

# **South Pole Station Emergency Energy Conservation**

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**Active Division /Departments**

**Area Directorate  
Science Support  
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## Purpose

This Standard Operating Procedures document defines the priorities for power consumption while operating on Emergency Power at the Amundsen-Scott South Pole Station.

## Scope/Applicability

The primary power plant at Amundsen-Scott South Pole station is designed so that one of three generators is running at any given time—providing two “backup” systems before use of the Emergency Power Plant is required.

In the event that main station power should become compromised, the limited capacity of the emergency power plant will require extreme conservation and “load shedding” according to priorities defined in this procedure. Alternative energy sources will be considered for the affected areas depending on the nature and duration of the problems in the main station power plant.

## Terms and Definitions

<b>ARO</b>	Atmospheric Research Observatory
<b>BIF</b>	Balloon Inflation Facility
<b>DNF</b>	Do Not Freeze (Cargo building)
<b>ECAMP</b>	Energy Conservation and Management Plan
<b>EPP</b>	Emergency Power Plant
<b>KW</b>	Kilowatts
<b>LIDAR</b>	Light Direction and Ranging instrument (science experiment)
<b>NPP</b>	New Power Plant
<b>TACAN</b>	Tactical Air Navigation (aircraft navigational beacon)

## Responsibilities

### ***Area Director/Winter Site Manager***

The on-site station manager will be responsible for maintaining this procedure, ensuring its compliance when necessary, and sharing the information herein with the station community.

### ***Manager, South Pole Science Support***

The Science Support Manager will work closely with science event representatives to understand their unique power requirements and share those requirements with the Area Manager. The Science Support Manager will maintain a spreadsheet, kept in Comms (Communications Area), describing each project's on-site points-of-contact and requirements for powering-down or powering-up of equipment.

### ***Facilities Engineer***

The Facilities Engineer shall continuously monitor station power loads, making adjustments as necessary and informing the Operations Manager and the Area Manager of any discrepancies or recommendations.

### ***Operations Manager/Power Plant Mechanic***

The Operations Manager and Power Plant Mechanic are responsible for ensuring that all relevant personnel understand and comply with this procedure.

## Discussion

Energy Conservation is important at all times. Every effort shall be made to educate station personnel about ways to conserve energy on-site. If use of the Emergency Power Plant becomes necessary, it will be important for everyone to realize that it is, indeed, an EMERGENCY situation, regardless of the duration, and conservation efforts shall reflect the nature of the situation.

## **Station Power Sources**

### ***New Power Plant (NPP)***

The New Power Plant (NPP) at South Pole consists of 3 main generator sets powered by 3512B caterpillar engines and coupled with 750 kW generators. A Caterpillar 3306B engine powers an additional Peaking Generator with a 205 kW generator.

The three main generators are to be operated one at a time, allowing one to be on stand-by and another to be available for maintenance. The Peaking generator will be used to pick up temporary, excessive loads.

In addition to the power generation the power plant houses heat recovery equipment used to heat the station and the water system for South Pole.

### ***Emergency Power Plant (EPP)***

The Emergency Power Plant consists of two Caterpillar 3412 engines/475 kW generators, also designed to run one at a time. If a peak demand for power remains above the 474 kW level or 1490 amperes per phase for five minutes, or if the demand is greater than 512 kW for two minutes, the main breaker will open to protect the generator, therefore causing a station-wide blackout.

In the past, “reserve power” could be achieved by combining the EPP generator with another from the Summer Camp Emergency Power Plant (Building 64) which is no longer available. Emergency power, then, is approximately *half* of the standard station power, or enough to sustain minimal life/health/safety operations.

### ***Alternative Power Sources***

In the event of prolonged use of the Emergency Power Plant, every attempt will be made to restore power to selected areas using portable generators and alternative energy sources.

## **Standard Conservation**

### **Community Participation**

There are several ways for each community member to conserve energy. The following suggestions should be encouraged at all times, not just while on emergency power.

Turn off lights, computer monitors, and electrical equipment when not in use

Portable heaters and electric blankets are prohibited.

Schedule use of laundry facilities for otherwise low-use times of the day/week

### **Operational Controls**

Daily nonessential construction operations that require significant electrical loads should be scheduled during non-peak hours of the day to better balance the electrical demands.

Surveying of building heating and cooling systems in various buildings may require thermostats to be reset or calibrated to correctly operate when a call for heat or cooling is required.

As-built's of the electrical system are conducted annually. Station electrical panels and the connected loads of all equipment are documented and electrical projections are updated monthly. These annual inspections should include an assessment of electrical motor loads that may require a soft starting electrical device or have the operational range adjusted so that the device doesn't cycle on and off within a short time period. These loads typically cause spikes on the grid that the generator must respond to.

Power loads which are not schedule-critical (Greenhouse lighting, LIDAR testing, baking, etc.) should be scheduled for otherwise low-use times.

During the austral summer, it is possible to disconnect typical winter operational loads that don't require summer season connection to the electrical grid, as follow:

- Water Well heat tape from the well head to the well
- Any Summer Camp electrical water heaters that may have been mistakenly turned on. Typically these facilities will have the electric water heater turned on during building startups.
- Surveying building heating and cooling systems in various buildings may require thermostats to be reset or calibrated to correctly operate when a call for heating or cooling is necessary.
- Adjust lighting in the dome and arches so that only light required for safety is operational. i.e. disconnect every other light bulb or replace the bulb or bulbs with a lower wattage than the existing bulb.

## **Warning Conservation**

When power use approaches the maximum limits of the on-line generator, the Power Plant Mechanic will inform the Area Manager/Winter Site Manager, who will announce the situation over the public address (“all-call”) system. All non-essential equipment should be shut down before automated load shedding begins or the main generator breaker opens, causing a blackout.

### **Community Participation**

Turn off all “entertainment” equipment i.e. stereos, televisions, and projectors

Turn off lights, computer monitors, and electrical equipment when not in use

No use of laundry facilities or “entertainment electronics” except as authorized by the Area Manager/Winter Site Manager.

Limit trips in/out of buildings to prevent heat loss from opening doors

### **Operational Controls**

Turn off Greenhouse Lights and as many lights as possible around station

Turn off as much kitchen equipment as possible

Limit access to low-use/recreational areas (SkyLab Lounge, Weight Rooms, etc.)

## **Emergency Conservation (“Load Shedding”)**

Under extreme circumstances, it will be necessary to shut down certain areas of the station, based on the amount of available power. Priorities for Load Shedding are outlined below.

### **Community Participation**

No use of laundry facilities or “entertainment electronics” except as authorized by the Area Manager/Winter Site Manager.

Restricted use of all other equipment/facilities.

Extremely restricted use of power for scientific reasons: the extent of the emergency will determine the extent of restrictions, as directed by the Area Manager/Winter Site Manager.

Limit trips in/out of buildings to prevent heat loss from opening doors

### **Operational Controls**

Power to particular areas on-site will be shut off in the following priority as required by the amount of available power:

Laundry Facilities

Greenhouse

Second floor of Comms (Administration, Store, Recreational Areas)

Old Garage and Shops

New Garage Shops

Summer Camp Berthing

Construction Camp

Feeder 4 (Old Garage, Old Carp Shop, Gym, Garage Arch)

Feeder 7 (Summer Camp, Construction Camp, Comms Equipment, TACAN)

Feeder 8 (Science & Upper Berthing, SkyLab, Engineering Office)

Feeder 9 (Dark Sector)

Feeder 3 (Cargo, BIF, DNF, Cryogenics Facility, Water Well)

Feeder 1 (Galley, Annex, Weight Room, Fire Shack, Freshie Shack, Black Box)

The remaining feeders shall be maintained as long as possible, for obvious reasons:

Feeder 2 (Comms, Bio-Med, Utilidor, Greenhouse)

Feeder 5 (Emergency Power Plant [partial])

Feeder 6 (Emergency Power Plant [partial], Fuel Arch and Pump Room, ARO)

Feeder 10 (New Power Plant, Garage Shops, Elevated Station, RF Building)



## **References**

### ***External Documents***

None

### ***Internal Documents***

Energy Conservation and Management Plan (ECAMP)

South Pole Station Power Report (Annual FEMC document)

## **Records**

None.

## **Attachments, Appendices**

None.