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Modern and efficient use of forest based biomass for sustainable energy sector development in the Ethiopian energy sector model

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Ethiopia's energy problem as in other Sub-Saharan African countries is acute due to heavy reliance on traditional bio-based energy resources, which account for 90% of national energy consumption, almost all of which is used inefficiently for household needs. In this presentation, a dynamic linear programming model developed, will be demonstrated to examine a least cost renewable energy resource development pathway that satisfies energy demand and resource availability constraints within Ethiopia's energy sector considering biomass use in electrical power generation and solid household energy consumption. Shadow value of resource availability constraint for power generation predicted to be about US \$ 332/KW and for traditional biomass US \$ 17/tons but varies from region to region. Model result implies that by 2045, Ethiopia will generate about 2,844MW power and 108 million tons of solid biomass (for satisfying fuel wood and charcoal demand) per year from forest biomass, provided about 2.16 million hectares of marginal (grazing and fallow land is afforested) and existing forest is sustainably utilized. Many factors make biomass electrical power attractive, such as its local economy linkages, job creation, waste reduction, and rural development advantages. Improved forestry and biomass resource management offer an approach to sustainable power development, particularly in off-grid areas, and a mechanism for mitigating carbon emissions via the carbon sequestration effects of forestry development. But the sustainability of this approach should be taken into account more cautiously. Realizing the potential benefits require concerted effort from government and concerned stakeholders to minimize the negative social and environmental consequences, and creating conducive institutions.

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