Buckeye Power Sales
Reliable Power Professionals Since 1947

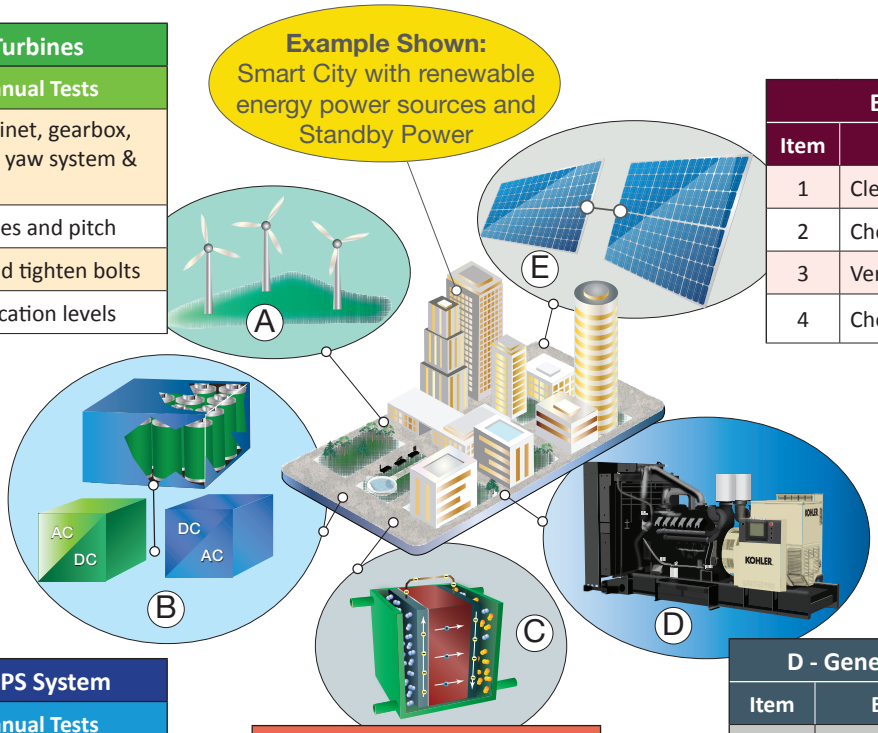
Many critical power applications, for example data centers and medical facilities, are switching to microgrids to supply all their electrical power requirements. Reasons for the adoption of microgrid power over the traditional macrogrid system vary; sometimes it's ensuring a more secure power supply, or economics, or easier to adopt renewable energy power sources, or all of these factors. Many microgrids are owned by a single entity and incorporate a variety of power generation sources, all tied together. Unlike a traditional standby generation system providing backup power to the traditional macrogrid, a service provider has to be able to maintain a variety of power sources, not just the generator system. This information sheet discusses all the components of a microgrid system that have to be maintained to ensure reliable operation, and the type of service provider resources necessary to provide Total System Maintenance of a microgrid system.

1.0 POWER SYSTEMS WITHIN A MICROGRID:

One advantage of a microgrid is that it is a group of power systems tied together to ensure the connected load is not reliant on a single source of power such as the macrogrid. Microgrids utilize various power sources to utilize renewable energy and to have the security of an Uninterrupted Power Supply (UPS). - ***See Figure 1.*** Various power components within the microgrid include: (Continued Over).

Service Requirements of Power Sources within a Microgrid System

A - Wind Turbines	
Item	**Bi-Annual Tests**
1	Inspect cabinet, gearbox, generators, yaw system & brakes
2	Assess blades and pitch
3	Examine and tighten bolts
4	Check lubrication levels



E - Solar Array	
Item	**Bi-Annual Tests**
1	Clean solar panels
2	Check vents debris free
3	Verify inverter operation
4	Check wiring connections

B - Battery UPS System	
Item	**Bi-Annual Tests**
1	Clean battery terminals
2	Check electrolyte
3	Measure voltage
4	Check wiring connections

C - Fuel Cell	
Item	**Bi-Annual Tests**
1	Check fuel valves
2	Check fuel pressure
3	Change chemical filter
4	Check pump operation
5	Check for leaks/cracks

D - Generator System	
Item	**Bi-Annual Tests**
1	Check/change filters
2	Battery electrolyte
3	Diesel fuel condition
4	Load test
5	Check electric contacts
6	Enclosure ventilation

Figure 1.

1.1 RENEWABLE ENERGY:

Many companies are adopting renewable energy sources to reduce their carbon footprint. Principal source are:

- **Wind Turbines -** Wind Turbines, or a group (termed Wind Farms) can generate from a few kilowatts to several megawatts.
- **Solar Panels -** Solar arrays can generate, depending on the available area, similar levels of power as wind turbines.
- **Related Equipment -** Solar panels generate DC power which has to be converted into AC power through an inverter. In addition to inverters, renewable energy systems also have rectifiers to recharge the batteries that provide power when the wind doesn't blow and the sun doesn't shine.

1.2 FUEL CELLS:

Medical facilities and data centers use fuel cells as part of their UPS systems. Large fuel cells are a more efficient user of fuel than internal combustion engines and fossil fueled power plants. *(See information sheet on Fuel Cells)*

1.3 BATTERY BANKS:

Medical facilities and data centers use battery banks as part of their UPS systems. Stored energy in the battery provides uninterrupted power when the connected load is switched to another power source. *(See information sheet on UPS Systems)*

1.4 ENGINE DRIVEN GENERATOR SYSTEMS:

When the wind doesn't blow, and the sun doesn't shine; the battery is discharged, and the fuel cells off-line, microgrids employ engine-driven generator systems. Sufficient fuel (gas or diesel) is held in storage to ensure power for the worst case scenario of all other power sources going off-line.

2.0 WHO PROVIDES SERVICE TO MICROGRIDS:

The support network for individual power generation equipment, whether it is a diesel generator system, solar array, wind turbine, fuel cell, or battery bank, is usually undertaken by the authorized distributor for the manufacturer of the power equipment. However, microgrid system operators are frequently requiring one company to provide all the planned maintenance and service requirements of all the power sources within the microgrid.

Providers of total service to power equipment within the microgrid fall into the following categories:

2.1 MANUFACTURERS AUTHORIZED DISTRIBUTOR:

Engine driven generator set manufacturers have developed a network of distributors to support complete generator systems, including service and maintenance programs for the engine, fuel system, generator end, controls, Automatic transfer Switched (ATS), paralleling switchgear, and controls. Their experience covers both electrical and mechanical items.

It is logical for the distributor to put in-house the service expertise for the other power sources within the microgrid and/or contract out to the manufacturer's representative as microgrid operators look to contract with one service provider.

2.2 NETWORK SERVICE PROVIDERS:

Companies, such as wireless providers, data centers, healthcare facilities, etc., with a network of power equipment with many installations across a wide geographic area, have for many years being putting network service contracts out to service providers offering nationwide generator service. These providers over time have added other service resources to the generator systems including UPS, batteries, inverters, and rectifiers. It is a natural step to include service resources for renewable energy and fuel cells.

3.0 SERVICE REQUIREMENTS OF A MICROGRID APPLICATION:

The manager of a microgrid application will look to provide a service contract to include planned maintenance and repair of all the power sources within the system. Service contracts will take account of consumable parts that have to be replaced at set intervals, wear items of rotating components, and deterioration of static components. The type of service required includes:

3.1 ENGINE DRIVEN GENERATOR SYSTEMS:

Planned Maintenance (PM) contracts cover all the components within a generator system. *(See information sheet on PM Service)*

An important part of PM is loading the generator to ensure it is ready to take the load when required. This ensures fuel, batteries and any other auxiliary equipment is fully operational.

3.2 RENEWABLE ENERGY SOURCES:

Service providers will be trained on Wind Turbines and Solar Array systems. They will have the equipment to manage the structural heights of wind turbines and the ability to replace solar panels that are defective and/or damaged. In addition to the energy sources, they will have a check-list to test inverter and rectifier operation. Generator distributors are already familiar with inverters and rectifiers as many generator systems have a UPS component including these items.

3.3 BATTERIES:

Battery maintenance ensures all the cells are functioning; electrolyte is correct, and connections are maintained. Batteries cell voltage will be monitored and checked, as will the discharge and charge rate.

3.4 FUEL CELLS:

Power generated by fuel cells is a product of a chemical reaction, *(see information sheet on fuel cells).* While the bulk of a fuel cell is a static component, the service contract will check any auxiliary equipment, the state of the electrolyte, anodes, and cathodes. Measurements will be taken and visual checks of fueling, connections, and general condition.

To fulfill our commitment to be the leading supplier in the power generation industry, the Buckeye Power Sales team ensures they are always up-to-date with the current power industry standards as well as industry trends. As a service, our Information Sheets are circulated on a regular basis to existing and potential power customers to maintain their awareness of changes and developments in standards, codes and technology within the power industry.

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