What is Reactive Power?

Alternating current (AC) is supplied in a 60Hz waveform. Reactive power is produced when the current waveform is out of phase with the voltage waveform due to inductive or capacitive loads. Current lags voltage with an inductive load, and leads voltage with a capacitive load. Only the component of current in phase with voltage produces real or active power that does real work. Current is in phase with voltage for a resistive load, like an incandescent light bulb. Reactive Power is necessary for producing the electric and magnetic fields in capacitors and inductors.

The additional current flow associated with reactive power can cause increased losses and excessive voltage sags. Transmission system operators have to ensure that reactive reserves are available to handle system contingencies such as the loss of a generator or transmission line because increased current flows after the occurrence of contingencies can produce greatly increased reactive power absorption in transmission lines. Some transmission system operators are now considering new rules for distribution systems that require a minimum allowable power factor. These minimum power factors could reduce the amount of reactive reserves that the system operator would have to provide. Distributed Energy (DE) could be ideally suited for providing reactive reserves in the distribution system.

Distributed Energy or DE, includes such resources as microturbines, reciprocating engine generators, and fuel cells. DE is often installed at or near electrical loads for local power and to take advantage of CHP or cooling, heating and power benefits that come from waste heat recovery of DE by thermally-activated technologies. With the right control scheme and algorithms, DE could be controlled to supply local reactive power and to regulate local voltage. Some DE devices contain synchronous generators, which can be directly connected to the local power system, and some, such as fuel cells or microturbines, must be interfaced to the local power system through an inverter because they produce DC or high-frequency AC that must be converted to 60Hz AC. Similar to a synchronous generator, the inverter can also be designed and controlled to “inject” reactive power locally and regulate voltage. Thus, a DE with a synchronous condenser or inverter could supply reactive reserves.