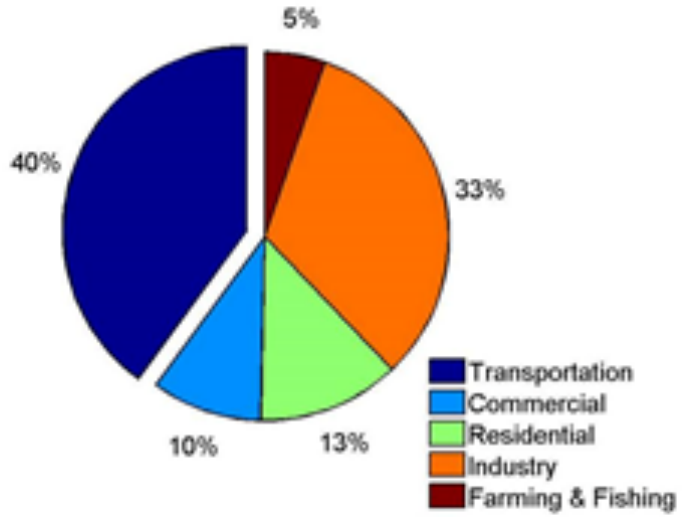
Energy systems for a city- Sustainable Valencia city (GROUP D)

- Valencia is a city at the west Europe located at the east part of Spain.
- Famous with its touristic places, beaches sea and sun.
- It has moderate winter and hot summer.
- One of the producers of orange in the world

Energy systems for a city- Sustainable Valencia city

Total production of Spain: 116000 TJ
Domestic production: 33000 TJ → 14% is only renewable sources

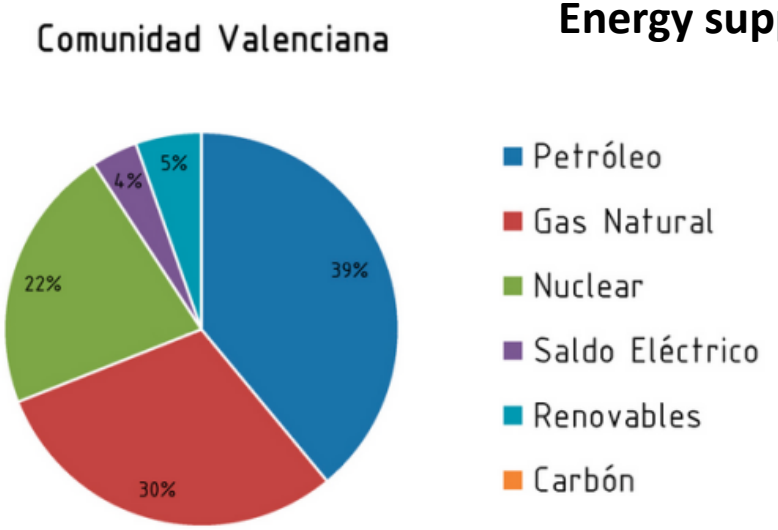
Nuclear energy production: 14000 TJ
Wind: 4000 TJ
PV: 700 TJ
Geo: 18 TJ
Coal: 1300 TJ
BE: 7200 TJ



Distribution of energy consumption:
Transportation: 40%
Commercial: 5%
Residential: 13%
Industry: 33%
Farming and fishing: 9%

Properties about distribution;
Transportation depends on fossil based
Nuclear can cover need for electricity
Industry revenue compensate by tourism sector

Energy supply for Valencia



Resources and technologies to support these;

Resources

Biomass
Rice
Rice stark
Orange
Algaes

Solar energy
Tidal energy
Wind energy
Hydrogen energy

Nuclear energy

What are the things that need to be improved?

- ❑ Increase the percentage of renewable sources specially for transportation
- ❑ Decrease the dependency to imported energy sources.
- ❑ Increase the quality of life as decreasing carbon emission.

What we should do for sustainable city?

- ❑ Replace energy supply for transportation to bioethanol.

Why we should do for sustainable city?

- ❑ Decrease the energy dependence on foreign sources.
- ❑ Achieve EU renewable energy standards.
- ❑ As precautions for global warming.
- ❑ Increasing oil prices

How we can change this?

- ❑ Building bioethanol plants for transportation
- ❑ Utilizing sources such as rice, orange.
- ❑ Build incineration plants for rice stark.
- ❑ Deploying eolic wind plants.
- ❑ Using tidal energy far away from sea.

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Biomass Energy

Utilizing orange peels for obtaining ethanol can create sources for transportation.

Total production of orange in Valencia city: 1.61 million tons
Exports: 0.1864 million tons
Consume: 0.746 million tons → 0.425 million tons orange peel can be obtained

According to this 4,675,000 gallons of ethanol can be produced as 200 proof.

A facility for processing ethanol costs 25-30 million dollars with a capacity of 100 million gallons;

Amount of energy can be generated is 396 TJ.

Procedure to Estimate Amount of BE

Energy Content from gasoline (34.2 MJ/L)

Energy Content from ethanol (22.57 MJ/L)

Amount of orange production (1.6million tons)

↓ Rate of residue's weight (57.6%)

Amount of residue (0.425 million tons)

↓ Amount of ethanol from unit of residue (11 gal/l)

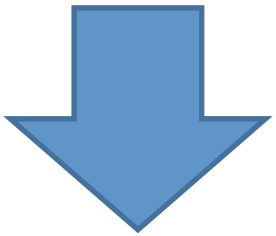
Amount of energy content in bioethanol (BE) is…

395.7 TJ

Procedure to Estimate Amount of Demand

Population in Spain (46.81 million)

Amount of energy use for transportation in Spain (338.88 TJ)

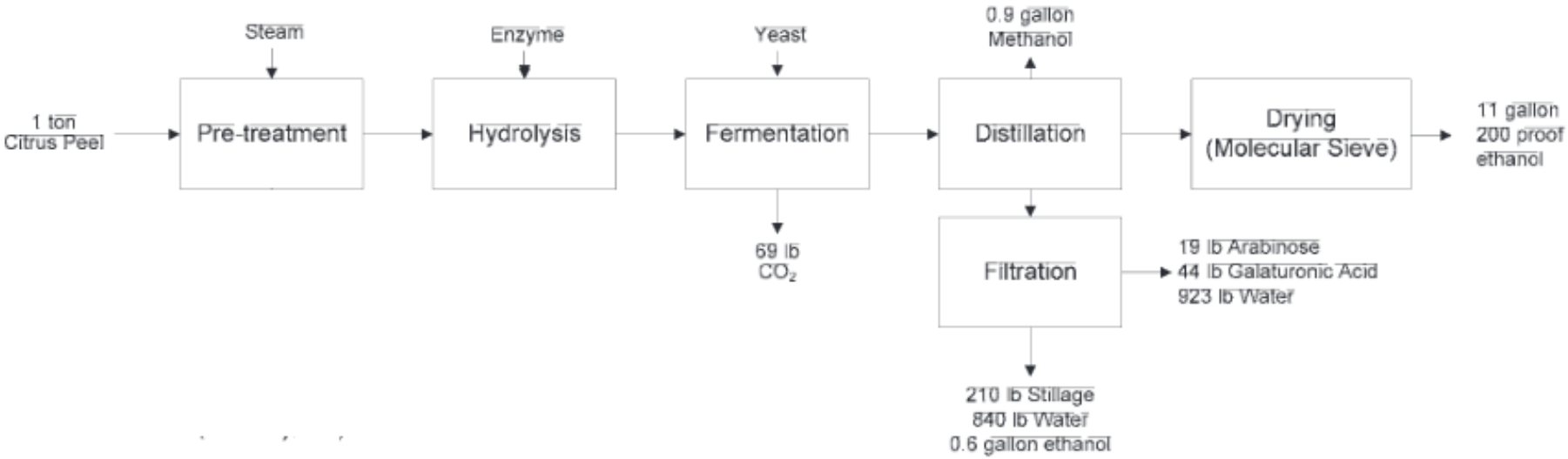


Population in Valencia city (8 million)

Amount of energy use for transportation in Valencia city is…

<u>579.2 TJ</u>

Process for obtaining bioethanol



With this process ethanol costs 1.23 $ per gallon[1] which is 3 times cheaper than gasoline.
Environmentally more friendly solution.
200 Proof ethanol which is pure ethanol more efficient than corn and rice source ethanol
Supplies from the aspect of purity.

[1] Weiyang Zhou, Economic Analysis of Ethanol Production from Citrus Peel Waste, Proc. Fla. State Hort. Soc.120: 2007. Proc. Fla. State Hort. Soc.120:310–315. 2007.

Biomass Energy

Utilizing rice stark for obtaining ethanol can create sources for transportation and generating electricity.

According to literature it is achieved to obtain ethanol using rice stark cost 0.45$ in Vietnam.

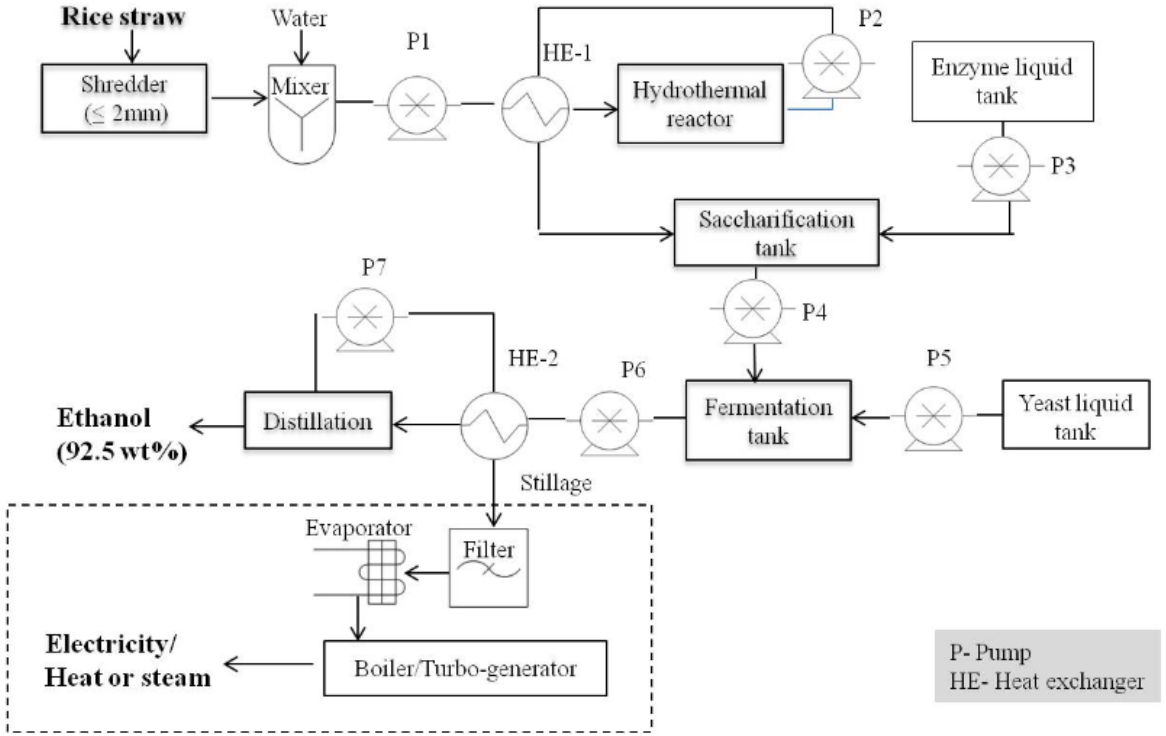


Figure shows the steps for obtaining ethanol using rice stark.

Also using rice starks for incineration is an option for producing electricity and heat energy.

Conclusion

- Valencia is a city the heavily relies on foreign energy supply
- Based on results Valencia could increase its self sufficiency by using the residues of one of its agricultural products, helping the city to achieve European renewable energy supply standards.