

Biomass

What is it and why you should care?



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Topics

- What is it
- Physics and chemistry
- History
- Politics in the US
- Politics in the world

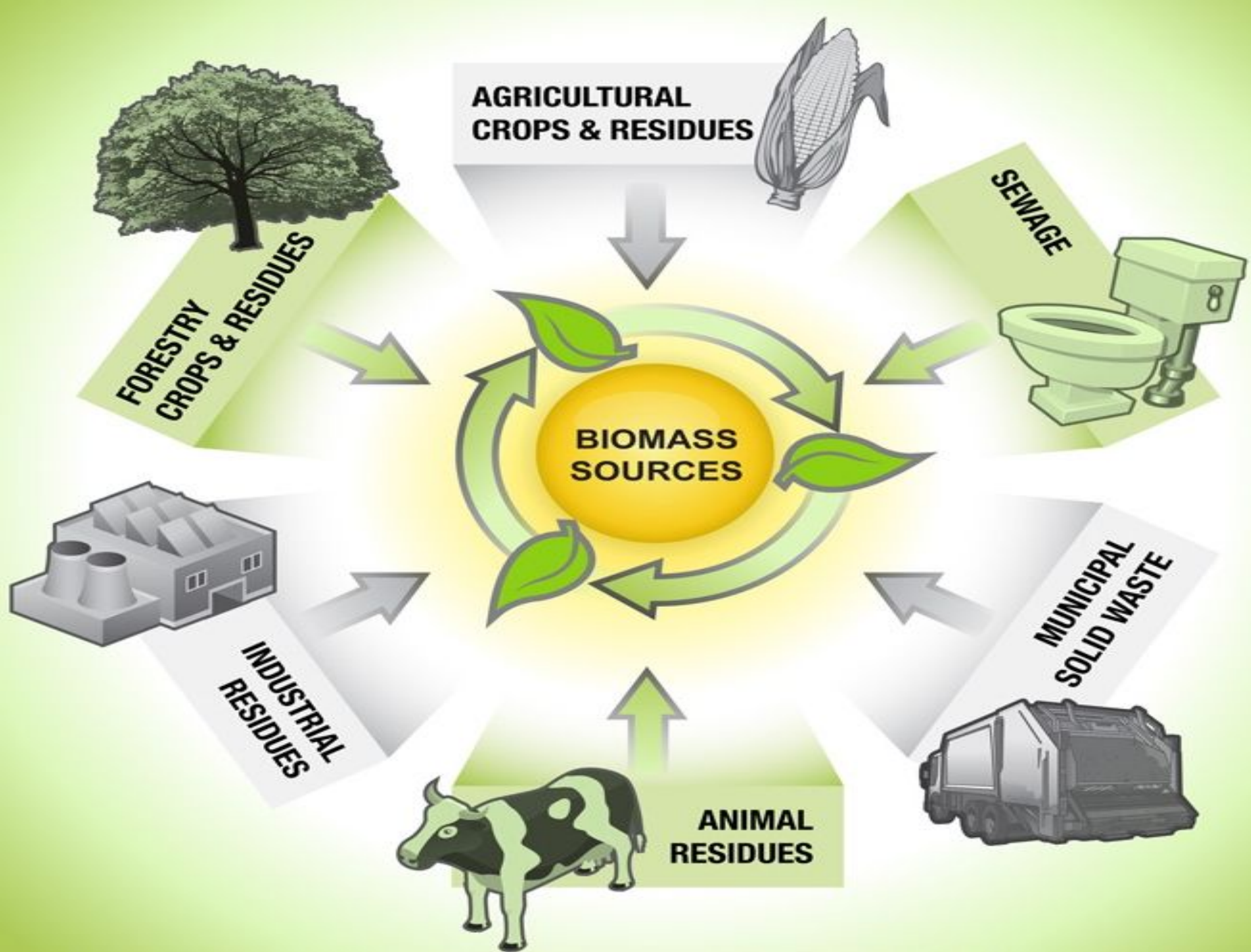
What is Biomass?



- **Biomass:** Energy. organic matter, especially plant matter, that can be converted to fuel and is therefore regarded as a potential energy source

How Biomass works?

- Physics-Unwanted waste and natural garbage is collected and burned to create heat energy.
- Chemistry- The burning of the resources or Biomass releases methane gas which can be used to power power plants and other energy dependent places.
- Biology-The biomasses are burned releasing gases that can be used as power.



Different ways of converting Biomass into energy

- Production of electricity- The resources being used are brought to a conversion facility especially for biomass, they are broken down and put into a furnace which boils water into steam which turns turbines creating electricity.
- Production of liquid fuel-can be converted directly into biofuel. Either ethanol or biodiesel. Both used for transportation. Biodiesel mixed with alcohol and oils and can be used for diesel engines. Ethanol is used in Flex Fuel cars.

Different ways of converting Biomass into energy cont.

Gas Fuel- resources can be burned on site where the biomass is being held which releases methane gas which is captured and used in power plants to create electricity.

Direct Energy- Simply burn the products and either turn it into steam that will create electricity or collect the methane and use it in power plants.

High Density Regenerative Forests
With Fast Growing Trees



Steam



Turbine
Rotated
By Steam

Rotating
Shaft



Electrical
Power

Feedstock Supply

Periodic
Biomass
Harvest

Steam Turbine

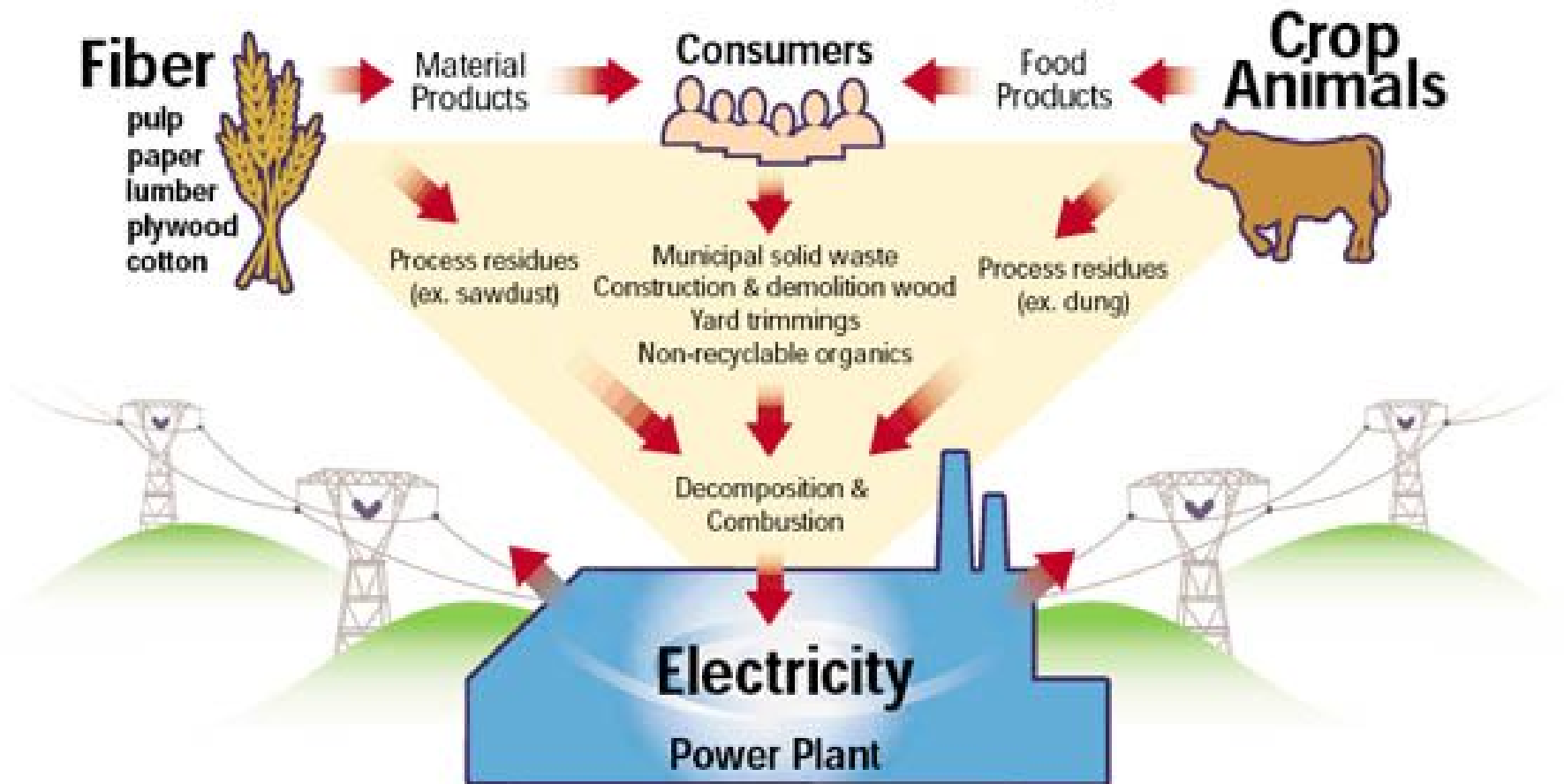
Burning
of
Biomass

Generator

Biomass Efficiency

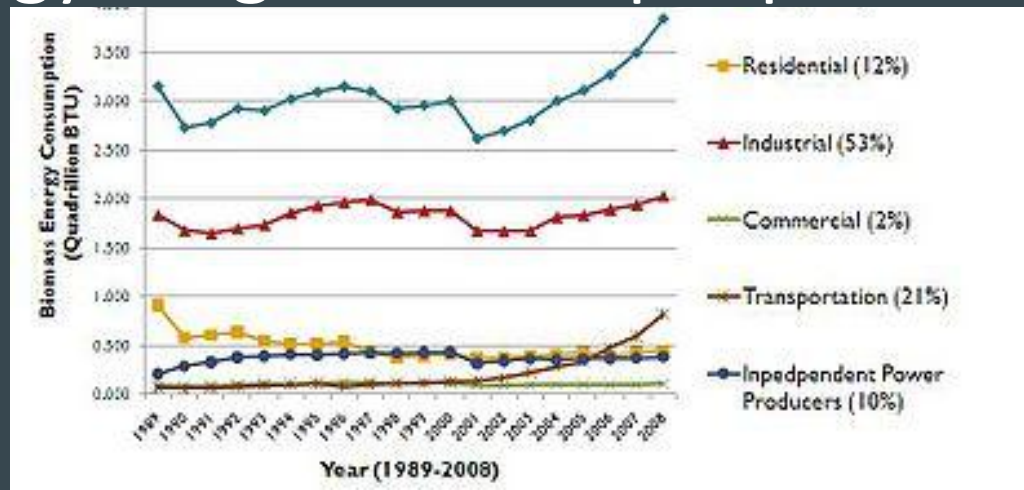
- Efficiency of biomass energy conversion- Very efficient and produces a reasonable amount of energy for the amount that is being burned.
- Possible future improvements- Slightly more environmentally friendly, if plants are not replaced then emissions cause climate problems. Also make the production cheaper because it is slightly costly.

Biomass to Electricity



Biomass History

- Biomass energy has been around since the creation of the earth. It wasn't until 1975 that the term "biomass" was coined. With the price of gas and the issues caused from mining coal the possibility of using natural materials for energy caught a lot of people's attention.

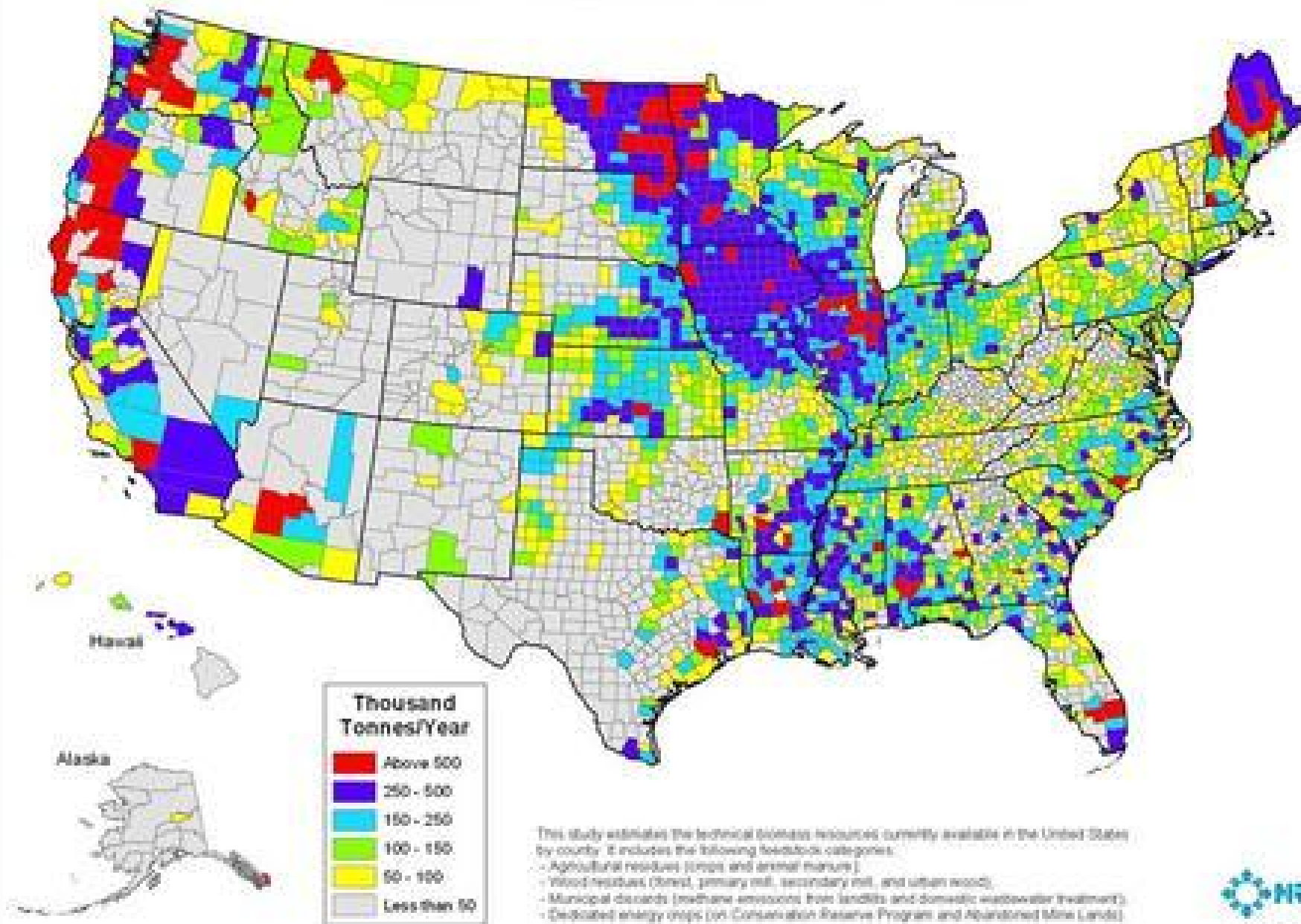




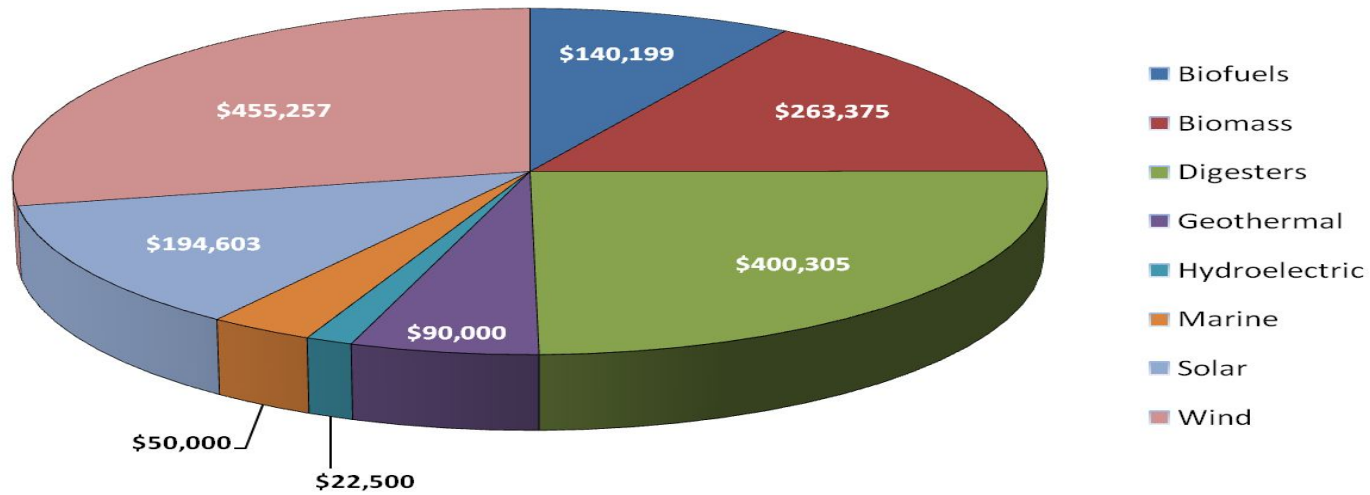
Biomass US Politics

- Who uses biomass in US and why? Industries burn waste wood to make products, people burn wood to heat their homes and waste to energy power plants burn organic waste products to produce electricity
- Who is against biomass energy and why? Those against using biomass claim that it's not entirely clean, it can cause deforestation and that it's inefficient and expensive to produce
- Where is biomass heading as an energy production source? Future plans for biomass energy include developing a more energy dense form

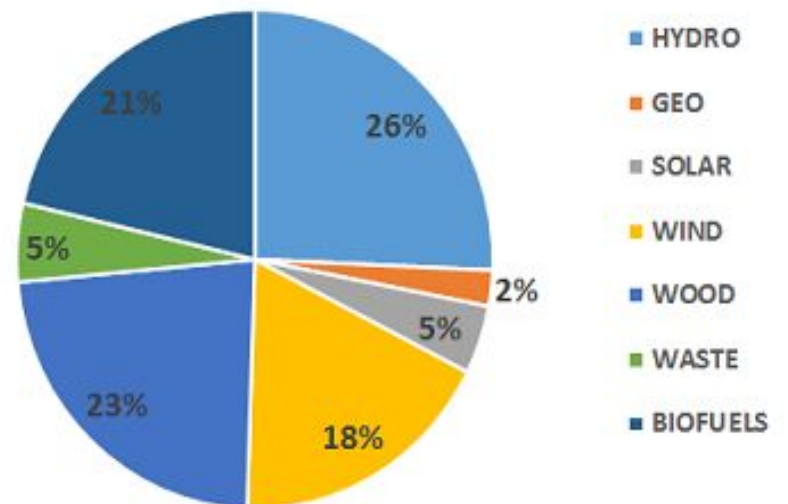
Biomass Resources Available in the United States



Feasibility Study Grants, FY2010 By Funding



Consumption of Renewable Energy 2014 EIA Table 10.1



Biomass Global Politics

- If countries began using their own domestic resources to fuel their energy needs through biomass, their entire economic status could take a giant leap in the positive direction.
- Some people argue that it may destroy the country's nature, but only if they don't replace what they take.



Biomass World Production

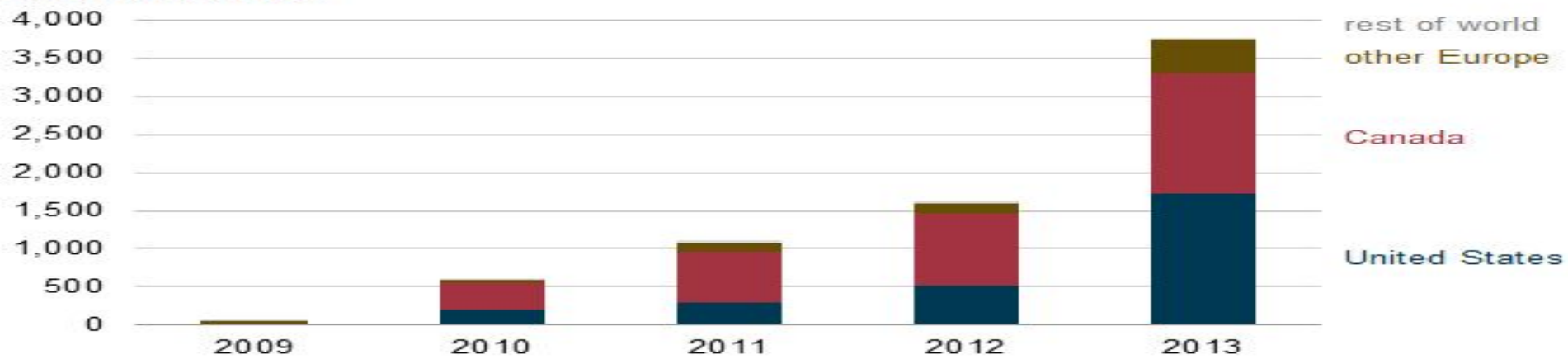
- The top producers of biomass energy in 2014 were The United States, China and Brazil
 - United States- 231480 terajoules
 - China- 151200 terajoules
 - Brazil- 126000 terajoules



Biomass Export/Import

- What is the US exporting to where- Mainly to Europe in places like Italy and England. Italy being the largest importer of wood pellets to burn.
- What is the US importing to where- doesn't really have the need for import because of its vast amounts of forest and resources.
- One of the largest growing countries using the pellets is south Korea. US exports doubled in 2012-2013.

United Kingdom wood pellet imports



WHY IS THE UNITED STATES A TOP EXPORTER?

because it has a sustainable supply of forest and wood certifications, and sustainable land management assurance.



shipping bulk pellets overseas uses **LESS THAN 13% OF THE ENERGY** used to transport pellets by truck.

» shipping a ton of pellets from the US to England emits less carbon emissions than transporting it from northern Scotland to England!

400%

percentage the European Union has increased pellet consumption by between 2006 and 2013: **FROM 4.6 MILLION TO 16 MILLION TONS**

198 »

pellet plants are in North America



SOUTHEAST U.S.

wood pellet exports from this region alone **doubled** between 2012 and 2013.

253 by 2016, export volumes are projected **TO INCREASE BY 253%**

the United Kingdom imported **3.75 MILLION TONS** of wood pellets in 2013.

ITALY

uses over 3 million tons annually. Consumption is growing between 200,000 and 300,000 tons a year.

» **ITALY IS MAINLAND EUROPE'S LARGEST BAGGED PELLET CONSUMER.**

unfortunately, Russia's history **IN OIL, GAS, AND COAL USE AND PRODUCTION** slows its bioenergy progress.

RUSSIA HAS PLENTY OF WOOD FIBER

SOUTH KOREA has been noted by experts as a rapidly emerging market.

20% **OF EUROPE'S ENERGY MUST NOW COME FROM RENEWABLES** which explains the wood import increase

2013 WOOD PELLETS IMPORT/EXPORT MAP

Sources: US Industrial Pellet Association | BIOMASS Magazine

Pros and Cons of Biomass for energy production

Pros

- Renewable
- Less dependent on fossil fuels
- Doesn't produce Carbon
- Widely available

Cons

- Not as efficient as gasoline
- Expensive
- Could potentially cause global warming



Effect of Biomass on Environment and Climate

-Burning biomass produces pollution

-It can lead to deforestation



Fuel Mass to Energy Output

Material	HHV ^a (MJ/kg)
Fir	21
Danish pine	21.2
Willow	20.0
Poplar	18.5
Cereal straw	17.3
Miscanthus	18.5
Bagasse	19.4
Switchgrass	17.4
Bituminous coal	26–2

- Higher Heating Value (HHV) is the total energy content released when the fuel is burnt in air
- HHV is measured in MegaJoules per Kilogram

Conclusion

- The use of Biomass as a source of renewable energy is vastly growing and is a great source of energy creation.
- As long as people are responsible by replacing what they take then there will not be any environmental harm.



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