



POWERING THE WAY

Rental Power Planner

CATERPILLAR®



PLANNING FOR TEMPORARY POWER:

A Critical Management Duty

As a facility manager, you know better than anyone that electrical power is the lifeblood of business. Without it, computers don't compute, pipes freeze, food spoils, and machines don't run.

An electric utility power line has a profound effect on your bottom line. When you're without it, you need reliable temporary power.

This Rental Power Planner can help you:

- **Plan effectively to secure rental generators**
- **Save time and money during scheduled shutdowns**
- **Act quickly during emergency outages**
- **Develop a plan or refine the temporary power strategy you already have in place**

A Cat® Rental Power expert will help you choose the power equipment you need.

GETTING STARTED

A Three-Step Approach

Although critical, planning for power doesn't need to be difficult. Here are three simple steps that will help you secure and maintain the rental power necessary to carry your facility successfully through a scheduled or emergency shutdown:

DETERMINE YOUR FACILITY'S ELECTRICAL LOAD

Before you rent temporary power, you have to know how much you need.

FULL POWER

If you have to keep your whole facility operating as it would with utility-supplied power, you need to determine your aggregate electrical load.

The quickest, easiest and most accurate way to do this is to take ammeter readings of your electrical distribution boxes. Take the reading when your company is normally operating at peak load. You can also obtain peak demand readings from your utility bills.

Aggregate loads are also listed on panels of electrical distribution boxes themselves. A statement of your total electrical capacity is also available at the local utility. However, these sources will not give you true readings of the temporary power you need since all buildings are wired for more electricity than they will use.

PRIORITY POWER

At times, you may want to power only those electrical loads that serve critical functions at your facility. If so, you need to prioritize individual loads.

If you're not sure what your critical loads are, start by determining the lost profit or other problems that result if your company is without the equipment. Other than life-safety electrical loads powered by your standby generator sets as required by law, examples of critical loads include:

- Lights
- Heating, ventilating and air conditioning (HVAC)
- Computers
- Process Equipment
- Pumps

Prioritizing will help you decide which loads require power immediately during an emergency. This is important since it may take several hours or longer to secure all of the rental equipment you need on site during a large scale emergency, such as a natural disaster.

In most buildings, a separate distribution box will feed critical loads. In this case, you may only need enough temporary power for the loads served by that set of circuit breakers.

You can also decide to power specific critical loads served by separate circuit breakers within a distribution box. To do so, take an ammeter reading of the distribution box during the off-hours at your facility with the equipment you don't need shut off and the critical loads on. The ammeter will tell you how much power you need to serve the critical loads since that is all the distribution box is feeding. However, it's important that the non-critical loads are shut off and kept off when rental power is hooked up.

If you want to power individual pieces of equipment that use motors, amperage and voltage information is listed on nameplates. You can list this information and all your power needs on the work sheet in this booklet.

An additional note: Rental power is often used to back up standby generator sets during scheduled and emergency outages. To find out how much temporary power you need for standby service, contact the company that supplied the standby generator, or a qualified rental generator set dealership.



Planning for temporary power may require the need to prioritize critical electrical loads.

KNOW WHERE TO RENT GENERATOR SETS AND RELATED EQUIPMENT

Your rental generator sets are only as reliable as the supplier who backs them. In planning for temporary power, find a rental dealership who has the equipment you need and a staff qualified to solve your problems and service the machines.

Visit the dealership to get to know the people you'll need to rely on during scheduled shutdowns and emergency power outages.

Here are basic questions to ask the dealerships:

- | | |
|--|--|
| <input type="checkbox"/> What is the kilowatt (kW) range of your generator set rental fleet? | <input type="checkbox"/> How do I know my rental units are 100 percent reliable? |
| <input type="checkbox"/> Can you deliver immediately? If not, how long will it take? | <input type="checkbox"/> What happens if a generator set I rent goes down? |
| <input type="checkbox"/> What if I need a generator set in the middle of the night, or during a holiday? | <input type="checkbox"/> Do you have cables and other equipment I may need? |
| <input type="checkbox"/> Who supplies fuel? | <input type="checkbox"/> Can you train my staff to hook up and operate the equipment? How long will it take? |
| <input type="checkbox"/> How are your rental contracts structured? How flexible are they? | <input type="checkbox"/> Can I obtain pre-approved credit so I can avoid delay during an emergency outage? |
| <input type="checkbox"/> Have you ever rented generator sets to customers in my industry? | <input type="checkbox"/> Can you supply an operator? |
| <input type="checkbox"/> What equipment/manpower do I need to provide? | |
| <input type="checkbox"/> What technical service/support do you offer? | |

ANSWER THE BASICS, SAVE TIME AND MONEY

Think about the following before the power goes off at your facility:

- How will the generator sets get from the dealership to the facility? Most dealerships deliver, but if you pick up the equipment yourself, you need to determine what size truck you will need. Most generator sets are towed on semi-trailers and pull trailers. Others are skid-mounted and require lifting equipment for loading and unloading.
 - Where will you put the generator sets? The largest generator sets, also referred to as power modules, measure 8 feet wide by 40 feet long. If tight quarters are consideration, two or more smaller units will provide the same power at about the same price.
 - How will you get cable from the generator sets outside your building to electrical distribution boxes inside? Consider installing a weatherhead, or a cable access door in an outside wall of your facility that can be closed when not in use. Then, you won't need to route cable through windows and doors that should remain shut during off-hours or inclement weather.
 - Can you store enough fuel close to the area where you plan to keep the generator sets? During extended generator set runs, an auxiliary tank of fuel will reduce service calls from your fuel supplier.
 - Do you have people on staff who can hook up the generator sets and check to ensure they will operate properly? If not, make sure your dealership or an electrical contractor can do the hookup, or have the dealership walk your staff through the procedures.
- Your Cat® Rental Power dealer has people on staff to help you plan out your fuel capacity, cabling needs, and on-site support.

KEY GENERATOR SET FEATURES TO SPECIFY:

Your local Cat® Rental Power dealer has many kinds of generator sets and features to choose from. Here are a few you should consider:

- **Sound-attenuation:** You'll need quiet generator sets, called sound-attenuated units, if your facility is close to homes or other business.
- **Auto start/stop connections:** This is a critical feature if you are using the rental generator sets to back up permanent standby units. Auto start/stop will automatically start a rental generator if a standby unit goes down.
- **Distribution panel labeling:** This helps inexperienced operators safely identify output voltages.
- **Radiator, exhaust discharge:** Some generator sets feature vertical radiator and exhaust systems to direct heat and exhaust gases up and away from people and buildings. These features are important in populated or high traffic areas.
- **Electronic governors:** Specify these if you have critical loads that cannot tolerate fluctuations in electrical frequency. Examples include computers, motor-driven equipment and other machines backed up by uninterruptible power supply (UPS) systems.
- **Output bus bars:** Bus bars should be spaced to allow for multiple output cable hookup. This lets you run several pieces of equipment off of one generator set.
- **Fuel capacity:** Check the fuel capacity and consumption rate to determine how many tanks of fuel will get you through your rental period. Generator sets should operate at least eight hours without refueling.
- **Fuel priming pump:** This ensures easier starts after transport.



- **Charging alternator:** This ensures batteries are charging when units are operating. Note: An outside power source is required for standby generator sets if the unit is equipped with battery chargers and/or space heaters and jacket water heaters.
- **Sight gauges:** Properly positioned sight gauges for fuel and other critical fluids speed up spot-checking, letting your staff spend more time on other matters.
- **Security:** Generator sets should be virtually tamperproof. Look for lockable doors, oil/ water drains mounted inside enclosure, and hidden exterior fuel drains. All connections, such as output bus bars, should be covered.



A sound-attenuated Caterpillar® XQ300 generator set mounted on a pull trailer.

POWER OUTAGE WORK SHEET

kVA/kW AMPERAGE CHART 80% Power Factor

kVA	kW	208V	220V	240V	380V	400V	440V	450V	480V	600V	2400V	3300V	4160V
6.3	5.	17.5	16.5	15.2	9.6	9.1	8.3	8.1	7.6	6.1			
9.4	7.5	26.1	24.7	22.6	14.3	13.6	12.3	12.	11.3	9.1			
12.5	10.	34.7	33.	30.1	19.2	18.2	16.6	16.2	15.1	12.			
18.7	15.	52.	49.5	45.	28.8	27.3	24.9	24.4	22.5	18.			
25.	20.	69.5	66.	60.2	38.4	36.4	33.2	32.4	30.1	24.	6.	4.4	3.5
31.3	25.	87.	82.5	75.5	48.	45.5	41.5	40.5	37.8	30.	7.5	5.5	4.4
37.5	30.	104.	99.	90.3	57.6	54.6	49.8	48.7	45.2	36.	9.1	6.6	5.2
50.	40.	139.	132.	120.	77.	73.	66.5	65.	60.	48.	12.1	8.8	7.
62.5	50.	173.	165.	152.	96.	91.	83.	81.	76.	61.	15.1	10.9	8.7
75.	60.	208.	198.	181.	115.	109.	99.6	97.5	91.	72.	18.1	13.1	10.5
93.8	75.	261.	247.	226.	143.	136.	123.	120.	113.	90.	22.6	16.4	13.
100.	80.	278.	264.	240.	154.	146.	133.	130.	120.	96.	24.1	17.6	13.9
125.	100.	347.	330.	301.	192.	182.	166.	162.	150.	120.	30.	21.8	17.5
156.	125.	433.	413.	375.	240.	228.	208.	204.	188.	150.	38.	27.3	22.
187.	150.	520.	495.	450.	288.	273.	249.	244.	225.	180.	45.	33.	26.
219.	175.	608.	577.	527.	335.	318.	289.	283.	264.	211.	53.	38.	31.
250.	200.	694.	660.	601.	384.	364.	332.	324.	301.	241.	60.	44.	35.
312.	250.	866.	825.	751.	480.	455.	415.	405.	376.	300.	75.	55.	43.
375.	300.	1040.	990.	903.	576.	546.	498.	487.	451.	361.	90.	66.	52.
438.	350.	1220.	1155.	1053.	672.	637.	581.	568.	527.	422.	105.	77.	61.
500.	400.	1390.	1320.	1203.	770.	730.	665.	650.	602.	481.	120.	88.	69.
625.	500.	1735.	1650.	1504.	960.	910.	830.	810.	752.	602.	150.	109.	87.
750.	600.	2080.	1980.	1803.	1150.	1090.	996.	975.	902.	721.	180.	131.	104.
875.	700.	2430.	2310.	2104.	1344.	1274.	1162.	1136.	1052.	842.	210.	153.	121.
1000.	800.	2780.	2640.	2405.	1540.	1460.	1330.	1300.	1203.	962.	241.	176.	139.
1125.	900.	3120.	2970.	2709.	1730.	1640.	1495.	1460.	1354.	1082.	271.	197.	156.
1250.	1000.	3470.	3300.	3009.	1920.	1820.	1660.	1620.	1504.	1202.	301.	218.	174.
1563.	1250.	4350.	4130.	3765.	2400.	2280.	2080.	2040.	1885.	1503.	376.	273.	218.
1875.	1500.	5205.	4950.	4520.	2880.	2730.	2490.	2440.	2260.	1805.	452.	327.	261.
2188.	1750.			5280.	3350.	3180.	2890.	2830.	2640.	2106.	528.	380.	304.
2500.	2000.			6020.	3840.	3640.	3320.	3240.	3015.	2405.	602.	436.	348.
2812.	2250.			6780.	4320.	4095.	3735.	3645.	3400.	2710.	678.	491.	392.
3130.	2500.			7520.	4800.	4560.	4160.	4080.	3765.	3005.	752.	546.	435.
3750.	3000.			9040.	5760.	5460.	4980.	4880.	4525.	3610.	904.	654.	522.
4375.	3500.			10550.	6700.	6360.	5780.	5660.	5285.	4220.	1055.	760.	610.
5000.	4000.			12040.	7680.	7280.	6640.	6480.	6035.	4810.	1204.	872.	695.

FOR YOUR REFERENCE

USEFUL ELECTRICAL FORMULAS

TO OBTAIN	SINGLE PHASE*	THREE PHASE*
Kilowatts	$\frac{V \times I \times pf}{1000}$	$\frac{1.732 \times V \times I \times pf}{1000}$
kVA	$\frac{V \times I}{1000}$	$\frac{1.732 \times V \times I}{1000}$
Horsepower required when generator kW unknown (if generator efficiency is unknown, use 0.93)	$\frac{kW}{0.746 \times \text{Efficiency (Generator)}}$	$\frac{kW}{0.746 \times \text{Efficiency (Generator)}}$
kW input when motor hp known (if motor efficiency unknown, use 0.85 x hp)	$\frac{hp \times 0.746}{\text{Efficiency (Motor)}}$	$\frac{hp \times 0.746}{\text{Efficiency (Motor)}}$
Amperes when motor hp known	$\frac{hp \times 0.746}{V \times pf \times \text{Efficiency}}$	$\frac{hp \times 0.746}{1.732 \times V \times pf \times \text{Efficiency}}$
Amperes when kW known	$\frac{kW \times 1000}{V \times pf}$	$\frac{kW \times 1000}{1.732 \times V \times pf}$
Amperes when kVA known	$\frac{kVA \times 1000}{V}$	$\frac{kVA \times 1000}{1.732 \times V}$

* Alternating Current

AMPACITY TABLES

AMPACITY OF CABLES TYPES W AND G
Based on Ambient Temperature of 30°C (86°F).
Temperature rating of cable

SIZE AWG/ kcmil	60°C (140°F)			75°C (167°F)			90°C (194°F)		
	D	E	F	D	E	F	D	E	F
8	60	55	48	70	65	57	80	74	65
6	80	72	63	95	88	77	105	99	87
4	105	96	84	125	115	101	140	130	114
3	120	113	99	145	135	118	165	152	133
2	140	128	112	170	152	133	190	174	152
1	165	150	131	195	178	156	220	202	177
1/0	195	173	151	230	207	181	260	234	205
2/0	225	199	174	265	238	208	300	271	237
3/0	260	230	201	310	275	241	350	313	274
4/0	300	265	232	360	317	277	405	361	316
250	340	296	259	405	354	310	455	402	352
300	375	330	289	445	395	346	505	449	393
350	420	363	318	505	435	381	570	495	433
400	455	392	343	545	469	410	615	535	468
500	515	448	392	620	537	470	700	613	536

The ampacities under subheading D are the allowable ampacity for single-conductor Types W cable only where the individual conductors are not installed in raceways and are not in physical contact with each other except in lengths not to exceed 24 inches (610 mm) where passing through the wall of an enclosure.

The ampacities under subheading E apply to 2-conductor cables and other multi-conductor cables connected to utilization equipment so that only 2 conductors are current carrying. The ampacities under subheading F apply to 3-conductor cables and other multi-conductor cables connected to utilization equipment so that only 3 conductors are current carrying.

1. Ambients not in Tables. Ampacities at ambient temperatures other than those shown in the tables shall be determined by means of the following formula:

$$I_2 = I_1^{1/3} \sqrt{\frac{TC - TA_2 - \text{DELTA TD}}{TC - TA_1 - \text{DELTA TD}}}$$

Where,

- I_1 = Ampacity from tables at ambient TA_1 ,
- I_2 = Ampacity at desired ambient TA_2 ,
- TC = Conductor temperature in degrees C,
- TA_1 = Surrounding ambient from tables in degrees C,
- TA_2 = Desired ambient in degrees C,
- DELTA TD = Dielectric loss temperature rise.

NOTE: Ultimate Insulation Temperature. In no case shall conductors be associated together in such a way with respect to the kind of circuit, the wiring method used, or the number of conductors that the limiting temperature of the conductors will be exceeded.

NOTE: The ampacity tables shown in this brochure are for general reference only: Cable installation conditions vary and require full compliance with the National Electrical Code.

POWER OUTAGE WORK SHEET

Use these pages as working documents to expedite generator set rentals during scheduled and / or emergency power outages. Photocopy the work sheets before you fill them out so that you can update them continually. Keep updated copies at home, since you may not have access to your office in an emergency.

KEY CONTACT TELEPHONE NUMBERS

CONTACT	OFFICE	HOME
In-house operations/ maintenance staff:	<hr/> <hr/>	<hr/> <hr/>
Person responsible for computers, security/data recovery/ alternate:	<hr/> <hr/>	<hr/> <hr/>
Person in charge during power outages/alternate:	<hr/> <hr/>	<hr/> <hr/>
Supplying utility contact/alternate:	<hr/> <hr/>	<hr/> <hr/>
Generator set dealership contact/alternate:	<hr/> <hr/>	<hr/> <hr/>
Person responsible for generator set hookup/alternate:	<hr/> <hr/>	<hr/> <hr/>
Person responsible for generator set operation/alternate:	<hr/> <hr/>	<hr/> <hr/>
Electrical engineer or contractor, if necessary:	<hr/> <hr/>	<hr/> <hr/>
Electrical engineer/ contractor/alternate:	<hr/> <hr/>	<hr/> <hr/>
Fuel supplier/alternate:	<hr/> <hr/>	<hr/> <hr/>

POWER OUTAGE WORK SHEET

In-House Electrical Information

Prioritized list of critical loads:

EQUIPMENT	VOLTAGE/AMPERAGE

Prioritized list of critical loads:

Location where schematic drawings, electrical diagrams, Power Planner Work Sheet and other instructions are kept:

Loads to isolate from main breaker:

Generator Sets/Auxiliary Equipment

Sizes of generator sets needed:	Transportation arrangements:
Time needed to locate generator sets on site:	Auxiliary equipment needed:

Is company check needed for generator set pick-up? Yes_____ No_____

(Not applicable if arrangements are made for pre-approved credit)

Generator set features to be specified (e.g., sound-attenuation, etc.):

CAT® RENTAL POWER

One Source For All Your Rental Power Needs.

Cat® dealers offer the expertise and equipment to meet the temporary power needs of facilities of virtually any size.

The staff of every Cat dealer is trained to determine your exact power requirements and to recommend appropriate generator sets and auxiliary equipment. Professional assistance is offered before generator sets are installed and throughout the rental period. Scheduled maintenance and emergency service are standard.

Every North American Cat dealer is also backed by Cat Rental Power, essentially offering you access to generator sets and auxiliary equipment owned by more than 50 dealerships throughout the United States and Canada.

Additionally, Caterpillar makes renting generator sets and related equipment easy when you call the 1-800-RENT CAT Hotline.



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CATERPILLAR®
TODAY'S WORK. TOMORROW'S WORLD.™