

Subject: ELECTRICAL POWER OUTAGE PROCEDURES Number: FMOP 3-3  
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## ELECTRICAL POWER OUTAGE PROCEDURES

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### 1.0 Background

The Main Campus at Brock University is fed from two 13.8kV overhead power lines from Horizon Utilities Vansickle Substation. These power lines are known as M52 and M71 and are currently rated for eight (8) megawatts (MW) and six (6) megawatts (MW) respectively. The campus also operates a co-generation plant (cogen) located at the Central Utilities Building (CUB) capable of generating up to 6.4 megawatts (MW) of electricity.

### 2.0 Purpose

The purpose of this procedure is to outline the installed infrastructure and required actions in the event of a power outage in order to mitigate impact on the campus and university operations.

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#### **3.0 Roles & Responsibilities**

##### **3.1. Facilities Management**

###### **3.1.1 Manager, Electrical Services (or designate)**

- Coordinate response and actions taken in the event of a power interruption.
- Take appropriate action as required to mitigate impact to the campus and university operations.
- Provide notice and input to Director, Maintenance & Operations, AVP, Facilities Management and Emergency Response Team (ERT), as required.

###### **3.1.2 Director, Maintenance & Operations**

- Provide resources to ensure adequate maintenance for electrical systems.
- Ensure that all Brock University personnel impacted by this procedure are aware of and trained in the contents of this FMOP.
- Communicate to AVP, Facilities Management, Co-Chairs, ERT and Executive Director, ITS on anticipated duration, and impact of power interruption. Advise any special actions that should be taken depending on circumstances.

###### **3.1.3 AVP, Facilities Management**

- Communicate to ERT and Senior Management on anticipated duration, and impact of power interruption. Authorize any special actions that should be taken depending on circumstances.

###### **3.1.4 Other Facilities Management Managers (Mechanical Services, Technical Services Officer, or designates)**

- Ensure trades staff are trained in actions typically required in the event of power interruptions.
- Prepare checklists to assist employees with required actions during and/or following power interruptions.
- Ensure “re-start” activities are completed.

###### **3.1.4 Customer Services Coordinator and/or Property Manager**

- Prepare communiqués to stakeholders advising of events and follow-up activities

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### 3.2 Security

#### 3.2.1 Security Officer on duty

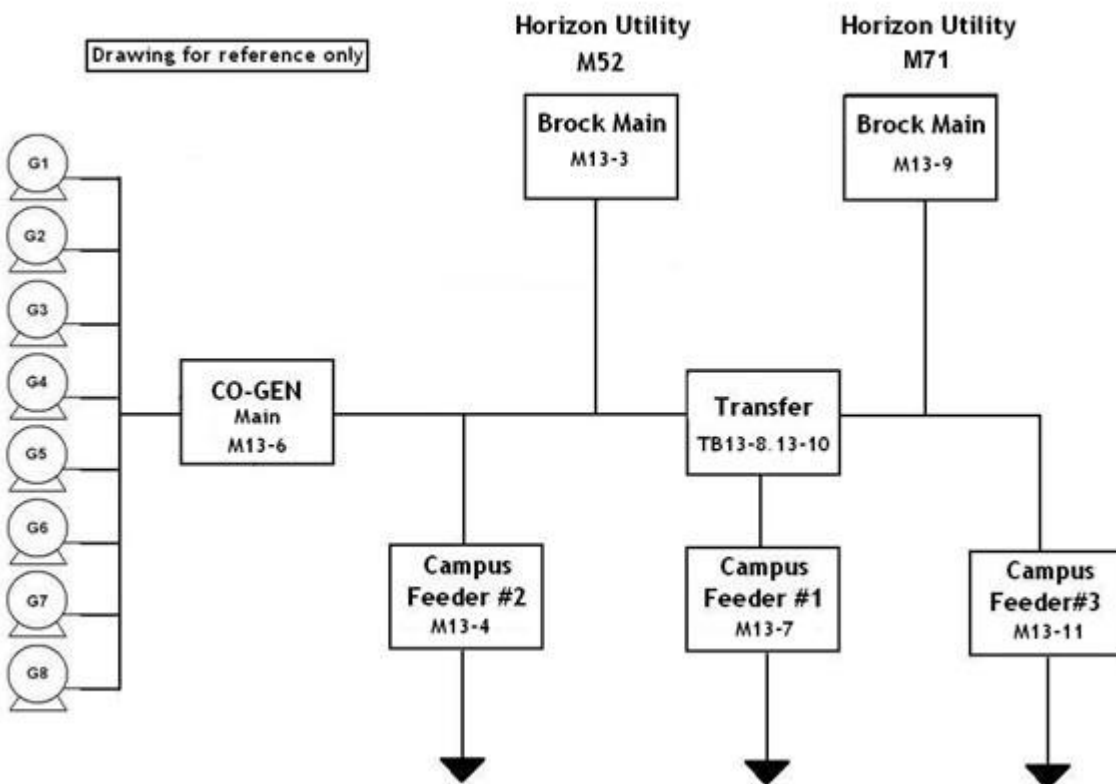
- Call-in Facilities Management trades and management as per Annex D.

### 3.3 Environmental Health & Safety

- Provide assistance to FM staff to determine if unsafe conditions arise because of or during power interruptions.

### 4.0 Power Distribution to Main Campus

The main campus is broken down into three (3) 13.8 kV main electrical feeders, sourced at the CUB building, and are known as *Campus Feeder #1*, *Campus Feeder #2* and *Campus Feeder #3*. These feeders travel through the underground tunnel system to substations located throughout the main campus. There are fifteen (15) substations on campus and each substation can select either *Campus Feeder #1* or *Campus Feeder #2* to supply its power with the exception of the Cairns Family Health and Bioscience Research Complex (CRN). The CRN is normally fed via *Campus Feeder #3*, but it can also select *Feeder #1* or *Feeder #2* if required. (See diagram below for breaker designations)



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#### 5.0 Co-Generation Plant Operation (Main Campus)

The cogen installed at the CUB acts as a prime power plant, paralleling with the utility and supplying electricity to the campus. The campus cogen plant consists of eight (8) 820 kW gas-fired generators. The waste heat produced is used for heating or cooling the campus year round. The cogen plant is controlled via a building automation system (BAS); it is programmed such that four (4) generators are normally running between the hours of 11:00 pm and 7:00 am. If at any time the plant has only two (2) generators running, Campus Security will be paged automatically by the BAS. As more power is required between 7:00 am and 11:00 pm the BAS will automatically start more generators; as excess power is produced, generators will be taken offline. (*note: the cogen cannot be connected to M71*).

#### 6.0 Automatic Load Shedding/Load Transfer (Main Campus)

To prevent an overload condition in the cogen and subsequent total blackout condition during a utility power outage, an “auto-load shedding scheme” was implemented in 2003. In 2010, this load-shedding scheme was upgraded with additional protection and the provision to “auto-load transfer” to the new utility line (M71). The auto load-shedding/load-transfer scheme is put into action automatically when the electrical power system senses a loss of power on the incoming M52 utility line. The auto load-shedding/load-transfer scheme is set to trip (i.e. disconnect from) *Campus Feeder #1* in the event of a utility outage via tie-breaker TB-8. If power is available on the M71 utility line, *Campus Feeder #1* would automatically be transferred to this line via tie-breaker TB-10 and be re-energized within 2 seconds (*note: an actual power interruption will occur*). *Campus Feeder #2* would remain closed and energized via the cogen (*note: no power interruption would occur*). To prevent overloading the generators, only select buildings are fed from *Campus Feeder #2* (i.e. with only four generators on-line after hours, *Campus Feeder #2* loads should be kept below 2400 kW.) The fifteen (15) substations are currently connected to campus feeders listed in *Annex A*. Please refer to *Annex F* for a campus map indicating which buildings are normally connected to a particular *Campus Feeder*.

#### 7.0 Power Outage - Typical Scenarios (Main Campus)

The following scenarios are described to act as a guide for certain types of power outages. The University’s Emergency Response Team (ERT) is to be alerted by Maintenance & Operations Services managers to be on stand-by where the possibility exists of a prolonged power outage (i.e. greater than 30 minutes) that could adversely impact the operations of one or more buildings/complexes together with outside weather conditions and/or planned major events.

7.1.M52 Utility Power Loss, M71 Utility Normal, Cogen Running. In the event of a loss of normal utility power M52, the buildings listed under *Annex A*, *Campus Feeder #2*, will be unaffected as the load shedding of *Campus Feeder #1*

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occurs. Buildings listed under *Annex A, Campus Feeder #1*, will lose total power for approximately two (2) seconds while being automatically transferred to the M71 utility line. Following successful transfer of load to M71, *Campus Feeder #1* will be fully powered with minor disturbances on equipment such as fire panels and UPS's which may require resetting following the interruption. After normal power is restored to M52 utility line, Facilities Management will manually transfer *Campus Feeder #1* back to normal after consultation with the "Utility Control Operator". This transfer will also cause a momentary disturbance on *Campus Feeder #1* as it is returned to its normal position.

7.2. M52 Utility Normal, M71 Utility Power Loss, Cogen Running. In the event of a loss of utility power M71, the buildings listed under *Annex A, Campus Feeder #3* (normally CRN only), will lose power and emergency/life-safety generators will start in that building. At that time, Facilities Management will be notified and manually transfer the CRN building over to *Campus Feeder #1*, thereby restoring power. After power is restored to the M71 utility line, Facilities Management will manually transfer the CRN building back to normal (*Campus Feeder #3*) after consultation with the "Utility Control Operator". All other buildings on campus will be unaffected by an M71 power outage.

7.3. M52 Utility Power Loss, M71 Utility Power Loss, Cogen Running. In the event of a loss of both utility power lines M52 and M71, the buildings listed under *Annex A, Campus Feeder #2*, will be unaffected as the load shedding occurs and load is maintained by the cogen. Both *Campus Feeder #1* and *Campus Feeder #3* will lose total power and emergency/life-safety generators will start in those buildings. During normal hours, upon discovering that the utility power is off, the Electrical Services Manager will contact the "Utility Control Operator" to determine the cause of the interruption and the expected duration. If the outage is outside of normal hours, Campus Security will phone the on-call Electrician and Electrical Services Manager as per *Annex D*.

7.3.1. **Scenario #1:** If the Electrical Manager is in communication with "Utility Control Operator" and it is expected that the M52 and/or M71 feeders will be re-energized in a short period of time (less than one hour), no change to the campus distribution network will occur.

7.3.2. **Scenario #2:** If the Electrical Manager is in communication with "Utility Control Operator" and it is expected that the M52 and/or M71 feeders will be de-energized for an extended period of time, all generators in the cogen could be brought on-line to feed additional buildings listed under *Campus Feeder #1* and/or *Campus Feeder #3* (the cogen is undersized to supply power to the entire campus). These buildings will be manually transferred via high voltage switches in each of the fifteen (15) substations according

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to priority listed in *Annex B* and great care taken not to overload the cogen system.

- 7.4. Utility M52 and M71 Normal, Cogen Shutdown. In the event of a loss of the cogen with the utility power normal (energized), all buildings will be electrically unaffected. Due to many electrical upgrades on campus from 2008 to 2010, there is no longer a need to “shed” electrical load on campus when the cogen is shutdown. Note that it is possible that heating and/or cooling capacities will be affected by a cogen shutdown (the detail to which this occurs is not covered in this BUFMOP).
- 7.5. Utility M52 Power Loss, M71 Normal, Cogen Shutdown. In the event of a loss of normal utility power M52 and loss of the cogen plant, the buildings listed under *Annex A, Campus Feeder #2*, will be without power with the exception of “life safety power”. Buildings listed under *Annex A, Campus Feeder #1*, will lose total power for approximately two (2) seconds while being automatically transferred to the M71 utility line. Following successful transfer of load to M71, *Campus Feeder #1* will be fully powered with minor disturbances on equipment such as fire panels and UPS’s which may require resetting following the interruption. If the Electrical Manager is in communication with “Utility Control Operator” and it is expected that the M52 feeder will be de-energized for an extended period of time and/or the cogen plant is unable to restart, the buildings connected to *Campus Feeder #2* will be manually transferred via high voltage switches as soon as FM Electrical staff are available. Following this switching the entire main campus would be powered by the M71 utility line (note: FM staff would monitor total campus load and communicate with the Utility Control Operator to ensure capacity is available on the feeder). After normal power is restored to M52 utility line and/or the cogen plant is fully operational, Facilities Management will manually transfer *Campus Feeder #1* back to normal after consultation with the “Utility Control Operator”. This transfer will also cause a momentary disturbance on *Campus Feeder #1* as it is returned to its normal position. Following which the buildings normally connected to *Campus Feeder #2* will be re-transferred back via individual high voltage switches (note: all high voltage switching requires a completed and signed “Authorization For HV Switching” form along with a completed pre-job hazard assessment).
- 7.6. Complete Power Loss - Utility M52, M71 and Cogen Shutdown In the event of a total blackout (i.e. loss of utility power and the cogen), the 500 kW life safety diesel generator (located at the CUB) will start and transfer “life safety power” to areas on the Main Campus such as fire alarm systems, exit lights, essential lighting in corridors, stairways etc, critical connected loads including elevators, sections of the computing centre (back up to one UPS), Brock University phone

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system, circuits in Biology Aquatic lab and CCOVI. Not all areas on campus are connected to this power source. In the unlikely event a total blackout occurs, Campus Security would use *Annex D* and call the on-call Electrician and the Electrical Services Manager. After investigating the situation, the Electrical Services Manager would report findings to the ERT. At this time it would be up to the ERT to direct the further actions.

#### **8.0 Lowenberger Residence (Permanent Life Safety Generator)**

Lowenberger Residence is powered separately by its own 60 kW natural gas life safety generator, which also provides additional power to one of two elevators (Car#1) and limited operation of heating systems (boiler#1) and associated circulation pumps.

#### **9.0 Robert S.K. Welch Hall (Permanent Life Safety Generator)**

Welch Hall (entire complex) is also powered by its own separate 100 kW natural gas life safety generator. This generator will supply life safety power to the building including the elevator and fire pump.

#### **10.0 Plaza Building (Permanent 30 Minute Battery Inverter)**

Special note for the Plaza Building, in the event of a complete power loss, the Plaza Building is powered by its own battery inverter capable of 30 minutes of stored energy. During this time students and staff will need to be evacuated from this building as per fire code (30 minutes of essential lighting to allow for evacuation).

#### **11.0 Kenmore Centre**

The Kenmore Centre houses Campus Security and is a central meeting location for the ERT. In the event of a complete power outage the Kenmore Centre will be partially powered by the central life safety generator located at the Central Utilities Building. The areas powered by the central generator are limited to the Campus Security front office. The south section of the Kenmore Centre including the study room (Room 120) and Command Center (Room 125) are not powered by the central life safety generator. In the event of an extended power outage (determined by the ERT), this building may be energized via a portable generator; a permanent generator connection point and transfer switch were installed in 2010 for such an event. **\*\*(Portable Generator Connection Point - Minimum size generator required is 30 KW, 120/208 Volt, 4-wire)\*\***

#### **12.0 East Campus**

The buildings at the East Campus do not have emergency life safety generators or inverters, excluding the International building. In the event of a power outage these buildings will be in a total blackout, with the exception of select life safety equipment with internal 30 minute battery backup. 573 Glenridge Ave. has a natural gas powered generator that is used for ITS equipment only; this generator does not provide life safety power. The ERT is to be alerted.

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- 12.1. The International Center. The International Center is powered by its own separate 150 KW natural gas life safety generator. This generator is capable of supplying life safety power including limited lighting, full elevator operation and limited heating and cooling capacities.

#### **13.0 Hamilton Campus**

Hamilton Campus does not have an emergency power source other than life safety battery-powered equipment. If the main utility power is off, this campus will be in total blackout. In the event of an extended power outage (determined by the ERT), this building may be energized via a portable generator; a permanent generator connection point and transfer switch were installed in 2009 for such an event. Campus Security would call the Electrical Services Manager to arrange for a rental unit and connection. The ERT is to be alerted. **\*\*(Portable Generator Connection Point - Minimum size generator required is 200 KW, 600/347 Volt, 4-wire)\*\***

#### **14.0 Rodman Hall**

Rodman Hall does not have an emergency power source other than life safety battery powered equipment. If the main utility power is off, this campus will be in total blackout. In the event of an extended power outage (determined by the ERT), this building may be energized via a portable generator; a permanent generator connection point and transfer switch were installed in 2009 for such an event. Campus Security would call the Electrical Services Manager to arrange for a rental unit and connection. The ERT is to be alerted. **\*\*(Portable Generator Connection Point - Minimum size generator required is 50 KW, 120/208 Volt, 4-wire)\*\***

#### **15.0 Brock Research & Innovation Centre (BRIC)**

The BRIC does not have an emergency power source other than life safety battery-powered equipment. If the main utility power is off, this building will be in total blackout. The ERT is to be alerted.

#### **16.0 Marilyn Walker School (Former Canadian Hair Cloth Building)**

Pre-construction/renovation of this structure does not have an emergency power source other than life safety battery powered equipment. If the main utility power is off, this building will be in total blackout. In the event of an extended power outage (determined by the ERT and/or Property Manager) this building may be energized via a portable generator to maintain the portable heating system; a permanent generator connection point was installed in 2010 for such an event. Campus Security and/or the Property Manager would call the Electrical Services Manager to arrange for a rental unit. The ERT is to be alerted. **(Portable Generator Connection Point - Minimum size generator required is 100 KW, 600/347 Volt, 4-wire)**



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### Annexes

Annex A	Campus Substation Switch Position and Life Safety Equipment List
Annex B	Building Switchover Priorities (Feeder #1, #2, #3)
Annex C	Main Campus Single Line Drawing ( <i>Restricted Distribution</i> )
Annex D	Call-In Procedures ( <i>Restricted Distribution</i> )
Annex E	Power Outage Checklists - FM Trades ( <i>Restricted Distribution</i> )
Annex F	Campus Feeder Identification Map ( <i>Restricted Distribution</i> )
Annex G	Emergency Generator Campus Map ( <i>Restricted Distribution</i> )