



**Brock University**  
**Facilities Management Operating Procedure**

**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, and/or AVP, Facilities Management and/or 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 AVP ITS on anticipated duration, and impact of power interruption. Advise any special actions that should be taken depending on circumstances. Communicate to other campus groups (e.g. Security, Emergency Response, HREHS, Department of Residences, Food Services, Recreation Services, CFHBRC, etc.)

**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 Manager, 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.

**3.2 Security**

**3.2.1 Security Officer on duty**

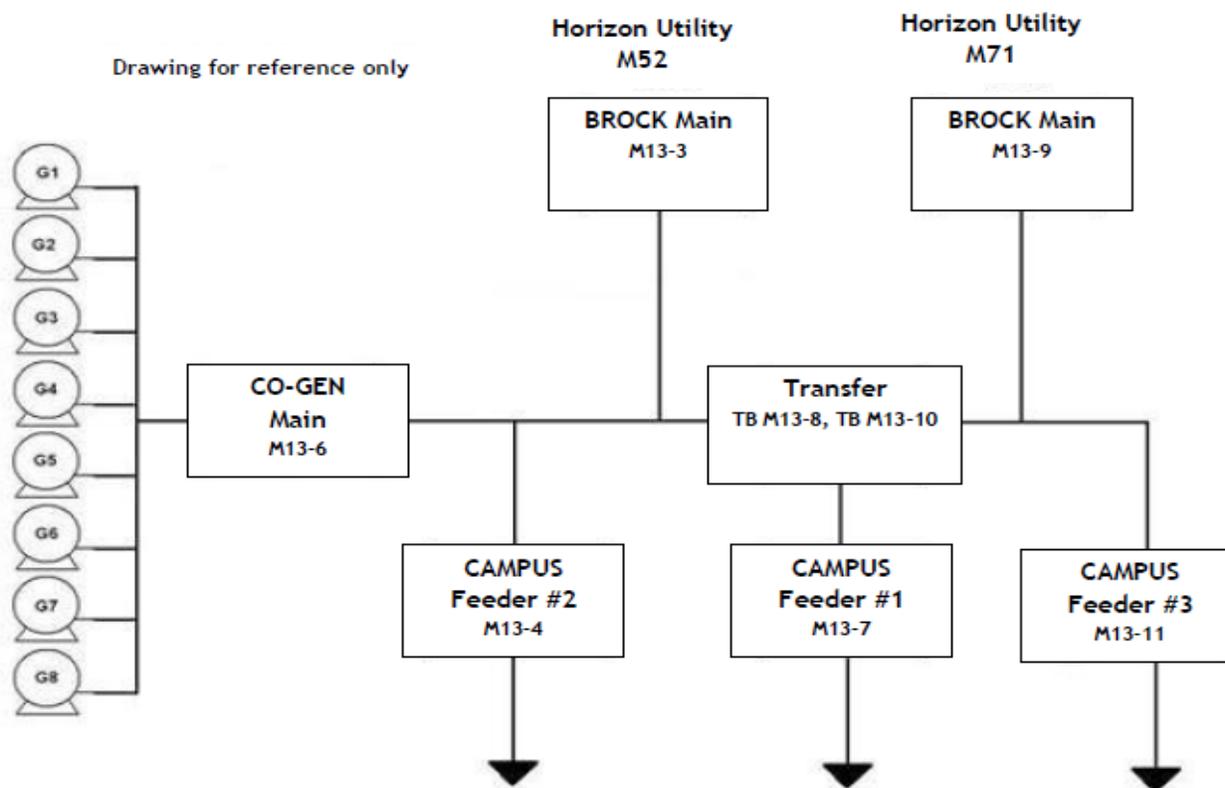
- Call-in Facilities Management trades and management as per Annex G.

**3.3 Human Resources Environmental Health & Safety (HREHS)**

- 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. These 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.)



#### 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 natural 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 M13-8. If power is available on the M71 utility line, Campus Feeder #1 would automatically be transferred to this line via tie-breaker TB M13-10 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 (e.g. 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 E 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 1 hour) 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 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 electronic equipment 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 “Horizon Utilities 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 on 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 review with Horizon Utilities. If the situation is anticipated to be of extended duration, a decision can be made whether to manually transfer the CRN building over to Campus Feeder #1. (If this is done, it will be necessary for another interruption to return the Feeder to normal arrangements.) 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

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the "Horizon Utilities Control Operator". All other buildings on campus will be unaffected by a power outage on M71.

- 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 power and any emergency/life-safety generators will start. During normal hours, upon discovering that the utility power is off, the Manager, Electrical Services will contact the "Horizon Utilities 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 Manager, Electrical Services as per Annex G.
- 7.3.1. **Scenario #1:** If the Manager, Electrical Services is in communication with "Horizon Utilities 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 Manager, Electrical Services is in communication with "Horizon Utilities 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 not sized 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 to priority listed in Annex B and great care must be 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. It is possible that heating and/or cooling for the campus will be affected by a cogen shutdown as the waste heat normally reclaimed from the cogen plant will not be available.
- 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" provided by backup generators. 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 electronic equipment which may require resetting following the interruption. The Manager, Electrical Services is to notify the "Horizon Utilities Control Operator" and if it is anticipated that the M52 feeder will be de-energized for an extended period of time and/or the cogen plant is unable to restart, a decision is to be made whether to manually transfer the buildings connected to Campus Feeder #2 via high voltage switches (once FM Electrical staff are available). Following this switching the entire main campus would be powered by the M71 utility line (note: FM staff will monitor total campus load and communicate with the Horizon Utilities 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

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Management will manually transfer Campus Feeder #1 back to normal after consultation with the "Horizon Utilities 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 manually re-transferred back via individual high voltage switches.

- 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, critical connected loads including elevators, sections of the computing centre (back-up to one UPS), Brock University phone system and dedicated 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 G and call the on-call Electrician and the Manager, Electrical Services. After investigating the situation, the Director, Maintenance & Operations or Manager, Electrical Services would report findings to the ERT. At this time it would be up to the ERT to direct the further actions. On Main Campus back-up generators are provided at Lowenberger Residence, Welch Hall and CFHBRC as per details in Annex F.

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

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

### 9.0 Welch Hall (Permanent Life Safety Generator)

Welch Hall is also powered separately by its own separate 100 kW natural gas life safety generator. This generator will supply back-up power to the building's emergency lighting and life safety systems including the elevator and fire pump.

### 10.0 Cairns Family Health Biosciences Research Complex (CFHBRC)

The CFHBRC is fed by feeder M71 and has 2 emergency generators: #1 Critical Equipment (1040 KW) and #2 Life Safety (240 KW).

- 10.1 Emergency power is provided by Generator #2 to the building's life safety systems (e.g. emergency lighting in labs, corridors and stairwells), fire protection systems and fire pump and special protection systems (Sapphire system and pre-action sprinklers for NMR room) and monitoring systems as required by building code. Elevators #1 & #3 are provided with emergency power. Generator #1 provides backup power to critical research equipment that was identified during the building design (some of this equipment is also fed by UPS as well). The majority of the building, including McMaster Medical areas and the business incubator (except as noted below), does not have cooling in the event of a power interruption.

- 10.2 During a power failure, services for the ACF are as follows: In addition to life safety elements as above fed by Generator #2, the ventilation system (AHUs 8A & 8B) has

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100% redundancy and is fed by emergency generator #1. Heating for this area has 100% backup from emergency power. In the event of a prolonged power outage, there is a manual valved connection to the domestic cold water which can be opened to provide limited cooling to the ACF. Despite this redundancy and emergency backup, there will be a short power interruption (of up to a few minutes), as Generator #1 starts up, and then the ventilation and heating systems would re-start.

- 10.3 Services during a power failure for the CL3 labs are as follows: In addition to life safety elements as above fed by Generator #2, the ventilation system (AHUs 3A & 3B), isolation bubble-tight dampers and other key systems have 100% redundancy and are fed by emergency generator #1. Heating for this area has 100% backup from emergency power. There is no back-up power to the cooling system in this suite, although ventilation will be maintained. Despite this redundancy and emergency backup, there will be a short power interruption (of up to a few minutes), as Generator #1 starts up, and then the ventilation and heating systems would re-start. Testing has been done that confirms that during this interval, the bubble-tight dampers will close without a reversal of the airflow in the suite.

### 11.0 Kenmore Centre

The Kenmore Centre houses Campus Security and the Central Command Management Center (CCMC), the 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 that is the 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 CUB life safety generator. In the event of an extended power outage, if determined by the ERT, a portable generator could be ordered to supply this building. 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

- 12.1 **International Center.** This building is powered by its own separate 150 KW natural gas-powered life safety generator. This generator is capable of supplying life safety power including emergency lighting, elevator operation and limited heating capability.
- 12.2 **Other buildings.** The other buildings at the East Campus do not have life safety emergency power. 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.
- 12.3 **573 Glenridge Ave.** This building has a 40 kW natural gas-powered generator that is used for ITS equipment only; this generator does not provide life safety power. 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. The ERT is to be alerted.

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**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 from Horizon Utilities is interrupted, 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 through a permanent generator connection point and transfer switch. In the event of an extended outage, on direction of the ERT, the Manager, Electrical Services is to arrange for a rental unit and connection. **\*\* (Portable Generator Connection Point - Minimum size generator required is 200 KW, 600/347 Volt, 4-wire)\*\***

**14.0 Rodman Hall**

Rodman Hall has no 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 permanent generator connection point and transfer switch for a rental generator, installed for such an event. Campus Security would call the Manager, Electrical Services 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 Captain John Decew School - Brock Research & Innovation Centre and Tecumseh Centre for Aboriginal Research and Education**

The Captain John Decew School 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 and the building is to be evacuated. The ERT is to be alerted.

**16.0 198 St. Paul - Marilyn I Walker School of Fine and Performing Arts**

This building is currently under construction and is expected to be complete in 2015. There is no emergency power at this time.

**17.0 References**

FMOP 1-3 After Hours Call-in Procedures  
CSOP19-02 Trades call-ins

**Annexes**

Annex A Campus Substation HV Switch Positions (Feeder #1, #2 & #3) and Life Safety Power  
Annex B Building Switchover Priorities (Feeder # 1 to Feeder #2) - Extended Power Outage - Cogen Running  
Annex C Main Campus Single Line Drawing (Restricted Distribution)  
Annex D Campus Feeder Identification Map (Restricted Distribution)  
Annex E Main & East Campus Emergency Generator Map (Restricted Distribution)  
Annex F Emergency Generator (Life Safety & Critical Equipment) & Connection points  
Annex G Electrical Power Outage Call-In Procedures (Restricted Distribution)  
Annex H Typical Power Outage Checklists - FM Trades (Restricted Distribution)