ABSTRACT: In recent years there has been a lot of interest in examining clean energy options with an eye on non-petroleum fuels. Research in wind, solar, geothermal, biofuels, hydrogen and clean coal are being actively explored. It is now recognized that our energy solutions must include a combination of these technologies integrated with energy storage and smart grid approaches. Strategic areas being considered by federal agencies, and the National Science Foundation will be briefly presented. This talk will focus on energy generation via turbines using hydrogen and biofuels as the combustion fuels. Hydrogen which may be produced by coal gasification may be considered as an alternative to natural gas, while biofuels are being considered as potential additives or replacement for gasoline and kerosene-based fuels. Both fuel options lead to significant reductions in environmental impact relative to natural gas and petroleum fuels. We will focus our discussion primarily on the combustion characteristics of these alternative fuels.