



Table 5:

## COMPARISON OF FUEL WOOD ENERGY WITH SOLAR PHOTO VOLTAIC AND WIND TURBINE SYSTEMS

ATTRIBUTES	<u>Solar (Photo-Voltaic) - Wind Turbine</u>	<u>Biomass (Fuel Wood)</u>
Pollution	Pollutes in manufacture, none in operation	Counters pollution - Restorative- CO2 absorption, oxygen generation.
Development Cost	Requires expansion of electrical grid - High Cost	Low
Operating Cost	Very Low	Low during planting. Low during maturation. Medium at harvest
Storage of Energy Produced	None	Stored on site as biomass.t
Conversion(s) Required	None - Direct electrical output	Low for direct combustion. Medium for ethanol/alcohol/butanol
Aesthetics	Poor.	Excellent - Forest and woodland restoration.
Greenhouse Gasses	No emissions however does not alter existing pollution	Carbon neutral. Cleanses existing atmospheric pollution
Substitution - Alternate Uses	None.	Pulp, paper, manufactured lumber, fiber products, heating fuel, others
Employment Creation	High in development - very little after establishment	Medium in development and harvest - Minimal during growth
Constancy of Production & Output	Varies daily by region and weather	Relatively constant long term
Useful Lifetime	30 yrs. Approx.	30-100+ yrs. Coppice growth (no replanting) - 7 yr. rotations
Scalability	Scalable to extent distribution grid exists.	Scalable to extent land is allocated.
Years to Deployment	Cost inhibits investment. Requires electric grid expansion	7-8 yrs. to first harvest. Minimal investments required.
Preemption of Resources	Requires large tracts of location-critical land.	Use of type 3 & 4 forest/pasture soils. May displace low intensity ranching.
Export	Problematic - electric transmission causes line losses	Ethanol/alcohol/butanol can be exported.
"Dense" (Transportation) Energy	Unsuitable for heavy transportation. Batteries as yet unsuitable	Usable for all modes including heavy trucks, locomotives, aircraft, etc.
Ancillary Costs	Complete replacement of fossil fueled machinery (transportation)	Fuel can be used as direct substitute for fossil fuels.

Note:

Fuel wood can be used without conversion for heating. Emissions of firewood combustion are low in NOX pollutants and with proper drying and use of EPA certified catalytic furnaces particulate emissions can be minimized by over 80%. Direct combustion is a viable option for heating use.