Reduction of Greenhouse Gas Emissions in Russia
–Finnish Business Opportunities

CASE STUDY: Rehabilitation of Heat Production in Nikolskoye

Developing Bioenergy Markets - Focus on Forest Sector and Russia

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Reduction of Greenhouse Gas Emissions in Russia –Finnish Business Opportunities

Objectives of the Project

1. Identify possibilities of greenhouse gas emission reduction in Northwest Russia, especially in the areas of St. Petersburg and Leningrad Oblast
2. Carry out more detailed calculations about different greenhouse gas reduction applications

Modules

1. Efficiency of Energy Production, Distribution and Use in Northwest Russia (LUT)
2. Possibilities for Energy Wood Procurement and Use in Northwest Russia (FFRI)

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Introduction

- This case study is part of the project ”Reduction of Greenhouse Gas Emissions in Russia – Finnish Business Opportunities”
- The aim of the case study was to clarify the potential reduction of greenhouse gas emissions in a real life case
- The village of Nikolskoye is located in Leningrad Oblast, 47 km southwest from St. Petersburg
- Nikolskoye is an urban community and there are both private detached houses with stove heating and apartment blocks with central heating

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Most Rational Means to Reduce CO_2 Emissions in St. Petersburg and in Leningrad Region?

Action	CO2 reduction potential [kt/a]	Emisson allowance potential [M€/a]	Other savings [M€/a]
Increase of efficiency of CHP plants 40% → 60% (total of 10 plants)	7 300	37	84
Reduction of losses 30 % → 10 % in district heating networks	3 320	17	56
Reduction of losses 16 % → 4 % in electricity distribution	2 500	13	
CH4 collection in 10 most important landfills	1 190	6	
Conversion of boiler houses coal → biomass (37 boilers, total capacity 140 MW)	208	1	
Paper recovery rate +10% (in order to reduce CH4 in landfills)	44	0,2	

Current Situation in Nikolskoye

- Heating season is 245 days
- Heating boiler plant consists of 2 boilers (DKVR – 6,5/13)
- According to tests boilers provide a total steam capacity of 7,7 MW at 80% efficiency
- The installed capacity of the boiler plant is 2,4 MW less than required

The annual avarage energy consumption

	MWh
Heating and ventilation	18608
Steam	2791
Hot water	5350
Total	**26749**

The total heat output demand

	MW
Heating	6.45
Hot water	2.44
Ventilation	0.65
Steam	0.58
Total	**10.13**

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Current Situation - Continued

- The heat losses in the distribution network have never been measured
  - For the calculation of tariffs the heat losses have been assumed to be 8%
  - Real heat losses have been estimated to be about 20 %
- The average fuel consumption is about 3500 t/year mazout

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Alternative Solutions

1. Biofuel heating plant
   - 10 MW hot water boiler plant including two waste-wood fired hot-water boilers (4MW and 2MW) and one light-fuel-oil fired reserve hot-water boiler (4MW)
   - The efficiency of this plant would be 83 %
   - Estimated fuel consumption:
     - light fuel oil: 40 t/a
     - wood chips: 34 630 loose m^3/year
     - electricity energy: 608 250 kWh/year
2. Natural gas heating plant
   - Estimated efficiency for this boiler is 92 %
   - Estimated fuel consumption: 2 650 000 m^3/year

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Greenhouse gas emission reduction

	Amount	CO2-emissions (1 a)	CO2-emissions (5 a)
Current situation		[t]	[t]
Oil	3500 t	11076.0	55380
Transportation	17 km	6.7	33.5
Project scenario 1			
Light fuel oil	40 t	129.0	645
Wood-waste	10340 t	0.0	0.0
Transportation (oil)	17 km	0.1	0.35
Transportation (wood)	50 km	40.8	204
Project scenario 2			
Natural gas	2650 km^3	4925.4	24627
Transportation	-	0.0	0.0
Reduction in scenario 1		10912.8	54564.15
Reduction in scenario 2		6157.3	30786.5

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Conclusions

- Current carbon dioxide emissions are 11 080 t/a
- Carbon dioxide emissions reduction potential is:
  - 10 910 t/a by chancing fuel from mazout to biofuels
  - 6 160 t/a by changing fuel from mazout to natural gas
- Assuming a market price of 5 € for ERU, the total value of emission reduction during the 5-year Kyoto period would be:
  - 272 000 € under biofuel scenario
  - 154 000 € under natural gas scenario

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