Future PSA Plant Electrical Assessment Form

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This document was developed by Build Health International for the Global Fund's Project BOXER.

Hospital Information			
Form Completed By	**Name**		**Title**
Hospital / Facility Name			
Date of Visit			
Hospital Contact Information	**Name**		**Title**
	Number (include country code)		**Email**
	Preferred contact method	☐	**Phone**
		☐	**WhatsApp**
		☐	**Email**
Drop a GPS pin at the hospital	☐	**Completed**	
Drop a GPS pin at the proposed site for the new PSA plant	☐	**Completed**	
Photo of Hospital/Facility Sign	☐	**Completed**	
Ask for a single-line diagram, if one was not provided before the assessment.	☐	**Completed**	

Ask the hospital technician to describe the electrical system layout, from the existing power supplies (transformers, generators, solar) to the loads on the system. Cable sizes, breakers, switches, and other protections should be included. Provide a high-level overview here, sketched or written, to be confirmed later.	

Power Supply Sources		
Main Power Supply Overview		
What is the main power supply? *Check all that apply.*	☐	**Utility (Transformers)**
	☐	**Generator**
	☐	**Solar**
Is the main power supply the same throughout the entire hospital?	☐	**Yes**
	☐	**No**
IF NO: Describe the other main power supplies and explain the areas of the hospital each covers.		
Backup Power Supply Overview		
What is the backup power supply? *Check all that apply.*	☐	**Generator(s)**
	☐	**Solar**
If there are different backup power supplies for different areas of the hospital, please explain.		

Transformers		
With the hospital technician, identify the transformer(s) that serve the hospital. Record the general areas of the hospital covered by each transformer.		
Transformer 1 (typically nearest the plant and serving the hospital)		
Transformer 2 (typically next closest depending on capacity available or main transformer for the hospital)		
Any other transformers present?		
Transformer 1		
Mark on a map of the hospital where the transformer is located.	☐	**Completed**
Drop a GPS pin at Transformer 1	☐	**Completed**
Measure the distance from the transformer to the transfer switch (ATS or MTS) and/or main distribution panel (MDP).	**Distance to transfer switch:**	
	Distance to MDP:	
Is the transformer dedicated to the hospital? (the transformer is not shared with the community or another facility)	☐	**Yes**
	☐	**No**
Who has ownership of the transformer? (in case an upgrade is needed, this will guide who is responsible financially)	☐	**Hospital**
	☐	**Utility**
Is the transformer accessible?	☐	**Yes**
	☐	**No**
IF YES: Take a clear picture of the transformer nameplate. For safety, keep a distance of 1-3 meters from the transformer.	☐	**Completed**
IF NO: Please explain why the transformer is not accessible.		

Using the picture of the transformer nameplate, fill in the fields below. If the transformer nameplate is not accessible (pole-mounted transformers), ask hospital staff if they know the following information. If the hospital staff does not know the transformer rating, they must contact the utility company to get the information.		
If the transformer nameplate was not available, where / who did you get the following information from?		
What is the transformer's power rating? [in kVA or kW]		
Record the manufacturer name and model #		
Record the primary voltage [V]		
Record the secondary voltage [V]		
Record the number of phases		
Record the frequency [Hz]		
Take a clear picture of the outgoing transformer feeder (outgoing from transformer to the hospital)	☐	**Completed**
Information on the feeder can be found on a label on the cable sheath/insulation. If the label is not accessible, the feeder size can be estimated by measuring the outside diameter with calipers and taking note of the type of cable (armored/non-armoured, copper/aluminum etc, number of cores, etc.)		
What is the outgoing transformer feeder size and type? (outgoing from transformer to the hospital)		
Transformer 2		
Mark on a map of the hospital where the transformer is located.	☐	**Completed**
Drop a GPS pin at Transformer 2 (If it is at the same location as an existing pin, add it to the name of the pin)	☐	**Completed**
Measure the distance from the transformer to the transfer switch (ATS or MTS) and/or main distribution panel (MDP). The transfer switch may be located with the MDP.	**Distance to transfer switch:**	
	Distance to MDP:	
Is the transformer dedicated to the hospital? (the transformer is not shared with the community or another facility)	☐	**Yes**
	☐	**No**

Who has ownership of the transformer? (in case an upgrade is needed, this will guide who is responsible financially)	☐	**Hospital**
	☐	**Utility**
Add the name and contact information of the point of contact for the transformer (hospital focal or utility company contact).		
Is the transformer accessible?	☐	**Yes**
	☐	**No**
IF YES: Take a clear picture of the transformer nameplate. Keep a distance of 1-3 meters from the transformer for safety purposes.	☐	**Completed**
IF NO: Please explain why the transformer is not accessible.		
Using the picture of the transformer nameplate, fill in the fields below. If the transformer nameplate is not accessible (pole-mounted transformers), ask hospital staff if they know the following information. If the hospital staff does not know the transformer rating, they must contact the utility company to get the information.		
If the transformer nameplate was not available, where / who did you get the following information from?		
What is the transformer's power rating? [kVA or kW]		
Record the manufacturer name and model #		
Record the primary voltage [V]		
Record the secondary voltage [V]		
Record the number of phases		
Record the frequency [Hz]		
Take a clear picture of the outgoing transformer feeder (outgoing from transformer to the hospital)	☐	**Completed**
Information on the feeder can be found on a label on the cable sheath/insulation. If the label is not accessible, the feeder size can be estimated by measuring the outside diameter with calipers and taking note of the type of cable (armored/non-armoured, copper/aluminum etc, number of cores, etc.)		
What is the outgoing transformer feeder size and type? (outgoing from transformer to the hospital)		

Main Distribution Panel (MDP)		
Mark on a map of the hospital where the MDP is located.	☐	**Completed**
Drop a GPS pin of the MDP location (If it is at the same location as an existing pin, add it to the name of the pin)	☐	**Completed**

Walk an acceptable cabling route between the MDP and the proposed PSA plant site with the hospital technician. Measure the distance. Use pins on Google maps or measure in-person. Mark the path between them on a printed map or in a PDF of the Google map.	☐	
Take a complete picture of the MDP	☐	**Completed**
Take a clear photo of the bus bars to assess the current carrying capacity. If possible, hold up an object for scale reference. Be extremely careful not to contact the bus bars.	☐	**Completed**
MDP number of phases	☐	**Single-phase**
	☐	**Three-phase**
MDP rating [A]		
Number of connected circuits in the MDP		
Is there space to add an additional breaker or a spare breaker?		
What is the condition of the MDP? Perform a visual inspection. Record if it is well-organized, labeled, damaged, properly enclosed, any visibly loose connections, signs of overheating etc.		
Main Breaker		
Main breaker location (At times main breaker will be outside MDP)		
Take a picture of the main breaker	☐	**Completed**
Take a picture of the main breaker nameplate	☐	**Completed**
Using the picture of the main breaker nameplate, fill in the fields below.		
Main breaker manufacturer name & model #		
Main breaker amperage [A] rating		
Main breaker voltage [V] rating		
Number of breaker poles		
Breaker curve type (for Miniature Circuit Breakers (MCBs) only)		
Category of breaker (Often Type A or Type B)		

What is the condition of the main breaker? Perform visual inspection. Record any signs of damage, overheating, improper mounting, is it bypassed, etc.		
Take a picture of the adjustment dials	☐	**Completed**
Using the picture of the main breaker adjustment dial, fill in the field below.		
Record breaker adjustable ratings & range (Ir, In, etc.)		
Using a clamp meter, record amperage readings at main feeder (All phases and neutral)	**L1:** **L2:** **L3:** **N:**	
Using a multimeter, record voltage readings at main breaker (All phases)	**L1-N:** **L2-N:** **L3-N:** **L1-L2:** **L1-L3:** **L2-L3:**	
Information on the feeder can be found on a label on the cable sheath/insulation. If the label is not accessible, the feeder size can be estimated by measuring the outside diameter with calipers and asking about the cable sheath type (XLD, armored, etc.).		
Main breaker incoming feeder size (usually incoming from the transformer)		
Main breaker outgoing feeder size (usually outgoing to the transfer switch or MDP busbars)		

Generators
With the hospital technician, identify the generator(s) that serve the hospital. Record the general areas of the hospital covered by each generator.

Generator 1 (typically the biggest generator or generator with spare capacity)		
Generator 2 (typically the closest generator if the first is far away)		
Generator 3		
Generator 1		
Is the generator the main power supply or a backup power supply?	☐	**Main Power Supply**
	☐	**Backup Power Supply**
If backup, what portion of the hospital is it backing up? A portion could be defined as wards or equipment like CT scanner, MRI machine, X-ray, etc. *If portion of hospital; explain further:*	☐	**Entire Hospital**
	☐	**Portion of Hospital:**
Drop a GPS pin at Generator 1 If it is at the same location as an existing pin, add it to the name of the pin.	☐	**Completed**
Take a picture of the nameplate. If for some reason you cannot see the nameplate, ask hospital staff for this information.	☐	**Completed**
Generator 1 prime [kVA or kW]		
Generator 1 standby [kVA or kW]		
Generator 1 manufacturer name & model #		
Information on the feeder can be on a label on the cable sheath/insulation. If the label is not accessible, the feeder size can be estimated by measuring the outside diameter with calipers and asking about the cable sheath type (XLD, armored, etc.).		
Generator 1 outgoing feeder size and number of feeders (from the generator to the ATS)		
Generator 1 running hours		
Backup system external tank?	☐	**Yes**
	☐	**No**
External tank size [Gallons or Liters]		
Were you able to test the generator without disrupting clinical operations?	☐	**Yes**
	☐	**No**
IF YES: How is the generator functioning?		

Generator 1 Circuit Breaker *(The circuit breaker where feeder from the generator terminates)*		
Take a picture of the generator breaker	☐	**Completed**
Take a picture of the generator breaker nameplate	☐	**Completed**
Using the picture of the generator breaker nameplate, fill in the fields below.		
Generator breaker manufacturer & model #		
Generator breaker amperage [A] rating		
Generator breaker voltage [V] rating		
Number of breaker poles		
Breaker curve type (for Miniature Circuit Breakers (MCBs) only)		
Category of breaker (Often Type A or Type B)		
What is the condition of the generator breaker? Perform visual inspection. Record any signs of damage, overheating, mounting issues, is it bypassed, etc.		
Take a picture of the adjustment dials	☐	**Completed**
Using the picture of the generator breaker adjustment dial, fill in the field below.		
Record breaker adjustable ratings & range (Ir, In, etc.)		
If possible (if the generator is running), use a multimeter to record amperage readings at generator breaker (All phases and neutral)	**L1:** **L2:** **L3:** **N:**	
Using a multimeter, record voltage readings at generator breaker (All phases)	**L1-N:** **L2-N:** **L3-N:** **L1-L2:** **L1-L3:** **L2-L3:**	
Generator 1 breaker outgoing feeder size (usually outgoing to the transfer switch)		

Generator 2		
Is the generator the main power supply or a backup power supply?	☐	**Main Power Supply**
	☐	**Backup Power Supply**
If backup, what portion of the hospital is it backing up? A portion could be defined as wards or equipment like CT scanner, MRI machine, X-ray, etc. *If portion of hospital; explain further.*	☐	**Entire Hospital**
	☐	**Portion of Hospital:**
Drop a GPS pin at Generator 2 If it is at the same location as an existing pin, add it to the name of the pin	☐	**Completed**
Take a picture of the nameplate. If for some reason you cannot see the nameplate, ask hospital staff for this information.	☐	**Completed**
Generator 2 prime [kVA or kW]		
Generator 2 standby [kVA or kW]		
Generator 2 manufacturer name & model #		
Generator 2 outgoing feeder size and number of feeders (from the generator to the ATS)		
Generator 2 running hours		
Backup system external tank?	☐	**Yes**
	☐	**No**
External tank size [Gallons or Liters]		
Were you able to test the generator without disrupting clinical operations?	☐	**Yes**
	☐	**No**
IF YES: How is the generator functioning?		
Generator 2 Circuit Breaker *(The circuit breaker where feeder from the generator terminates)*		
Take a picture of the generator breaker	☐	**Completed**
Take a picture of the generator breaker nameplate	☐	**Completed**
Using the picture of the generator breaker nameplate, fill in the fields below.		
Generator breaker manufacturer & model #		

Generator breaker amperage [A] rating		
Generator breaker voltage [V] rating		
Number of breaker poles		
Breaker curve type (for Miniature Circuit Breakers (MCBs) only)		
Category of breaker (Often Type A or Type B)		
What is the condition of the generator breaker? Perform visual inspection. Record any signs of damage, overheating, mounting issues, is it bypassed, etc.		
Take a picture of the adjustment dials	☐	**Completed**
Using the picture of the generator breaker adjustment dial, fill in the field below.		
Record breaker adjustable ratings & range (Ir, In, etc.)		
If possible (if the generator is running), use a multimeter to record amperage readings at generator breaker (All phases and neutral)	**L1:** **L2:** **L3:** **N:**	
Using a multimeter, record voltage readings at generator breaker (All phases)	**L1-N:** **L2-N:** **L3-N:** **L1-L2:** **L1-L3:** **L2-L3:**	
Generator 2 breaker outgoing feeder size (usually outgoing to the transfer switch)		

Transfer Switch		
What two sources of power does the transfer switch change between?		
Where is the transfer switch located?	☐	**It is part of the generator**
	☐	**With the Main Distribution Panel (MDP)**
	☐	**Wall-mounted apart from the MDP and generator**

IF wall-mounted, measure the distance from the transfer switch to the MDP.	**Distance to transfer switch (for backup system):**	
Transfer switch type	☐	**ATS (Automatic Transfer Switch)**
	☐	**MTS (Manual Transfer Switch)**
Mark on a map of the hospital where the ATS/MTS is located or drop a GPS pin. (If it is at the same location as an existing pin, add it to the name of the pin)	☐	**Completed**
Take a picture of the ATS/MTS nameplate	☐	**Completed**
Record the amperage [A] of ATS/MTS		
ATS/MTS manufacturer name & model #:		
How many poles does the ATS/MTS have? (Typically, 3 or 4)		
Is the ATS/MTS working?	☐	**Yes**
	☐	**No**

Solar (skip section if no solar power available at facility)	
Panel rating [kW]	
Number of panels	
Batteries	
If there is a battery bank, record its capacity	
How old are the batteries?	
If it is visible on the battery label, record the chemistry of the batteries (Typically, lithium or acid)	

Grounding Configuration		
Identify the type of earthing arrangement (typically able to do this at the MDP by checking the grounding cables from the utility)	☐	**TN-S**
	☐	**TN-C**
	☐	**TN-C-S**
	☐	**TT**
	☐	**IT**
Identify location of earthing electrode(s) that would be relevant to the PSA plant connection (the panel feeding that would likely the plant). Earthing electrode(s) may not be present		

depending on the type of earth arrangement.		
If there is an earth electrode, measure earthing resistance of the earth electrode(s) [Ω]		
Take a picture of the clamp meter measuring the earthing resistance of the earth electrode.	☐	**Complete**
What is the size of earth cable(s) linking the panel that will feed the PSA plant to the earth electrode?		
Is the earth electrode(s) properly connected to the MDP earth bar and/or transformer neutral? (Follow cable from the earth electrode(s) to the transformer and/or MDP)		
Take a photo of the connection at the MDP earth bar.	☐	**Complete**
Does the generator have its own earth electrode?		

For all electrical systems, fill in the tables below.

Additional Elements			
Repeat this section for all additional elements. *Additional elements include capacitor bank, Automatic Voltage Regulator (AVR), surge arrester, large UPS, etc.*			
	AVR	**Additional Element #2**	**Additional Element #3**
Additional Element Type			
Manufacturer			
Model #			
Electrical Characteristics			
Location in system			
What is the reason why this element was installed?			

Utility Power Reliability and Measurements	
Ask hospital staff the following questions and record their responses in detail	
How reliable is electricity at the facility?	
How often is electricity lost on average? (number of times per day or per week)	
When electricity is lost, how long is it lost for? (minutes, hours, etc.)	
Any other observations on power usage and quality?	
If using a datalogger during the assessment, how many hours of data were you able to collect?	
Take measurements at the expected PSA plant connection point. Typically, this is at the MDP before the transfer switch. Provide a clear description of its location. Take several readings at different time intervals of line to line voltage, line to neutral voltage using a digital multimeter if a datalogger isn't available. If you use a multimeter, please indicate the times of day that you measure.	

Overview	
Any major safety concerns at time of assessment (even if unrelated to the PSA plant installation)?	

Any major concerns of the electrical infrastructure from the transformer to the MDP?	
Any major concerns of the electrical infrastructure from the backup system to the MDP?	
Please comment on the capacity of the electrical system for an expansion of the medical oxygen system and/or additional machinery.	
Any further information?	