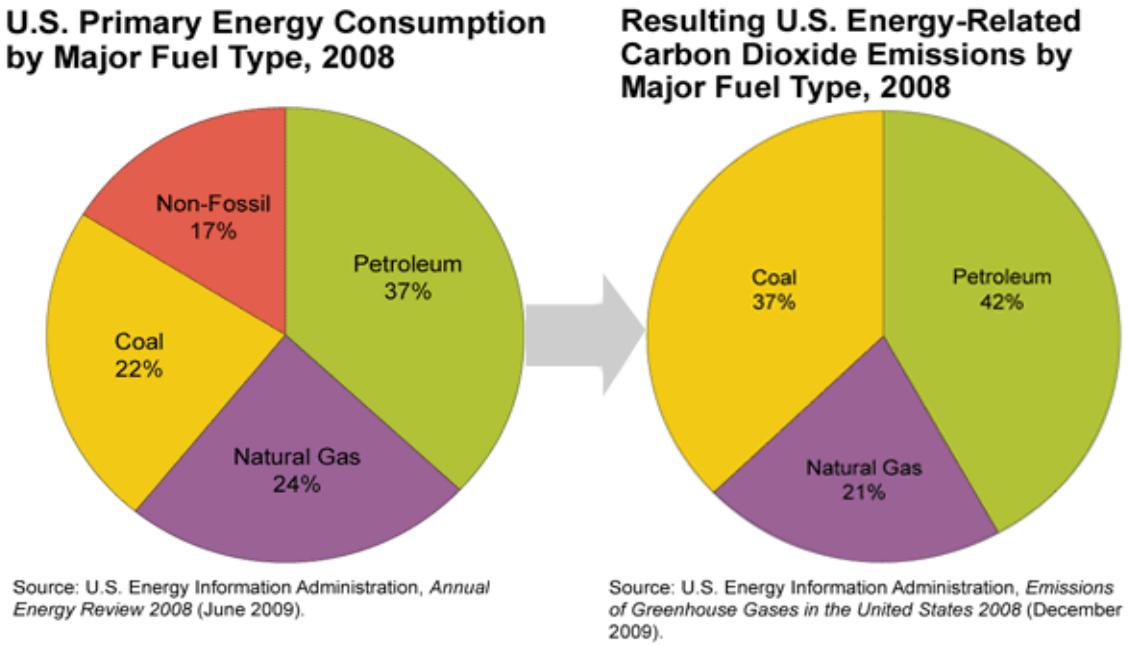
Biomass Utilization and the Carbon Cycle:

Biomass is considered to be a carbon neutral energy source. The chart below from the U.S. Energy Information Administration shows carbon dioxide emissions resulting from different energy sources. Non- fossil fuels (including biomass) make up 17% of U.S. energy consumption and according to this chart, result in 0% of the energy related carbon dioxide emissions. Using biomass for energy, however, does release carbon dioxide into the atmosphere. This brings up an interesting question: how can biomass release carbon into the atmosphere when burned (or pyrolysized), but still be considered a carbon neutral energy source?



The Environmental Protection Agency (EPA) explains that CO2 emissions associated with burning biomass are "part of the short term CO2 cycle of the atmosphere"[1]. As a tree grows it sequesters CO2, and when that tree dies from disease, old age, forest fire or human removal it releases its previously captured carbon back into the atmosphere. Even if a human does not remove the tree, it will naturally fall and decompose releasing its stored CO2. Each tree can only release as much carbon as it had already sequestered and therefore has a net zero impact on the total amount of CO2 in the atmosphere with in its lifetime.

[1] http://www.epa.gov/ttn/chief/ap42/ch01/final/c01s06.pdf

While this carbon neutral characteristic may be true of each individual tree, when you broaden the analysis to an entire forest other intricacies emerge that have major implications for the sustainability of removing biomass from the forest. A forest has the possibility of being carbon neutral, carbon positive or carbon negative. For example, if a forest has less growth (carbon-sequestration) than removal (carbon-release) then there is a net carbon increase in carbon dioxide (carbon positive) released from the forest within the given time period. The counter is also true – if the forest is adding more biomass than is being removed, then it is acting as a carbon sink (carbon negative).

What this means for carbon neutral or carbon negative energy production from biomass is that the removal of biomass from the forest must never exceed new growth. For many, this idea of removing only as much, or less, than is growing is defined as "sustainable" forest management. Thus, to answer the question – is biomass a carbon neutral energy source, one must ask, is the forest from which the biomass is being taken managed sustainably?