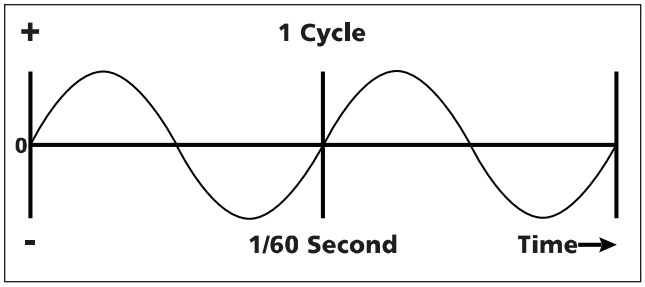
factsheet

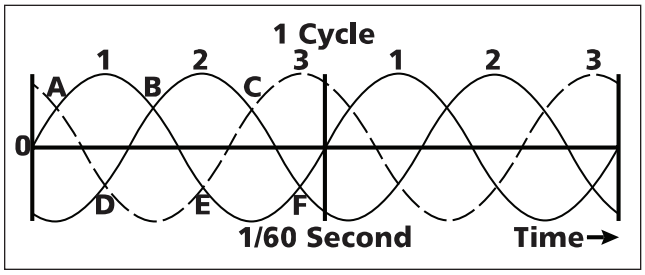
October 2005

# AC/DC Conversion

AC power is conducted in three phases. In an AC circuit, it takes 1/60 of a second to complete a single cycle. The cycle can be drawn as a wave, with a positive peak and a negative valley:



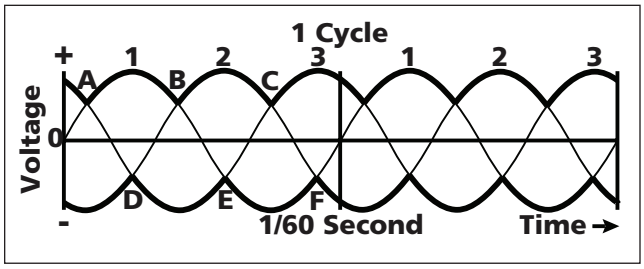

Three phases of power are used to provide a smooth power resource. To get three phases, three circuits are put together so that their waves overlap on the same voltage and time scale providing a constant median or average voltage.



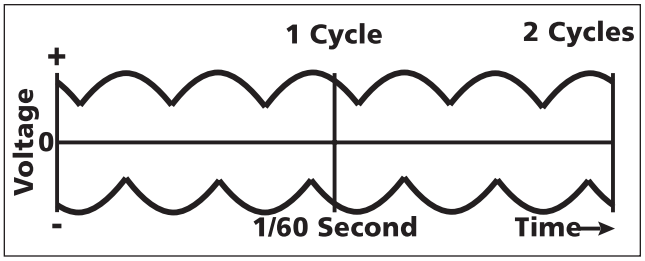

The three phases give each AC cycle three positive peaks and three negative valleys. To convert this power to DC, at each peak, one mercury arc valve or half of a thyristor valve picks off the positive pulses.

Another picks off the negative pulses. The switch occurs at each of the six points during the cycle (360 times a second) to build a continuous, one-way DC current. Voltage driving the current will be either negative or positive. The output of half the valves is positive, and the output of the other half is negative.

So the thyristor valves, firing in sequence, skim off the peaks and valleys from the AC waves. The DC output can be plotted to look like this:




The ripple effect as DC emerges gets smoothed out by equipment in the station yard.




One of the by products of the conversion process is stray frequencies (anything other than 60 hertz). These signals cause insulation breakdown in substation equipment and can also manifest themselves as static on AM radio stations. Capacitors and reactors filter unwanted frequencies and prevent them from being introduced to the AC power system.