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RACI, rationalization of combustion processes, Ltd.

WP2: NATIONAL AND INTERNATIONAL ACTIVITIES ON BIOMASS CHP

County report for Slovenia

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GOZDARSKA KNJIŽNICA

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APPENDIX 1

Detailed information about biomass CHP plants in Slovenia

- 1. Tanin, Sevnica
- 2. Novoles, Straža
- 3. Furnirnica Merkscha, Celje
- 4. Tisa Stol, Kamnik
- 5. Lipa, Ajdovščina

1 Current situation on CHP and biomass CHP in the national energy sector.

Slovenia is a country poor with fossil fuels, in particular those of high quality. The existing energy system based on hydroelectric power plants is largely exploited. Due to Slovenia's specific natural conditions in the Alpine and Sub-alpine area, the environment is very vulnerable, which makes the construction of new power plants both a demanding and costly intervention. Slovenia's dependency on imported energy has reached as much as 81 %, although it should not exceed 65 %. The use of energy per inhabitant is within the average of the European Union, while the consumption per unit of GDP is 2.5 times higher, which means that energy is not used as efficiently as in the EU. With respect to this situation, it is understandable that the Resolution on Efficient Energy Supply and Use in Slovenia (1996) gives special emphases to the improvement of efficiency, and to the increase of consumption (production) through renewable energy sources.

On national level data about power production are collected by Statistical Office of the Republic of Slovenia. There are three important surveys at national level:

- The statistical survey of electricity and heat production in public power plants which covers public supply undertakings which generate electricity for sale to third parties as their primary activity;
- The statistical survey of autoproducers which covers autoproducer undertakings which generate electricity and/or heat wholly or partly for their own use as an activity which supports their primary activity;
- The statistical survey of heat supply which covers heat only plants and heat distribution companies.

Total gross production of electricity in Slovenia was 13.624 GWh (in year 2000), of which 32 % was produced in CHP plants (Table 1). The majority of all CHP plants are public plants, but also autoproducers are very important producers of electricity and heat. By our definition autoproducers are producer undertakings which generate electricity and heat wholly or partly for their own use as an activity which supports their primary activity. They may be privately or publicly owned. From Biomass CHP point of view the category of autoproducers is very important. According to our data almost all Biomass CHP plants are in wood processing industry and they are in category of autoproducers - they produce electricity and heat manly for support their primary production.

Table 1: Electricity production by type of producers and net power of plants, 2000¹ (all data are in GW)

| | | Tot | al | Public p | olants | Autopro | Male HE ²⁾ | |
|-------------------------|-------|-------------|-----------------------|-------------|--------|-------------|-----------------------|------------------------|
| GW | total | electricity | CHP | electricity | CHP | electricity | CHP | Small HE ²⁾ |
| | | only | plants | only | plants | only | plants | |
| | | | тот | AL | | | | |
| Gross production | 13624 | 9247 | 4377 | 9061 | 3927 | 96 | 450 | 90 |
| Own use by power plants | 829 | 324 | 505 | 323 | 463 | 1 | 42 | 1 |
| Net production | 12795 | 8923 | 3872 | 8738 | 3464 | 96 | 408 | 89 |
| Net power (MW) | 2631 | 1768 | 863 | 1678 | 767 | 19 | 96 | 71 |
| | | Hydroe | electric | power pla | nts | | | |
| Gross production | 3834 | 3834 | - | 3648 | | 96 | | 90 |
| Own use by power plants | 63 | 63 | - | 62 | - | 1 | | |
| Net production | 3771 | 3771 | - | 3586 | - | 96 | - | 89 |
| Net power (MW) | 860 | 860 | - | 770 | - | 19 | - | 71 |
| | | Conven | tional tl | hermal pla | ants | | | |
| Gross production | 5029 | 652 | 4377 | 652 | 3927 | - | 450 | |
| Own use by power plants | 553 | 49 | 505 | 49 | 463 | - | 42 | |
| Net production | 4476 | 603 | 3872 | 603 | 3464 | - | 408 | |
| Net power (MW) | 1115 | 252 | 863 | 252 | 767 | - | 96 | |
| | | Nuc | clear po | wer plant | | | | |
| Gross production | 4761 | 4761 | | 4761 | | - | - | |
| Own use by power plants | 212 | 212 | - | 212 | - 8 | - | - | |
| Net production | 4549 | 4549 | | 4549 | | - | - | |
| Net power (MW) | 656 | 656 | | 656 | | - | get in | |

¹⁾ The figures are rounded, so the sums might not be totally correct.

Source of data: Statistical Office of the Republic of Slovenia, 2001

The majority of CHP plants in Slovenia are producing electricity and heat from lignite, brown coal, fuel oil and natural gas, only 1 % of power from CHP plants is produced from biomass (table 2). Among biomass only wood, wood waste and biogas are used as a fuel in CHP plant.



²⁾ Estimate for small private hydroelectric power plants.

Table 2: Fuel use in conventional thermal plants, (year2000)

| | | | Total | | Public p | lants | Autoproc | lucers ¹⁾ |
|----------------------------|---------------------|-------|-------------|--------|-------------|----------------|-------------|----------------------|
| | Unit | Total | Electricity | CHP | Electricity | CHP | Electricity | CHP |
| | | 10001 | only | plants | only | plants | only | plants |
| | | | | | | | | |
| Brown coal, imported | 1000 t | 426 | - | 426 | - | 347 | | 79 |
| Brown coal, domestic | 1000 t | 749 | 609 | 140 | 609 | 140 | - | _ |
| Lignite | 1000 t | 3718 | - | 3718 | - | 3718 | | |
| Wood and wood waste | 1000 t | 133 | - | 133 | , (j), (j) | _ | - | 133 |
| Fuel oil, extra light | 1000 t | . 2 | 2 | - | 2 | 0 | | 0 |
| Fuel oil, sulphur below 1% | 1000 t | 51 | - | 51 | | 2 | - | 49 |
| Fuel oil, sulphur 1% and | 1000 t | _ | _ | _ | _ | _ | _ | _ |
| more | 1000 (| | | | | | | |
| Other liquid fuels | 1000 t | 285 | _ | 285 | - | | | 285 |
| Natural gas | mio Sm ³ | 225 | 1 | 224 | 1 | - | - | 224 |
| Bio gas | mio Sm ³ | 9 | | 9 | • | , . | _ | 9 |

¹⁾Fuel use for electricity production and for heat production for sale and for own use is included.

Source of data: Statistical Office of the Republic of Slovenia, 2001

If we study heat supply in last 5 years we can see that the net production has increased (index is 1,13). Especially the production of CHP plants has increased (for 555 TJ in last 5 years), but unfortunately not on the account of biomass (Table 3).

Table 3: Balance of heat supply

| | Unit | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|----------------------------|---------------------|---------|-----------------|------|------|------|------|
| | Net | produc | tion | | | | |
| | TJ | 8097 | 8191 | 7972 | 8098 | 8149 | 9172 |
| Heat only plants | TJ | 2420 | 2230 | 2126 | 2037 | 2153 | 2940 |
| CHP plants | TJ | 5677 | 5961 | 5846 | 6061 | 6266 | 6232 |
| | F | uel use | , ¹⁾ | | | | |
| Brown coal | 1000 t | 221 | 234 | 208 | 254 | 240 | 205 |
| Lignite | 1000 t | 205 | 192 | 161 | 161 | 156 | 159 |
| Wood and wood waste | 1000 t | 41 | 41 | 33 | 30 | 30 | 28 |
| Fuel oil, extra light | 1000 t | 3 | 2 | 2 | 3 | 5 | 4 |
| Fuel oil, sulphur below 1% | 1000 t | 7 | 17 | 7 | 2 | 1 | 1 |
| Other liquid fuels | 1000 t | | | | | | 0 |
| Natural gas | mio Sm ³ | 78 | 88 | 87 | 93 | 94 | 121 |
| | Final | consun | nption | | | | |
| | TJ | 8097 | 8191 | 7972 | 8098 | 8149 | 8181 |
| Households | TJ | 3876 | 4446 | 4589 | 4465 | 4330 | 3952 |
| Other consumers | TJ | 4221 | 3745 | 3383 | 3633 | 3819 | 4229 |

Source of data: Statistical Office of the Republic of Slovenia, 2001

2 RTD and Demonstration projects on biomass CHP

There are no RTD or Demonstration projects on biomass CHP in Slovenia at the moment. We have only demonstration projects on biomass district heating systems (PHARE project in towns: Gornji Grad, Preddvor, Solčava and Nazarje).

3 Existing CHP plants

There were only 8 biomass CHP pants in Slovenia in 1995. According to an available database (Ministry of the Environment and Spatial Planning, RACI) there are 6 CHP plants in Slovenia. Five of them are autoproducers installed in wood processing industry. One plant was part of wood processing factory but with downfall of the factory it was sold separately to a private company and now they produce and sell power to different small companies in close neighbourhood. Only one plant is selling surplus electricity and heat to the grid. They all have old out-of-date combustion technologies.

Wood waste from wood processing industry are used in all five plants. Three of them are using only wood waste from their production, two plants are buying wood waste from different suppliers.

The sixth plant is located in a sewage water cleaning plant, using biogas as fuel for gas engines. Three engines (250 kW_{el} each) are installed at this plant, but two of them are out of commission.

The installed electric power of all this five plants is 5,2 MW_{el}. Average annual production is 15,4 GWh of electric power and 190,5 GWh of heat.

All the details are in Appendix 1.

4 Legislation and support mechanisms

In Slovenia we don't have special law about renewable sources of energy. Also there is no special legal instrument for promotion of biomass CHP plants.

At the moment there are only few legal documents regarding biomass CHP plants:

1. Energy Conservation Strategy for Slovenia (1996):

- Special emphasis is given to the promotion of renewable sources of energy (according to this document share of wood biomass as energy source should double by the year 2010 (from 4 to 8 %)). To reach this goal some action from the state should be taken (subsidies, investments, CO₂ taxes, special prices for "green electricity" – electricity produced from biomass.
- There were 8 biomass CHP in Slovenia in 1994 (heat production 60 MWh and electricity production 8.5 MWh)
- The strategy anticipates investments in 6 new biomass CHP till 2010 (The estimate value of the investment is 12 mill. X.).

2 Action programme for use of wood biomass in Slovenia (from 2001 to 2010)

- It is still just a proposal of the government to the parliament (it was not accepted jet).
- It doesn't anticipate any investment in biomass CHP, only in biomass district heating systems (50 new systems), biomass installation's in industry (100 new installation's) and biomass heating systems for individual houses (5000 new individual heating systems).
- Investments in installations in industry can also include biomass CHP plants.
- The estimate value of the investment is 179 mill. X

3 National energy programme (from 2001 to 2010)

- According to the law we should have a national energy programme.
- It is still in preparation, a special emphasis should be given also to biomass CHP plants.

4 Tax on burdening the air with carbon dioxide

- According to current legislation users of fossil fuels are entitled to certain tax deductions based on former fuel consumption, electricity generation and measures for efficient energy consumption, former fuel consumption contributing the major part of the deductions.
- An amendment should come into force soon, cancelling all the deductions based on former fuel consumption, thus making biomass a more interesting energy source.

5 Tax on waste deposition

- Tax on waste deposition is among other things based on the content of organic carbon in the waste, this carbon contributing to much higher taxes.
- With use of biomass as energy source two taxes can be avoided. First, tax on waste deposition, and second CO₂ tax, that should be paid for substitute fossil fuel.

5 Literature

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- 3. (1996). Resolution on Efficient Energy Supply and Use in Slovenia (1996). Ministry of economic affairs, 126 p.
- KRAJNC, N, / DOMAC, J. (2001). South-Eastern European Biomass Action A new international research co-operation between Slovenia and Croatia. V: Woody biomass as an energy source - challenges in Europe. Finland. Joensuu: European Forest Institute: Proceedings No. 39, p. 131 - 139.

6 Term of references

Public plants are public supply undertakings which generate electricity or electricity and heat as their primary activity. They may be privately or publicly owned.

Renewables comprise solid biomass, industrial and municipal waste.

Autoproducers are autoproducer undertakings which generate electricity and/or heat wholly or partly for their own use as an activity which supports their primary activity. They may be privately or publicly owned.

CHP plants are combined heat and power plants which are designed to produce both heat and electricity.

Heat only plants are plants which are designed to produce heat only.

P'OCOGEN, TASK 2

| Country: | Slovenia | | | | | | |
|-------------------------------|--|--|------------------------|--------------|---------------------|------------------------------|------------------|
| ne: | Lipa | | | | | | |
| ation: | Ajdovščina | | | | | | |
| ner: | Lipa | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| til: | | | | | | | |
| webpage: | 1001 1000 | | | | | | |
| r of construction | 1984,1983 | | | | | | |
| ort description of the plant | It's an old plant in wood proce an activity which supports the producing electricity from bio | eir primary activi | ty. Thay produc | e electricit | y only 6 months. Th | ere is the only steam | |
| | | | | | | | |
| Character of plant | Commercial plant | | | | | | |
| | | | | | Their own use (%) | Covering their own needs (%) | |
| nual production (normal year) | District heat: | 46 | 6.4 GWh | | 100 | 10 | 0 |
| | Grid electricity: | 0, | 02 GWh | | 100 | | 20 |
| | Electric efficiency | n.a | % | | | | |
| | Thermal efficiency | n.a | % | | | | |
| hnology | Combustion | | ~ | | | | |
| Initiology | | | | | | | |
| | Steam engine | | | | | | |
| nace | Gate | | | | | | |
| | Capacity | 7,5 *2 | MW _{fuel} | | | | |
| Fuel | | | | | Moisture content | Lower booting value | Input of hismans |
| | | | | | | Lower heating value | |
| | Legislating and appropriate and accommodate | | | | % | kWh/kg | m3/h |
| | Woodchips (saw industry) | | | 100 % | 20 | n.a | 1,4 |
| | | | | % | | | |
| | | | | % | | | |
| others | S CONTRACTOR OF THE CONTRACTOR | | | % | | | |
| | Fuel for pilot flame | | | | | | |
| | , donor prochamo | | | | | | |
| Turbine | Type | Spilling | | | | | |
| uiblie | Power | F - 1000 CO 10 | 00 MW _{el} | | | | |
| | rowei | 1,1 | OO IVIVV _{el} | | | | |
| d evelopmen | Type | | 40 | | | | |
| ıt exchanger | Туре | | AP ANA | | | | |
| | Heat | 2* 5,5, 2*1,5 | MW _{th} | | | | |
| | | | | | | | |
| e Gas | | | | | | | |
| | Flue gas volume flow | n.a. | Nm³/h | | | | |
| | Flue gas temperature | 180-250 | °C | | | | |
| issions | | | | | | | |
| | СО | 111 | 00 mg/Nm ^a | | | | |
| | NOx | | 5C mg/Nm ³ | | | | |
| | | | | | | | |
| | Particles | n.a. | mg/Nm ³ | | | | |
| | CxHy | n.a | mg/Nm ³ | | | | |
| | SO ₂ | n.a. | mg/Nm³ | | | | |
| | Other | n.a. | mg/Nm ^o | | | | |
| Costs | Investment costs | n.a | Mio ' | | 9 9 9 8 9 | | |
| | | | | | | | |
| | | | F1 0 | ((0) | | | |
| | | | Fuel Costs (| | | | |
| | Woodchips (saw industry) | | | 7,7 | | | |
| | | | | | | | |
| | | | | | | | |
| Others | | | | | | | |
| | | | | | | | |
| | Subsidies | 0,0 | 00 Mio ' | | | | |
| | Number of employes | | 6 | | (in four shifts) | | |
| 0 | Annual operating time | 7.0 | | | | | |
| le . | Airiual operating time | 7.9 | 69 h/a | | | | |

"'OCOGEN, TASK 2

| untry: | Slovenia | | | | | | |
|-----------------------------------|---|--------------|--|--------------|------------------|----------------------------|-----------------|
| ne: | Stol | | | | | | |
| ation: | Kamnik | | | | | | |
| ner: | Tisa d.o.o. | | | | | | |
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| | +386 1 8315 584 | | | | | | |
| | +386 1 8314 908 | | | | | | |
| ail: | | | | | | | |
| bpage: | | | | | | | |
| r of construction | 1968 | | | | | | |
| rt description of the plant | It's an old plant built in wood neighbourhood. Thay will sta surplus will be sold to the grid | rt with rec | | | | | |
| | | | | | | | |
| rracter of plant | Commercial plant | | | | | | |
| | | | | | Their own use | Covering their own | |
| | District Control | | 105 011 | | (%) | needs (%) | |
| nual production (normal year) | District heat: | | 12,9 GWh | | 0 | 100 | |
| | Grid electricity: | | 2,7 GWh | | 18 | 100 | |
| | Electric efficiency | n.a. | % | | | | |
| | Thermal efficiency | n.a. | % | | | | |
| hnology | Combustion | | | | | | |
| | Steam turbine | | | | | | |
| nace | Gate | | 05.151 | | | | |
| | Capacity | | 6,0 MW _{fuel} | | | | |
| 1 | | | | | Moisture content | Lower heating value kWh/kg | Input of biomas |
| | Woodchips (saw industry) | | | 100 9 | | 2,33 | 2575 |
| others | | | | 9 | % % % | 2,00 | 2515 |
| others | Fuel for pilot flame | | | | 76 | | |
| | | | | | | | |
| bine | Туре | KKK | | | | | |
| rbine | Type Power | KKK | 1,22 MW _{el} | | | | |
| | Power | KKK | 1,22 MW _{el} | | | | |
| rbine | Power | KKK | | | | | |
| | Power | KKK | 1,22 MW _{el} | | | | |
| at exchanger | Type Heat | KKK | MW _{th} | | | | |
| at exchanger | Type Heat Flue gas volume flow | KKK | MW _{th} | | | | |
| at exchanger | Type Heat | KKK | MW _{th} | | | | |
| at exchanger e Gas | Type Heat Flue gas volume flow Flue gas temperature | KKK | MW _{th} 17000 Nm²/h 259 °C | | | | |
| at exchanger e Gas | Type Heat Flue gas volume flow | KKK | MW _{th} | | | | |
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| at exchanger | Power Type Heat Flue gas volume flow Flue gas temperature CO NOx Particles | n.a. | MW _{th} 17000 Nm³/h 259 °C 171 mg/Nm³ 402 mg/Nm³ mg/Nm³ | | | | |
| at exchanger | Power Type Heat Flue gas volume flow Flue gas temperature CO NOx Particles CxHy | | MW _{th} 17000 Nm³/h 259 °C 171 mg/Nm³ 402 mg/Nm³ mg/Nm³ mg/Nm³ | | | | |
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| at exchanger e Gas issions | Power Type Heat Flue gas volume flow Flue gas temperature CO NOx Particles CxHy SO ₂ Other | n.a. | MW _{th} 17000 Nm³/h 259 °C 171 mg/Nm³ 402 mg/Nm³ mg/Nm³ 0 mg/Nm³ mg/Nm³ | | | | |
| at exchanger le Gas issions | Power Type Heat Flue gas volume flow Flue gas temperature CO NOx Particles CxHy SO ₂ | n.a. n.a. | MW _{th} 17000 Nm³/h 259 °C 171 mg/Nm³ 402 mg/Nm³ mg/Nm³ mg/Nm³ 0 mg/Nm³ | | | | |
| at exchanger le Gas issions | Power Type Heat Flue gas volume flow Flue gas temperature CO NOx Particles CxHy SO ₂ Other | n.a. n.a. | MW _{th} 17000 Nm³/h 259 °C 171 mg/Nm³ 402 mg/Nm³ mg/Nm³ 0 mg/Nm³ Mio ′ | ('A) | | | |
| at exchanger le Gas issions | Power Type Heat Flue gas volume flow Flue gas temperature CO NOx Particles CxHy SO ₂ Other Investment costs | n.a. n.a. | MW _{th} 17000 Nm³/h 259 °C 171 mg/Nm³ 402 mg/Nm³ mg/Nm³ 0 mg/Nm³ mg/Nm³ | | | | |
| at exchanger le Gas issions | Power Type Heat Flue gas volume flow Flue gas temperature CO NOx Particles CxHy SO ₂ Other | n.a. n.a. | MW _{th} 17000 Nm³/h 259 °C 171 mg/Nm³ 402 mg/Nm³ mg/Nm³ 0 mg/Nm³ Mio ′ | ('Æ) 22,7 | | | |
| at exchanger le Gas issions | Power Type Heat Flue gas volume flow Flue gas temperature CO NOx Particles CxHy SO ₂ Other Investment costs | n.a. n.a. | MW _{th} 17000 Nm³/h 259 °C 171 mg/Nm³ 402 mg/Nm³ mg/Nm³ 0 mg/Nm³ Mio ′ | | | | |
| at exchanger le Gas issions | Power Type Heat Flue gas volume flow Flue gas temperature CO NOx Particles CxHy SO ₂ Other Investment costs Woodchips (saw industry) | n.a. n.a. | MW _{th} 17000 Nm³/h 259 °C 171 mg/Nm³ 402 mg/Nm³ mg/Nm³ 0 mg/Nm³ Mio ′ | | | | |
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PIOCOGEN, TASK 2

| set: Moriscoha Furrimos September Sept | ountry: | Slovenia | | | | | | | | |
|--|------------------------------|------------------------------|----------|---------------------|------------------------------|--------------|-----------------------|---------------------|---------------------|----------|
| set: Age Age | ie: | | | | | | | | | |
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| ntices in the plant in the plant in wood processing industry. They are autoproducers - they generate electricity and fleat mostly for their own owned. The turbine was reconstructed in 2001. **Their own use a wathing which supposes their primary authinity. They are autoproducers - they generate electricity and fleat to the grid. It is privately connect. The turbine was reconstructed in 2001. **Their own use burylow and the to the grid. It is privately connect. The turbine was reconstructed in 2001. **Their own use burylow and the to the grid. It is privately connects (%) **Their own use burylow and the to the grid. It is privately connects (%) **Their own use burylow and the to the grid. It is privately connects (%) **Their own use burylow and the to the grid. It is privately connects (%) **Their own use burylow and the to the grid. It is privately connects (%) **Their own use burylow and the to the grid. It is privately connects (%) **Their own use burylow and the to the grid. It is privately connects (%) **Their own use burylow and to the grid. It is privately connects (%) **Their own use burylow and the to the grid. It is privately connects (%) **Their own use burylow and the to the grid. It is privately connects (%) **Their own use burylow and the to the grid. It is privately connects (%) **Their own use burylow and the to the grid. It is privately connects (%) **Their own use burylow and the to the grid. It is privately connects (%) **Their own use burylow and the to the grid. It is privately connects (%) **Their own use burylow and the to the grid. It is privately and the to the grid. It is privately for their own uses a connects (%) **Their own use a connect (%) **Their own use | | | | | | | | | | |
| | | | | | | | | | | |
| Try of construction It's an obligate is wood processing industry. They are autoproducers they generate electricity and heat mostly for their own can an activity with supports their primary activity. They all surpluses of electricity and heat to the grid. It is privately owned. The turbine was reconstructed in 2001. In an an activity with supports their primary activity. They all surpluses of electricity and heat to the grid. It is privately owned. The turbine was reconstructed in 2001. In an activity with supports their primary activity. They all surpluses of electricity and heat to the grid. It is privately owned. The turbine was reconstructed in 2001. In an activity with supports their primary activity. They all surpluses of electricity and heat to the grid. It is privately owned. The turbine was reconstructed in 2001. In an activity with supports their primary activity. They all surpluses of electricity and heat to the grid. It is privately owned. The surpluses of electricity and heat to the grid. It is privately owned. The surpluses of electricity and heat to the grid. It is privately owned. The surpluses of electricity and heat to the grid. It is privately owned. The surpluses of electricity and heat to the grid. It is privately owned. The surpluses of electricity and heat to the grid. It is privately owned. The surpluses of electricity and heat to the grid. It is privately owned. The surpluses of electricity and heat to the grid. It is privately owned. The surpluses of electricity and heat to the grid. It is privately owned. The surpluses of electricity and heat to the grid. It is privately owned. The surpluses of electricity and heat to the grid. It is privately owned. The surpluses of electricity and heat to the grid. It is privately owned. The surpluses of electricity and heat to the grid. It is privately owned. The surpluses of electricity and heat to the grid. It is privately owned. The surpluses of electricity and heat to the grid. It is privately owned. The surpluses of electricity and heat to | | +386 3 428 5166 | | | | | | | | |
| ref contractation 1977 1971 1972 197 | ail: | | | | | | | | | |
| It's an old plant in wood processing industry. They are autoproducers - they generate electricity and heat mostly for their own use as an activity which supports their primary activity. They sell surpluses of electricity and heat to the grid. It is privately worded. The furbles was recommended in 2001. In a commendate of the sell of the se | | | | | | | | | | |
| use as an activity which supports before primary activity. Thay sell surpluses of electricity and heat to the grid. It is privately womed. The turbine was reconstructed in 2001. """ """ """ """ """ """ """ | r of construction | 1977 | | | | | | | | |
| iracter of plant Commercial plant Commercial plant Commercial plant Commercial plant Commercial plant Commercial plant District heat: 20 OWh (%) 12 OWh (%) 12 OWh (%) 15 OWN (%) 10 OWN (%) (WOWN (W) | at decadetion of the plant | | | | | | | | | |
| tracter of plant Commercial plant Listed production (normal year) District heat: Grid electricity: Electric difficiency na. % Thermal efficiency | or description of the plant | | | | | ay sell surp | cluses of electricity | and heat to the gri | d. It is privately | |
| Market M | | owned. The turbine was recon | structed | in 2001. | | | | | | |
| Market M | | | | | | | | | | |
| March Marc | | | | | | | | | | |
| Market M | | | | | | | | | | |
| March Marc | | Commercial plant | | | | | | | | |
| Main | tracter of plant | Commercial plant | | | | | Their own use | Covering their ow | 'n | |
| Grid electricity 1.2 GWh 90 70 | | | | | | | | | | |
| Grid selectricity | ual production (normal year) | District heat: | | 20 | GWh | | | | 100 | |
| Electric efficiency n.a. % | | | | 1,2 | GWh | | 90 | | | |
| Combustion Steam furbine | | | n.a. | | % | | | | | |
| Combustion Steam furbrine Steam fu | | | | | | | | | | |
| Mode Capacity 12,0 MW | hnology | | | | | | | | | |
| Capacity 12,0 MV Mode | | Steam turbine | | | | | | | | |
| Woodchips (sew industry) Bark and other wood residues Fuel for pilot filame Type Power Power Type Heat Flue gas volume flow Flue gas temperature 197 "C Particles CXHy P | nace | Gate | | | | | | | | |
| Woodchips (saw industry) | | Capacity | | 12,0 | MW _{fuel} | | | | | |
| Woodchips (sew industry) | | | | | | | | | | |
| Woodchips (sew industry) 60 % 20 n.a 2,5 | iel | | | | | | | Lower heating val | ue Input of biomass | |
| Bark and other wood residues | | | | | | | % | kWh/kg | m3/h | |
| Subsidies Subs | | Woodchips (saw industry) | | | | 60 % | 20 | n.a | 2,5 | |
| Fuel for pilot flame | | Bark and other wood residues | | | | 40 % | 30 | n.a | 1,6 | |
| Fuel for pilot flame | | | | | | % | | | | |
| urbine Type Power AEG-KANIS 0,755 MWe st exchanger Type Heat MWe e Gas Flue gas volume flow Flue gas temperature 18725 Nm³/h 197° °C issions CO 504 mg/Nm³ NOX 120 mg/Nm³ Particles 124 mg/Nm³ CxHy n.a. mg/Nm³ SO2 0 mg/Nm³ Other n.a. mg/Nm³ mosts Investment costs n.a Mino* Fuel Costs (*Im3) 4,7 3,6 Others Subsidies 0,000 Mio* Mio* Subsidies 0,000 Mio* (in four shifts) Auditors of the policy o | others | | | | | % | | | | |
| Power 0,755 MWa | | Fuel for pilot flame | | | | | | | | |
| Power 0,755 MWa | | | | | | | | | | |
| ## Exchanger Type Heat MWn, ## Gas Flue gas volume flow Flue gas temperature | ırbine | Туре | AEG-K | ANIS | | | | | | |
| Heat MW _n Flue gas volume flow Flue gas temperature 197 °C issions CO 504 mg/Nm³ NOx 120 mg/Nm³ Particles 124 mg/Nm³ CXHy n.a. mg/Nm³ SO₂ 0 mg/Nm³ Other n.a. mg/Nm³ Nivestment costs n.a Mio ⁻ Fuel Costs (*/m3) Woodchips (saw industry) Sawdust 3,6 Subsidies Number of employes 6 (in four shifts) | | Power | | 0,755 | MW _{el} | | | | | |
| Heat MW _n Flue gas volume flow Flue gas temperature 197 °C issions CO 504 mg/Nm³ NOx 120 mg/Nm³ Particles 124 mg/Nm³ CXHy n.a. mg/Nm³ SO₂ 0 mg/Nm³ Other n.a. mg/Nm³ Nivestment costs n.a Mio ⁻ Fuel Costs (*/m3) Woodchips (saw industry) Sawdust 3,6 Subsidies Number of employes 6 (in four shifts) | | | | | | | | | | |
| Flue gas volume flow 18725 Nm³/h Flue gas temperature 197 °C | at exchanger | | | | | | | | | |
| Flue gas volume flow 18725 Nm²/h Flue gas temperature 197 °C | | Heat | | | MW _{th} | | | | | |
| Flue gas volume flow 18725 Nm³/h | . 600 | | | | | | | | | |
| Flue gas temperature | e Gas | Elua gas valuma flavo | | 10705 | NIma?/h | | | | | |
| CO | | | | | | | | | | |
| CO 504 mg/Nm³ NOx 120 mg/Nm³ Particles 124 mg/Nm³ CxHy n.a. mg/Nm³ SO2 0 mg/Nm³ Other n.a. mg/Nm³ Other n.a. mg/Nm³ Mio ´ Fuel Costs ('/m3) Woodchips (saw industry) Sawdust 3,6 Others Subsidies 0,000 Mio ´ Number of employes 6 (in four shifts) | | riue gas temperature | | 197 | C | | | | | |
| NOx 120 mg/Nm³ Particles 124 mg/Nm³ CxHy n.a. mg/Nm³ SO2 0 mg/Nm³ Other n.a. mg/Nm³ Other n.a. Mio ´ Fuel Costs (*/m3) Woodchips (saw industry) Sawdust 3,6 Others Subsidies 0,000 Mio ´ Number of employes 6 (in four shifts) | issions | 00 | | | | | | | | |
| Particles 124 mg/Nm³ CxHy n.a. mg/Nm³ SO2 0 mg/Nm³ Other n.a. mg/Nm³ Investment costs n.a Mio ´ Woodchips (saw industry) 4,7 Sawdust 3,6 Others 0,000 Mio ´ Number of employes 6 (in four shifts) | | | | | FIRST COLUMN COLUMN | | | | | |
| CxHy | | | | | | | | | | |
| SO ₂ 0 mg/Nm³ Other n.a. mg/Nm³ Osts Investment costs n.a Mio ´ Woodchips (saw industry) Sawdust A,7 Sawdust A,7 Sawdust A,7 Subsidies 0,000 Mio ´ Number of employes 6 (in four shifts) | | Particles | | 124 | | | | | | |
| Other n.a. mg/Nm³ Investment costs n.a Mio ´ Woodchips (saw industry) Sawdust Others Subsidies Number of employes Number o | | | n.a. | | THE RESERVE | | | | | |
| Number of employes Investment costs n.a Mio ´ Fuel Costs ('Im3) 4,7 3,6 Others Subsidies 0,000 Mio ´ (in four shifts) | | SO ₂ | | 0 | mg/Nm³ | | | | | |
| Woodchips (saw industry) Sawdust Others Subsidies Number of employes Fuel Costs ('/m3) 4,7 3,6 Others Fuel Costs ('/m3) Mio ' (in four shifts) | | Other | n.a. | | mg/Nm³ | 16 | | | | |
| Woodchips (saw industry) Sawdust Others Subsidies Number of employes O(000 Mio ' Number of employes (in four shifts) | nsts | Investment costs | n.a | | Mio ' | | | | | |
| Woodchips (saw industry) Sawdust Others Subsidies Number of employes O(000 Mio ' Number of employes (in four shifts) | | | | | | | | | | |
| Woodchips (saw industry) Sawdust Others Subsidies Number of employes O(000 Mio ' Number of employes (in four shifts) | | | | | Fuel Costs | ('/m3) | | | | |
| Sawdust 3,6 Others Subsidies 0,000 Mio ' Number of employes 6 (in four shifts) | | Woodchips (saw industry) | | | | | | | | |
| Others Subsidies 0,000 Mio ' Number of employes 6 (in four shifts) | | | | | | | | | | |
| Number of employes 6 (in four shifts) | | | | | | | | | | ozdarsh |
| Number of employes 6 (in four shifts) | Other | | | | | | | | 12.12 | 3 in |
| Number of employes 6 (in four shifts) | Others | | | | | | | | 100 | The same |
| Number of employes 6 (in four shifts) | | Cubaidian | | 0.000 | Min | | | | 8 | 全国 |
| | | | | | | | | | 1. 40 | 20.75 |
| ne Annual operating time 8.256 h/a | | | | NEW THE PROPERTY OF | A THE REST AND A PROPERTY OF | | (in four shifts) | | 18 14 | 1034 |
| 10 W. M. M. | 10 | Annual operating time | | 8.256 | h/a | | | | 18 46 | - Word |

PIOCOGEN, TASK 2

| Country: | Slovenia | | | | | | | | | |
|------------------------------|---|----------------|--|--------------------|-------|--------|------------------|-------------------|----|------|
| ne: | NOVOLES | | | | | | | | | |
| ation: | Straža | | | | | | | | | |
| ner: | Novoles | | | | | | | | | |
| | | | | | | | | | | |
| | +386 7 308 45 00 | | | | | | | | | |
| | +386 7 308 38 78 | | | | | | | | | |
| nil: | | | | | | | | | | |
| vebpage: | | | | | | | | | | |
| r of construction | 1970 | | | | | 610 | | | | |
| rt description of the plant | It's an old plant in wood proce an activity which supports the they are officially buying the v | eir primary ac | ctivity. I | It is privately | owned | I. The | | | | |
| | | | | | | | | | | |
| aracter of plant | Commercial plant | | | | | | | | | |
| dottor or plant | Commercial plant | | | | | | Their own use | Covering their ow | 'n | |
| | | | | | | | (%) | needs (%) | | |
| ual production (normal year) | District heat: | | 66,4 | GWh | | | 100 | | 73 | |
| | Grid electricity: | | | GWh | | | 100 | | 53 | |
| | Electric efficiency | n.a. | | % | | | | | | |
| | Thermal efficiency | n.a. | | % | | | | | | |
| -Uhnology | Combustion | | | | | | | | | |
| | Steam turbine | | | | | | | | | |
| nace | Grate | | | | | | | | | |
| | Capacity | | 13.8 | MW _{fuel} | | | | | | |
| | | | and the latest designation of the latest des | | | | | | | |
| uel | | | | | | | | Lower heating val | | |
| | | | | | | | % | kWh/kg | | m3/h |
| | Woodchips (saw industry) | | | | 91 | | 30 | | | 6,6 |
| | Sawdust | | | | 9 | % | 10 | | | 0,6 |
| | | | | | | % | | | | |
| others | | | | | | % | | | | |
| | Fuel for pilot flame | | | | | | | | | |
| | | | | | | | | | | |
| urbine | Туре | Siemens | T 50-5 | 59 | | | | | | |
| | Power | | | MW _{el} | | | | | | |
| | | | | | | | | | | |
| it exchanger | Туре | | | | | | | | | |
| | Heat | | | MW _{th} | | | | | | |
| | | | | | | No. | | | | |
| e Gas | | | | | | | | | | |
| | Flue gas volume flow | | 26400 | Nm³/h | | | | | | |
| | Flue gas temperature | | 223 | °C | | | | | | |
| issions | | | | | | 1 | | | | |
| | со | | 669 | mg/Nm³ | | | | | | |
| | NOx | | | mg/Nm³ | | | | | | |
| | | | | | | | | | | |
| | Particles | n.a. | | mg/Nm³ | | | | | | |
| | СхНу | n.a. | | mg/Nm³ | | | | | | |
| | SO ₂ | | | mg/Nm³ | | | | | | |
| | Other | n.a. | | mg/Nm³ | | | | | | |
| costs | Investment costs | | 1,5 | Mio ' | | | (In year 1970) | | | |
| | | | | | | | | | | |
| | | | | Fuel Costs (| /m3) | | | | | |
| | | | | . 40, 00313 (| | | | | | |
| | | | | | 16 | | | | | |
| | Woodchips (saw industry) | | | | 0,3 | | | | | |
| | Sawdust | | | | | | | | | |
| | | | | | | | | | | |
| Others | Sawdust | | | | | | | | | |
| Others | Sawdust | | | | | | | | | |
| Others | Sawdust | | 0,000 | Mio * | | | | | | |
| Others | Sawdust s Subsidies | | | | | | (in four shifts) | | | |
| Other | Sawdust | | 0,000 12 5.678 | | | | (in four shifts) | | | |

"'OCOGEN, TASK 2

| Country: | Slovenia | | | | | | |
|---------------------------------|---|--|--------------------------------|-----------|--------------------|---------------------|--------------|
| ne: | TANIN | | | | | | |
| ation: | Sevnica | | | | | | |
| ner: | Tanin Sevnica | | | | | | |
| | | | | | | | |
| | +386 7 814 12 24 | | | | | | |
| : | | | | | | | |
| ail: | | | | | | | |
| webpage: | | | | | | | |
| r of construction | 1978 | | | | | | |
| rt description of the plant | It's an old plant in wood procuse as an activity which supp production - that's why the co | orts their primary | activity. It is | privately | | | |
| | | | | | | | |
| " iracter of plant | Commercial plant | | | | Their own use | Covering their own | |
| | | Research Control of the Control of t | | | (%) | needs (%) | |
| munual production (normal year) | | | GWh | | 100 | 100 | |
| | Grid electricity: | | GWh | | 100 | 70 | |
| | Electric efficiency | n.a. | % | | | | |
| | Thermal efficiency | 80 | % | | | | |
| hnology | Combustion | | | | | | |
| | Steam turbine | | | | | | |
| nace | Gate | | | | | | |
| | Capacity | 16,9 | MW _{fuel} | | | | |
| Fuel | | | | | Moisture content % | Lower heating value | |
| | Mandahina (namindustra) | | | 93 % | 50 | kWh/kg | kg/h 6903 |
| | Woodchips (saw industry) | | | | | 2,44 | 6903 |
| | Bark | | | 1 % | 60 | | |
| othe | rs fuel oil Fuel for pilot flame | | | 6 % | | | 200 t/year |
| Turbine | Type Power | Franco Tosi - 1,32 | T.V.A. 500 MW _{el} | | | | |
| at exchanger | Type Heat | | MW _{th} | | | | |
| Feet 77 7 7 7 7 7 7 | | | | Wile. | | La Res | |
| e Gas | | | | | | | |
| | Flue gas volume flow | | Nm³/h | | | | |
| | Flue gas temperature | 221 | °C | | | | |
| issions | | | | | | | |
| | CO | | mg/Nm³ | | | | |
| | NOx | 248 | mg/Nm³ | | | | |
| | Particles | 115 | mg/Nm³ | | | | |
| | СхНу | 1,1 | mg/Nm³ | | | | |
| | SO ₂ | 10 | mg/Nm³ | | | | |
| | Other | n.a. | mg/Nm³ | | | | |
| ^-sts | Investment costs | | Mio ' | | (In year 1977) | | |
| | | | | | | | |
| | | | Fuel Costs (| (*/t) | | | |
| | Woodchips (saw industry) | | | 0 | | | |
| | Bark | | | 0 | | | |
| | | | | | | | |
| Othe | ers fuel oil | | | 0,28 | '/kg | | |
| | | | | | | | |
| | Subsidies | 0,000 | Mio ' | | | | |
| | Number of employes | 7 | | | (in four shifts) | | |
| | | - 1 | | | (miles) | | |
| 10 | Annual operating time | 8000 | h/a | | | | |