

**DRISLA –
POTENCIAL for POWER GENERATION
CAPACITY in MACEDONIA**

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Introduction

- ✓ The Daily collection and management of the solid waste in the Republic of Macedonia raises many problems;
- ✓ Solution - solid waste can be used as fuel for power production;
- ✓ Territorial problems - municipalities are reluctant to build solid waste landfills in their own territories – *Not In My Yard*;
- ✓ Drisla landfill is solution for these issues;
- ✓ Thermal treatment-optimal solution will solve the problem and at the same time become energy source.

Current Status

The location of Drisla has been chosen based on certain criteria and:

- Secures sanitary safety;
- Enables all needed protection for the soil, air and subterranean waters;
- Rational use of the land;
- Minimizes expenses for managing solid waste and mineralization;
- Enables conditions for easy use of mechanization and keep the procedure of safely stock on the landfill.

Skopje Waste Content on Average

.	Waste elements	kg	%	Hd for elements kJ/kg	Hd for waste kJ/kg
1	Paper	2257.7	9.6	18000	1536
2	Glass	636.6	2.7		
3	PVC	2478.05	10.49	34875	3662
4	Metal	1055.8	4.47		
5	Cans	47	0.2		
6	Danger Waste	71.8	0.3		
7	Biomass	5614.5	23.77	12400	1752
8	Textile	980.15	4.15	16200	632
9	Leather	130.9	0.55	18600	85.5
10	Wood	187.3	0.79	16275	114
11	Rubber	297.9	1.26	19500	229
12	Grass	307.9	1.3	13000	212
13	Mineral components	597.6	2.53		
	Other	8958.3	37.93		
	Total	23621.5	100		
	Combustion materials		51.85		9633

Solid Waste Quantity in Macedonia

- Annual quantity of solid waste in Macedonia is **560 000** tons;
- Annual quantity solid waste from Skopje in Drisla is **140 000- 160 000** tons;
- Quantity that needs to be collected is 390 000 tons/year of solid waste across Macedonia;
- More of the waste landfills do not meet the sanitary and safety standards, and majority of them are neglected and wild; and,
- In order to improve the current situation the number of non-sanitary/wild landfills has to be reduced.

Recommendation for energy system

- Cogeneration is not applicable because of the distance between the city and the landfill both in economical and technical manner;
- Recommended optimal solution is incinerator with movable rotation grids, where the turbine converts the steam power into electrical energy.

Energy characteristics of Drisla

Annual quantity of solid waste in Drisla	GS_{god}	t/year	160 000
Quantity of solid waste per hours (24 hours by day)	GS_h	kg/h	18519
Heat value of the solid waste (accepted)	Hd	kJ/kg	9000
Heat value by hour from the quantity of solid waste	Q_h	kW	46296

Drisla Solid Waste Power Plant Info

Type of the power plant			Steam condensation turbine 11.5 MW
Average capacity of energy to manage kept in solid waste	Q_h	kW	46 296
Turbine Power	P	kW	11 900
Production of electrical energy	W	MWh/year	95 201
Specific investment	c_I	€kW	1 500
Total investment with interest rate 6 %	I	€	23 740 729
Net income after all expenses and salaries	PR	€/year	1 200 855
Simple pay back period	SPB	year	15

Solid Waste Reloading Station and Transport

- There is a plan for building few regional landfills, in accordance with the regulatory guidance;
- Recommended solution is a baling and reloading station as substitution for the waste landfills.



- The waste is pressurized and baled in the plastic wrapping;



Solid Waste Reloading Station and Transport (cont.)

- There is possibility for railway transportation to Drisla;
- The transportation expenses are 7.5 €/ton per distance of 150km;
- This solution anticipates higher installed capacity of the power plant in Drisla.

Power Plant Info for Total Quantity of Solid Waste in Macedonia

Type of the power plant			Steam turbine
Average energy capacity to manage kept in solid waste	Q_h	kW	162 000
Turbine Power	P	kW	41 650
Production of electrical energy	W	MWh/year	333 203
Specific investment	c_I	€/kW	1 300
Total investment with interest rate 6 %	I	€	72 013 543
Net income after all expenses and salaries	PR	€/year	3 623 878
Simple pay back period	SPB	year	15

Analysis Elements

(Calculation basic info)

- The analysis was done for initial steam pressure of **64 bar**;
- The Steam temperature was determined (**450 °C**);
- The economic analysis takes into account the electrical energy price at **0.040 €/kWh**;
- It is anticipated that the plant will be functioning continuously (in three shifts);
- An interest rate of **6 %** was adopted;
- The waste stocking costs **11 €/ ton**;
- The average transportation price was agreed at **6 €/ ton** waste.
- The calculations include a profit percentage as well.

Conclusions

- ✓ “Drisla” has capacity to accommodate of all waste in the country, after a specified processing;
- ✓ The transformation of waste into energy is technically doable;
- ✓ Idea- “Drisla” to be transformed in eco-energy capacity in order to reduce the pollution while the energy generation will reduce the management costs;
- ✓ There is a need for detailed cost benefit analysis especially for the funds to be invested in few regional sanitary landfills in comparison with the transportation of the baled waste to Drisla;
- ✓ The basic findings point out that this is a feasible project.

**The municipal waste is not a garbage –
IT IS A RESOURCE**

**Thank
you
for
your
attention!**