2022 and 3rd November 2022 respectively. Works at the TGU power station are ongoing. The established direct line extensions are as follows: 1. CG TPL - 4463 2. PowerGen, Penal - 4461 3. PowerGen, Pt. Lisas - 4460
Meet with the IPPs to develop a load rejection scheme	300,440	This is ongoing. At the 2nd meeting of the Independent Technical Committee, a committment was given by the IPPs to provide a response by the next scheduled meeting in November 2022.

Status Update on Recommendations from the report completed by the Cabinet Appointed Committee to investigate the causes of the Islandwide Power Outage on Wednesday 16th February 2022

Action	Officer	Status Update
Develop various islanding schemes for the power system	300,440	For the CG TPL Power Station,discussions on whether their facility can be used to create an island in the event of a major system disturbance to allow for quick re-energization of buses at the power stations and faster restoration of supply to customers is ongoing. CG TPL reported that GE was engaged on this endeavour. An engineer from GE visited the plant in the first week of November 2022 to determine the islanding capability of the plant. A report from GE is being awaited.
Check capability of all DC supplies for batteries at the various substations	300	Completed
Meet with the ODPM to work out mechanisms for response during an islandwide blackout	211,217	Completed
Follow up with the formation of a National committee to look at disaster management of the power grid failure	230	Awaiting an update from 230.
Survey and provide cost for the construction of double circuit line from BC substation to Gateway substation	300,402	The survey for the 132kV double circuit BC/Gatweway circuit was completed. It is estimated that the line route will be 38km of overhead line and 3.2km of underground cable. The duration of works is estimated to be approximately 5 years with an estimated cost of MTTD 487.70 (note that estimate does not include land acquisition costs).