BHI Electrical Assessment Form

Existing PSA Plant

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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 PSA plant loads. 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 to the PSA plant?	☐	**Utility (Transformers)**
	☐	**Generator**
	☐	**Solar**
Is this power supply shared with other areas of the hospital?	☐	**Yes**
	☐	**No (dedicated to the PSA plant)**
If YES, list the other areas/loads connected to this power source.		
Backup Power Supply Overview		
What is the backup power supply to the PSA plant? *Check all that apply.*	☐	**Generator(s)**
	☐	**Solar**
Is the backup power supply dedicated to the PSA plant or shared?	☐	**Dedicated**
	☐	**Shared (if shared, specify which loads it shares with)**

Transformers		
With the hospital technician, identify the transformer(s) that are connected to the PSA plant, as primary or backup power supply. Repeat this section for multiple transformers.		
Mark on a map of the hospital where the transformer is located.	☐	**Completed**
Drop a GPS pin at the transformer	☐	**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**
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. 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)		

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**
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.		
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 are connected to the PSA plant, as primary or backup power supply. Repeat this section for multiple generators.		
Is the generator the main power supply or a backup power supply?	☐	**Main Power Supply**
	☐	**Backup Power Supply**
Does it support the entire facility, or only a portion? If a portion, please elaborate. 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 the generator (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 prime [kVA or kW]		
Generator standby [kVA or kW]		
Generator 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 outgoing feeder size and number of feeders (from the generator to the ATS)		
Generator 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 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)		
Breaker trip curve type		
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 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) relevant to the PSA plant connection (the panel feeding that would likely the plant). Earthing electrode 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 feeding 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?		

Oxygen Plant Subpanel		
Drop a GPS pin at the location of the oxygen plant subpanel	☐	**Completed**
Number of circuits in oxygen plant panel		
Take a photo of the panel showing all breakers. If available, include the panel schedule or any circuit labels.	☐	**Completed**
If it is not possible to take a photo, identify the different breakers in the panel and record the load they are feeding. Note Amp rating, type, and feeder size.		
Are the rotary screw compressor(s), booster compressor(s), and oxygen concentrator(s) each on their own circuit?	☐	**Yes**
	☐	**No**
Take a photo of the oxygen panel main breaker	☐	**Completed**
Oxygen panel main breaker size [Amps]		
Oxygen panel main breaker trip type		
Oxygen panel main breaker # of poles		
Take a photo of panel condition	☐	**Completed**
Note the condition of the panel. Elaborate if it is very poor (visual inspection, is it waterproof, exposed, etc.)		
Take a photo showing condition of breakers	☐	**Completed**
Note the condition of the breakers. Elaborate if it is very poor (evidence of overheating, are they properly installed, etc.)		
Size of incoming feeder to oxygen panel		

Approximate length of incoming feeder to oxygen panel		
Type of incoming feeder to oxygen panel		
Method of installation of feeder? For example: underground, in conduit, in trays, etc.		
Is it earthed (is there an earth rod)?	☐	**Yes**
	☐	**No**
Identify extra capacity in the PSA sub-panel: Is there a blanking space or free breaker that would allow for upgrade or additional PSA machinery?	☐	**Yes**
	☐	**No**
Any additional details of note?		
Using a clamp meter, record amperage readings at the incoming feeder while the plant is running (All phases and neutral)	**L1:** **L2:** **L3:** **N:**	
Using a multimeter, record voltage readings at the oxygen plant main breaker while the plant is running (All phases)	**L1-N:** **L2-N:** **L3-N:** **L1-L2:** **L1-L3:** **L2-L3:**	

Oxygen Plant Subpanel (Continued)			
Does the plant have a surge suppressor/protector?		☐	**Yes**
		☐	**No**
If YES:	**What does it cover?**	☐	**PSA Plant only**
		☐	**Entire facility**
	Current rating (kA)		
	Location in system		

	Make & model		
	Take a photo of the nameplate	☐	**Completed**
Does the plant have an automatic voltage stabilizer?		☐	**Yes**
		☐	**No**
If YES:	**What does it cover?**	☐	**PSA Plant only**
		☐	**Entire facility**
	Size (kVA)		
	Location in system		
	Make & model		
	Take a photo of the nameplate	☐	**Completed**

Circuit - Rotary Screw Compressor *Repeat this section for any additional rotary screw compressors*		
Compressor Nameplate Photo (showing make, model, serial, and power information)	☐	**Completed**
Does the compressor have a VSD?	☐	**Yes**
	☐	**No**
Does the plant have a phase monitoring/phase protection relay?	☐	**Yes**
	☐	**No**
IF YES: Is it original or was it added after installation?	☐	**Original**
	☐	**Added after installation**
Compressor kVA Rating		
Compressor Number of Phases		
Compressor Voltage		
Circuit Breaker Size		
Circuit Breaker # of poles		
Circuit Breaker Type		
Circuit Breaker Photo	☐	**Completed**
Feeder Size (incoming to circuit breaker)		
Feeder Size (to equipment)		
Method of installation of feeder? For example: underground, in conduit, in trays, etc.		
Is the rotary screw compressor grounded (does it have a ground wire)?	☐	**Yes**
	☐	**No**

Circuit - Oxygen Concentrator *Repeat this section for any additional oxygen concentrators*

Oxygen Concentrator Nameplate Photo (showing make, model, serial, and power information)	☐	**Completed**
Oxygen Concentrator kVA Rating		
Oxygen Concentrator Number of Phases		
Oxygen Concentrator Voltage		
Circuit Breaker Size		
Circuit Breaker # of poles		
Circuit Breaker Type		
Circuit Breaker Photo	☐	**Completed**
Feeder Size (incoming to circuit breaker)		
Feeder Size (to equipment)		
Method of installation of feeder? For example: underground, in conduit, in trays, etc.		
Does the PSA plant have an internal UPS or backpack battery for the controls?	☐	**Dedicated UPS**
	☐	**Backpack battery**
	☐	**Neither**
Is the oxygen concentrator grounded (does it have a ground wire)?	☐	**Yes**
	☐	**No**

Circuit - Cylinder Filling Booster Compressor (if applicable) *Repeat this section for any additional booster compressors*		
Booster Compressor Nameplate Photo (showing make, model, serial, and power information)	☐	**Completed**
Booster Compressor kVA Rating		
Booster Compressor Number of Phases		
Booster Compressor Voltage		
Circuit Breaker Size		
Circuit Breaker # of poles		
Circuit Breaker Type		
Circuit Breaker Photo	☐	**Completed**
Feeder Size (incoming to circuit breaker)		

Feeder Size (to equipment)		
Method of installation of feeder? For example: underground, in conduit, in trays, etc.		
Is the booster compressor grounded (does it have a ground wire)?	☐	**Yes**
	☐	**No**

Circuit - Low-Pressure Booster Compressor (if applicable) *Repeat this section for any additional low-pressure booster compressors. These will be used to adjust delivery pressure to the Medical Gas Distribution System (MGPS) in some cases.*		
Low-Pressure Booster Compressor Nameplate Photo (showing make, model, serial, and power information)	☐	**Completed**
Low-Pressure Booster Compressor kVA Rating		
Low-Pressure Booster Compressor Number of Phases		
Low-Pressure Booster Compressor Voltage		
Circuit Breaker Size		
Circuit Breaker # of poles		
Circuit Breaker Type		
Circuit Breaker Photo	☐	**Completed**
Feeder Size (incoming to circuit breaker)		
Feeder Size (to equipment)		
Method of installation of feeder? For example: underground, in conduit, in trays, etc.		
Is the low-pressure booster compressor grounded (does it have a ground wire)?	☐	**Yes**
	☐	**No**

Overview	
Utility Power Supply	
When applicable, obtain information by asking 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?	
General	
Any major electrical safety concerns at time of assessment (even if unrelated to the PSA plant)?	
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?	
Any major concerns of the electrical infrastructure from the MDP to the PSA plant?	
Do the current primary and backup power supplies have adequate capacity to support the PSA plant? If NO, please identify other potential sources of power.	
Please comment on the capacity of the electrical system for an expansion of the medical oxygen system and/or additional machinery.	
Any further information?	

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?			