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THE EFFECT OF A SMALL POWER PLANT WITH BIOMASS ON THE QUALITY OF ELECTRIC ENERGY

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ABSTRACT

The increase of the electric power consumption year by year directs us to think of more restorable sources of electric power which include the power plants with biomass. Small power plants of a kind should be built on the spots where the distributive network of middle voltage is long, jagged and wide. The effect of small power plants of a kind will be given in the example of a power cable of middle voltage in ED Krusevac.

It will be shown that by building of the power plant, the voltage characteristics are much improved, the loss of the electric power is decreased and the production of the electric power is increased. The building of a power plant of a kind in the territory of Krusevac is justified because there is a lot of biomass present. It should be mentioned that there is a number of factories that process agricultural products (oil factories , drying, smoking factories for fruit, meat etc, juice factories) and their waste can be used for combustion, which, would lessen the factories' expenses of biomass waste deposit.

There are also big village households here which have different kinds of waste from agricultural products (straw, reed, leguminous plants) forest waste (dry branches, cones etc.) The advantage of this power plant comparing to a thermo plant is that it uses cheaper fuel for combustion, biomass is cheaper than coal comparing to a hydro plant- it doesn't depend on water current, especially during summer period when it is small; comparing to a wind plant- it doesn't depend on the speed of wind.

The advantage of these plants is also the fact that it can be built in any place especially if it is built here for the reason of improving the quality of electric power, whereas other kinds of plants depend on locations of rivers, the wind speed, coal transport.

In the territory of ED Krusevac the widest network is in the mountain places and voltage characteristics are the worst there, losses are high ; however because of a national park (Kopaonik mountain), no such plant should be built here lest the environment should be polluted despite the fact that these power plants pollute less comparing to thermo plants. In these mountain places wind and small hydro plants should be built for they also have the effect of improving the quality of the electric energy.

A SMALL POWER PLANT WITH BIOMASS

Searching for restorable sources of the electric power we found the power plant with biomass. In the world as well as here there are less and less firm fuels (coal), liquid fuels (petrol), gas. The plants with the drive of biomass create the smaller effect of a greenhouse which is shown in a diagram given.

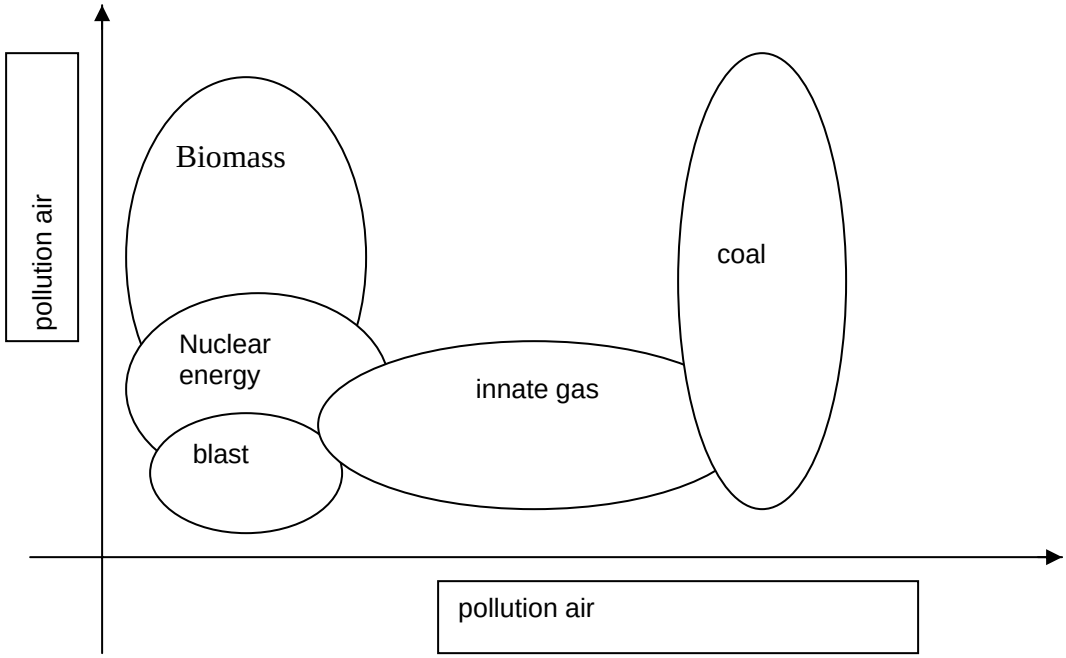

DIAGRAM 1-EFFECT PLANT WITH BIOMASS AT POLLUTION AIR

A review was carried out to ascertain the technical and socio-economic potential for using biomass in small-scale heat and power plants. Thermo-chemical plants up to around 5 MW, including fuel cells, were the main technologies considered. The objective was to identify from recent literature, including descriptions of demonstration and commercial projects, the costs and efficiencies of a range of small-scale biomass conversion systems and their future potential for improvement. The process was divided into primary energy conversion of the biomass, followed by secondary conversion of the liquids or gases produced Direct combustion is the established technology for converting biomass to heat. For small-scale systems up to around 10 MWh, underfeed and grate stokers are well proven, reliable technologies with relatively low investment costs. Bubbling and circulating fluidized bed technologies are economic only at capacities greater than 10 MWh and certainly not in small-scale applications for electricity production alone. Electricity production with conventional steam technologies (steam engines or turbines) has very low efficiencies of around 5-20% at the <5 MW scale. Where there is a demand for both electricity and heat, as is well understood at the larger scale plants, the overall cogeneration system efficiencies can be much higher, at around 50-80%. Operating problems encountered with combustion technology at the small-scale are associated with reactions taking place in the hot fuel gas and unpredictable ash melting behavior depending on the type of biomass used.

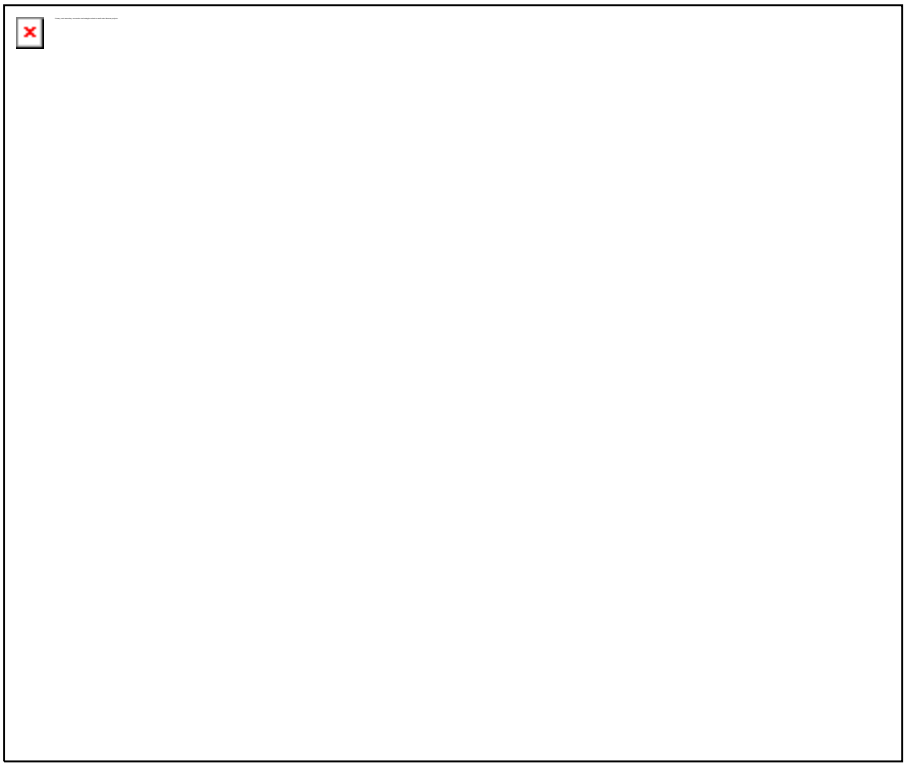

DIAGRAM 2-SMALL-SCALE

There is also less need to invest in filters for filtering CO2. The most efficient and profitable small plants with biomass drive are 3-5 MW.In the table given there are certain biomasses and their caloric vaules showed.

TABLE 1- BIOMASS CALORIC

Biomass	MJ/kg
Phragmites cmmunis	14.2
Oryza sativa	14.2
Juglans regia	16.4
Quercus suber	8
Citrus aurancium	8
Picea abies	7.8
Dendrocalamus strictus	8
Betula pendula	9.7
Olea europaea	14.5
Pinus silvestris	8.3

THE EFFECT OF SMALL POWER PLANTS WITH BIOMASS ON THE QUALITY OF THE ELECTRIC ENERGY

The effect of the small plants on the quality will be shown in an example of ED Krusevac. For this example, a 10 kV power cable was chosen which is very long and is supplied by antenna. With this power cable the village households are supplied which are very jagged, distant from the source of the superior TS 35/10 kV which aside from the losses of electric power also have low voltages especially in the final TS 10/0,4 kV which is all showed in the table given.

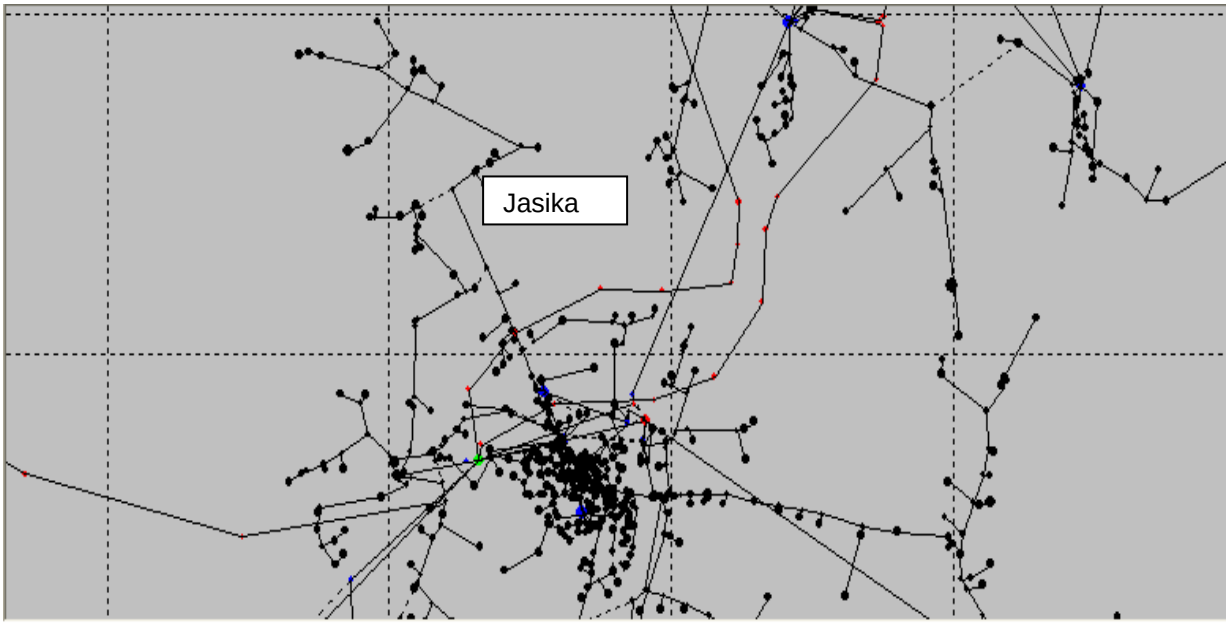

FIGURE 1-NETWORK 10 KV JASIKA

TABLE 2-BACK CONSTRUCTION PLANT WITH BIOMASS

TS 10/0,4 kV	Voltage (kV)	losses el.energy (MW)
Vratare	8.38	0.365
Zalogovac 2	8.14	
Zalogovac 4	8.14	
Zalogovac 5	8.14	
Zalogovac 3	8.08	
Globare	8.07	
Globare 2	8.07	
Marenovo	8.00	
Parcane	8.00	
Parcane 2	8.00	
Parcane 3	8.00	

In order to lessen the losses of electric power as well as the voltage drops in the power cable of 10 kV Jasika which is supplied from TS 110/10 kV Krusevac 4 it is necessary to build a new TS 35/10 kV or some power plant which will inject the energy into this 10 kV power cable. A better solution is the building of a power plant biomass especially in this location where there is lot of biomass (straw, reed, small branches, bushes etc). Besides these biomasses that can be gathered around in the vicinity there are also factories that do processing of food products which leave waste that can be used as a fuel for the power plant. After connecting the power plant to this power cable, the losses of electric energy will be decreased , the characteristics of voltage will be increased and improved on the power cable as shown in table No 3

TABLE 3-NEXT CONSTRUCTION PLANT WITH BIOMASS

TS 10/0,4 kV	Voltage (kV)	losses el.energy (MW)
Vratare	10.04	
Zalogovac 2	9.84	
Zalogovac 4	9.84	
Zalogovac 5	9.79	
Zalogovac 3	9.79	
Globare	9.77	
Globare 2	9.77	

TS 10/0,4 kV	Voltage (kV)	
Marenovo	9.72	
Parcane	9.72	
Parcane 2	9.72	
Parcane 3	9.72	

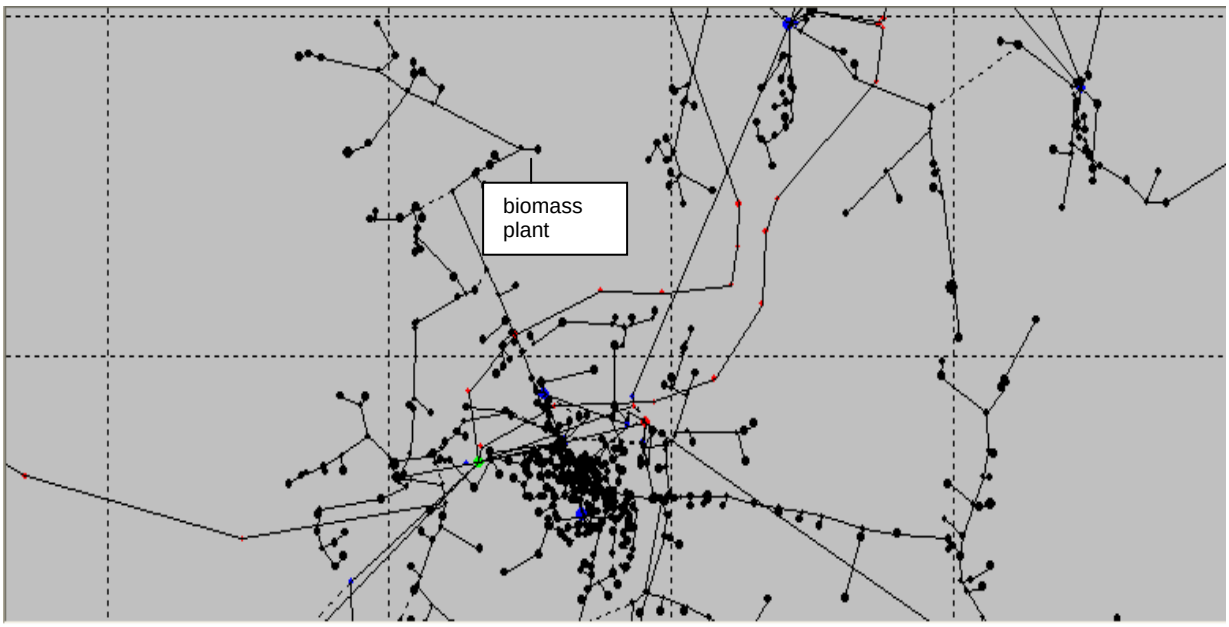

FIGURE 2-LOCATION PLANT WITH BIOMASS

The installed power of this plant is approximately 3 MW and it is estimated that in this region there is enough biomass for it. The expenses of supplying the plants with biomass include the purchase of waste of agricultural products from farmers and the transport of the waste from the factory to the power plant. These expenses of purchasing and gathering the biomass are smaller than those of coal excavation and coal transportation to the thermo plant.
A thermo power plant is not profitable in this location for the above mentioned reasons. A small hydro plant cannot be built because there is no larger river in the vicinity, as well as a wind power plant because in this region the speed of wind is usually low.

CONCLUSION

By building this power plant with biomass drive, besides improving the quality of the electric power in this region, the electric power system is also relieved.
It is recommended to gigantic factories (for fruit, vegetables and wood processing) to build these power plants for production of the part of their own consumption.

REFERENCES

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3.Magazine Renewable Energy World, may 2000, page 11-16