



Biomass Usage and Issues

Learning objectives:

- 1) To describe what is Biomass
- 2) To indicate extent to which Biomass is clean and renewable
- 3) To indicate the different approaches in which Biomass is being used

Background:

- Power companies are under pressure to find alternatives to fossil fuels such as coal
- % renewables in energy target. EU 20% by 2020, India 40% by 2030. US States taking initiative, likely 20% by 2020
- Biomass: Fuel derived from Plant matter
- Considered clean and renewable

Overview:

- Versatile: Solid, Liquid, Gas
- Already supplies about 10% of world energy demand
- Both traditional small scale wood gathering to large scale farming processes involved
- Significant source of employment

Biomass Agriculture:

- Farmers grow corn for producing ethanol
 - Alternate source of income
 - Competition with food resources
- Bio-wastes

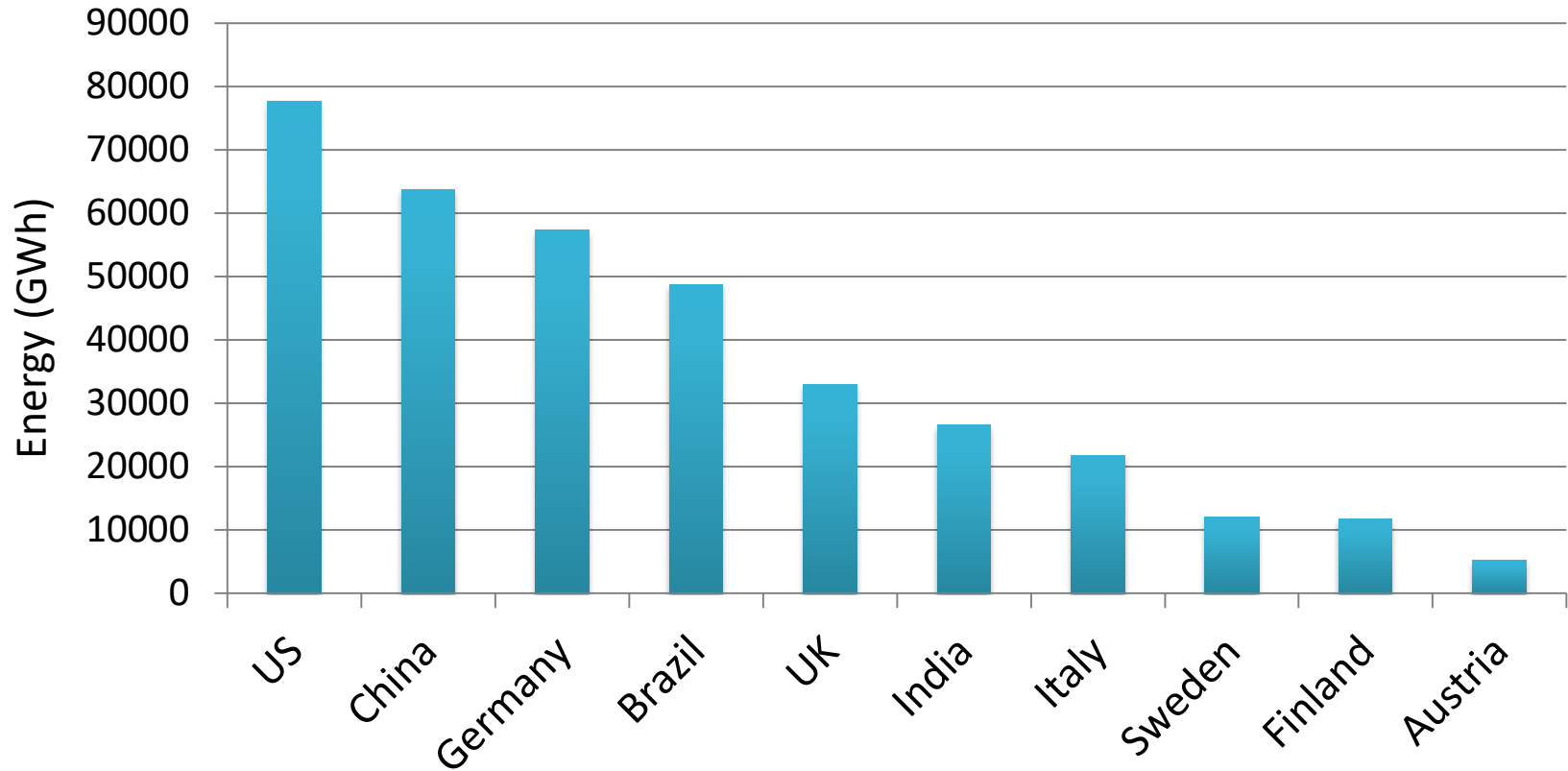
Straw:

- Biomass is often by-product or waste product from agriculture
- Straw is a major by-product from grain production (40% by weight of overall product)
- Billions of tons produced globally. Only 100 million tons used, rest burnt in the open or allowed to rot.
- Crop residue burning in October-November and Pollution in Delhi

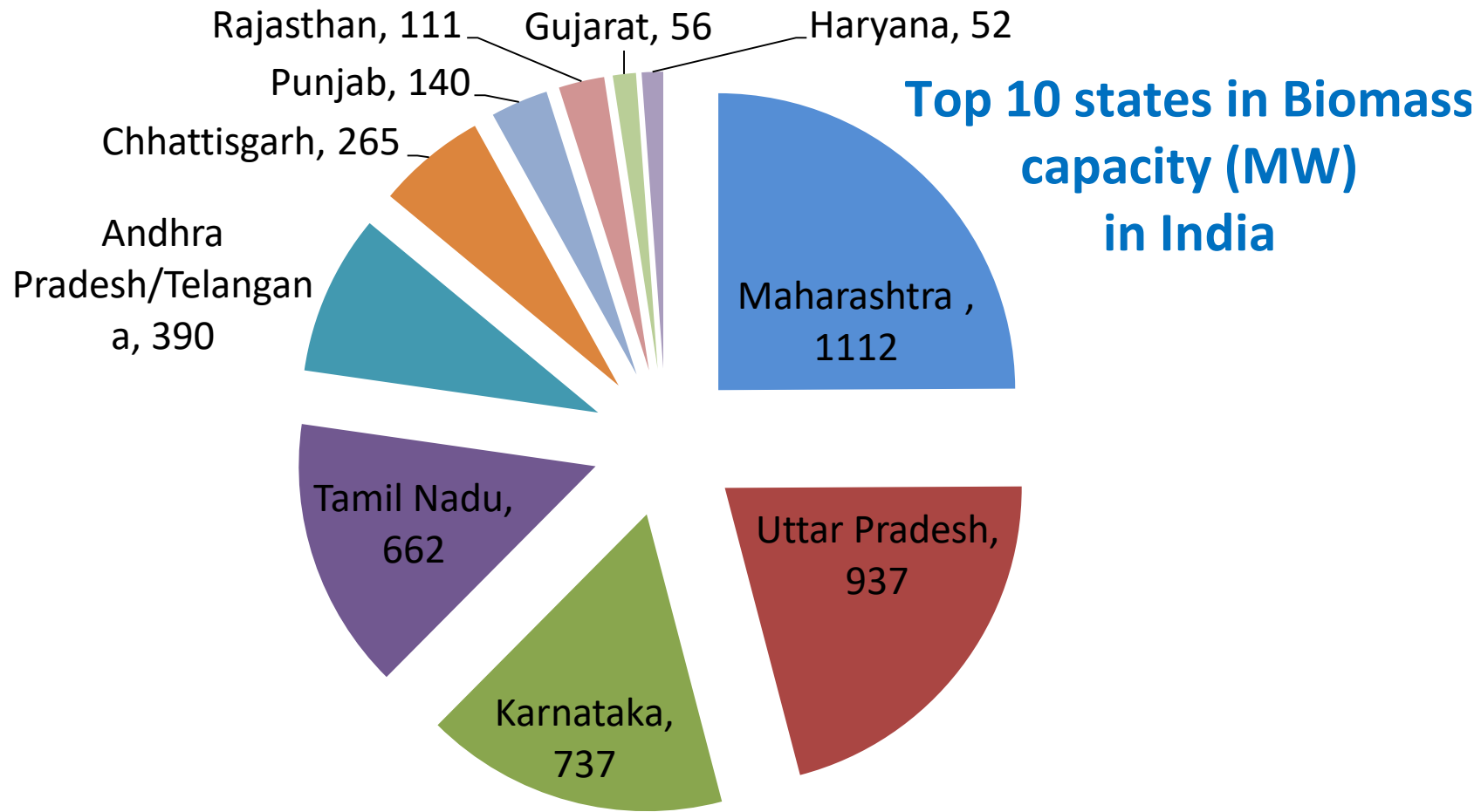
Substitutions:

- Coal – Direct combustion of wood
- Coal – Charcoal (wood heated in absence of air), removes volatiles, twice the energy content per unit mass
- Petrol – Ethanol by fermentation of corn/sugarcane (anaerobic)
- Diesel – Biodiesel, from vegetable oils such as soybean oil
- Natural gas – Biogas, from organic wastes (anaerobic)

Top 10 nations in Biomass Electricity (GWh)



Source: https://en.wikipedia.org/wiki/List_of_countries_by_electricity_production_from_renewable_sources



Source: Ministry for New and Renewable Energy (MNRE)

- 32% of Energy in country from Biomass
- Impacts 70% of the population
- 5940 MW biomass based power plants
- 4946 MW Grid connected
- 994 MW off grid power plants
- Bagasse: Major part of the above

Bagasse: Fibrous remains after juice extracted from Sugarcane

Source: Ministry for New and Renewable Energy (MNRE)

Biomass is clean?

- Carbon released is what was captured by the plant originally
- Time scale?
- Other impurities
- Impact on wildlife?

Time scale

Lifespan of a tree: 50 years to 3500 years

Time required to burn a tree?

Many things can happen to a tree as part of natural process

Biomass is clean?

Emissions from burning wood, CO₂, CO, SO_x, NO_x

Emissions from coal

Calorific value of wood	15 MJ/kg
Calorific value of Coal:	25 MJ/kg

Conclusions:

- 1) Extracting energy from plant or plant derived products is referred to as Biomass energy
- 2) Carbon neutrality of biomass may be more complicated to estimate than previously assumed
- 3) Plant products can be directly used to fuel power plants or converted to petrol or diesel and then used