

# Electric Generation Overview for Engines

Depending on equipment selection and options, electric generators can cost between \$400 to \$3000 per kW of installed capacity. The following describes the various options:

## Diesel Engines

Diesel engines are the least expensive type of generator available. Most air quality control districts will permit diesel engines for emergency power only. Some air quality districts are limiting the time of day and hours per year that diesel engines can be tested (a limit of 200 hours per year is common). Diesel engines require on-site storage tanks and occasionally suffer from problems with fuel contamination. They are the most common type of backup generator due to their low first costs and relatively high reliability.

## Natural Gas Engines

Although much more expensive than diesel generators, natural gas generators can be permitted to run on a full or part-time basis, producing savings in the form of reduced electricity costs. There are two major types of natural gas engines; lean burn and rich burn. Lean burn engines tend to have higher electric generating efficiencies, while rich burn engines tend to produce more waste heat.

## Synchronizing Equipment

Without synchronizing equipment, electricity can be supplied to the facility from **only one source at a time**, either the electric utility **or** the on-site electric generator. Switching between the electric utility and the on-site generator typically causes a temporary power interruption unless special equipment is purchased. Synchronizing equipment is required in order to run the on-site generator in parallel with the electric utility's electric service. This allows peak shaving benefits without sacrificing backup capability. The cost of installing synchronizing equipment will have a significant impact on the overall project costs.

## Heat Recovery Equipment

Installation of heat recovery equipment allows the recuperation of waste heat from the generator. Typically, this waste heat can be used to produce hot water, chilled water, or steam. Although adding significantly to overall project costs, heat recovery equipment usually produces shorter project payback times due to additional energy savings on existing hot water, chilled water, or steam systems.

## Maintenance

As with any piece of machinery, internal combustion engines must be well maintained. Maintenance costs vary with hours of operation. Engines require frequent oil changes and tune-ups, as well as top-end overhauls every 10,000 to 15,000 hours and major overhauls every 30,000 to 60,000 hours. Please refer to manufacturer specifications for actual maintenance intervals.

Most major manufacturers offer maintenance contracts. Maintenance contracts can vary from limited maintenance to comprehensive maintenance covering rebuilds and major overhauls. Maintenance contracts range in cost between 1 cent and 4 cents per kilowatt-hour.