BIOMASS CONVERSION – REALITY AND OUTLOOK

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Rapid rate at which fossil and residual fuels are releasing CO2 into the atmosphere has raised international concern and has spurred intensive efforts to develop alternative, renewable, sources of primary energy.

There are a number of ways to reduce the emission of green house gases like large application of wind energy or solar energy as well as storage of CO2 in the deep see or underground.

Another way is the utilization of biomass. Although biomass contains carbon and the generation of energy out of this fuel releases CO2, this CO2 is also taken out of the atmosphere during growth of the plant.

Therefore we call biomass a green house gas emission neutral energy source. In contrast to the carbon in fossil fuels the carbon in biomass has a cycle period from plant to the atmosphere and back of between one and some tens of years.

The promotion of biomass energy and more efficient utilization of local sustainable energy resources is part of strategy on fuel diversification in many countries worldwide.

Almost all sub-tropical and tropical countries and areas in Europe, Asia, Africa, Australia and America have a great comparative advantage due to the intensity and regular availability of solar energy, which may be exploited through plant photosynthesis.

The solar energy stored in chemical form in plant and animal materials is among the most precious and most promising alternative fuels not only for power generation but also for other industrial and domestic applications.

Biomass absorbs the same amount of CO2 in growing that it releases when burned as a fuel in any form. Biomass contribution to global warming is zero. In addition, biomass fuels contain negligible amount of sulphur, so their contribution to acid rain is minimal.

The earth receives annually 3 millions of Exajoule‡ (EJ) from the sun. Part of this energy comes availably as hydropower at 90 EJ, as wind 630 EJ and via biosynthesis 1250 EJ. This has to be compared to an annual consumption of energy worldwide, which amounts to 400 EJ. Currently, biomass is the fourth largest energy resource after coal, natural gas and oil.

However, the technical biomass potential is only that part of the 1250 EJ, which with present day state of the art technology, can be made available. This technical potential is evaluated at 150 - 200 EJ, but can increase rapidly if technology progresses.

Over millions of years, natural processes in the earth transformed organic matter into today's fossil fuels: oil, natural gas and coal.

In contrast, biomass fuels come from organic matter in trees, agricultural crops and other living plant material. Major biomass energy resources for power generation include:

The Forest Residue PRODUCTION OF
HEAT (DIRECT COMBUSTION=DC) & SYNGAS
Free Field Residue PRODUCTION OF
HEAT (DC) & SYNGAS
Waste from Wood Processing Industry PRODUCTION OF
HEAT (DC) & SYNGAS
Urban Wood, Paper & Cardboard Waste PRODUCTION OF
HEAT (DC) & SYNGAS
Waste from Agricultural Products Processing Industry PRODUCTION OF
BIOGAS & SYNGAS
Organic Components in Town Waste PRODUCTION OF
SYNGAS & BIOGAS

Solid & Liquid Animal Manure PRODUCTION OF

SYNGAS & BIOGAS

Agricultural Plant Waste PRODUCTION OF

HEAT (DC), BIOGAS, SYNGAS, METHANOL & ETHANOL

Waste Waters PRODUCTION OF

BIOGAS

Landfills PRODUCTION OF

BIOGAS (LANDFILL GAS)

Unlike any other energy resource, using biomass to produce energy is often a way to dispose of biomass waste materials that otherwise would create environmental risks.

We distinguish the following three major biomass conversion technologies:

Direct Combustion **PRODUCT HEAT (HOT WATER, HOT AIR, STEAM);**

Thermo-Chemical Conversion **PRODUCT PYROLYSIS, CHARCOAL, SYNGAS;**

Bio-Chemical Conversion **PRODUCT METHANOL, ETHANOL, BIOGAS.**

‡ 1EJ = 1018J

There are a number of challenges that inhibit the development of biomass energy. In this regard, formulation of sustainable energy policy and strategies in addressing these challenges is indeed a pre-requisite for the development and promotion of biomass energy.

Major available biomass conversion technologies and their commercial implications are discussed in this paper.