

WP 3.1

Slovenia

Inventory of demo projects



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WP3 – sustainable Exploitation of Biomass

Action 3.1: Transnational Tool development

3.1.1 – Inventory

3.9 Slovenia, Country description

Introduction

Slovenia is a country in Central Europe and it has been a member of the European Union since 2004. From a geographical point of view it has 20.273 km² of land; of which about 60 % is covered with forests. As of 2009 Slovenia has a population of 2,032,362 and a population density of 100 inhabitants per km².

Because of the high percentage of forest areas there is a big potential to develop woody biomass as a renewable source of energy. Current forest cutting does not reach half the estimated annual increment leaving this energy resource largely unexploited.

3.9.1 Renewable energy sources

Renewable energy sources (RES) is an important source of primary energy in Slovenia. Increasing the share of RES in total energy consumption is one of the priorities of the energy and environmental policies. The RES are considered to be an important national strategic stock of energy; almost 70 % of primary energy has to be imported. Slovenia has a very good potential for RES use, because over 60 % of the country is covered with forests and because of high hydroelectric energy potential. According to the environmental indicators in Slovenia the consumption of RES is about 10 % of total energy consumption. The biggest share of RES represents woody biomass with 56.5%, then hydropower with 37 % and other RES with 6.5 % (geothermal, biogas, heating solar systems and PV). In 2007 the electric energy generated from RES was about 3,300 GWh or about 22 % of total electricity production. The share of RES in final energy consumption is around 15 % and it will have to be increased by another 10 % to meet the target of 25 % by 2020.

Hydroelectric energy

Hydropower is the most important RES in Slovenia and in 2007 it generated 96,7 % of all electric energy produced from RES. Production is divided between small hydropower plants that have up to 10 MW of installed power and large hydropower plants with installed power above 10 MW. The installed power of hydropower plants in Slovenia is more than 800 MW, with the yearly production of more than 3.000 GWh. Production of electric energy is most depended on the river stages. In 2007 the installed power of hydropower plants was 18 % greater than in 2000, but the electric energy generation was 14.9 % smaller. This is mostly due to higher water stages of rivers in 2000. Slovenia's hydroelectric power potential has not yet been adequately utilised. The potential is estimated at about 9,000 GWh per year.

Geothermal energy

At the moment there are no geothermal power plants in Slovenia. This is mostly due to high risk investment in geothermal holes that determine the potential of geothermal energy. The geothermal energy in Slovenia is usually used for heating purposes. Geothermal heating is used in 29 locations with common installed heating power of 64 MW.

Wind energy

In Slovenia there are no large wind power plants. The installed electric power of small wind power plants in 2008 was only 24.4 kW. They are mostly used to power remote areas that have no other sources of energy.

Thermal Solar Energy

The largest part of the solar energy in Slovenia comes from hot water solar systems. Most of them are installed on individual buildings. The average energy of quazi-global irradiation in Slovenia is 4,020 MJ/m² with standard deviation 520 MJ/m². In 2008 the total installed area of solar collectors was 134,000 m² and they were mostly used for heating water. Thermal solar system produced around 87 GWh of energy in 2007.

Photovoltaic energy

Production of electric energy from the sun in 2007 was 0.7 GWh that is 0.02 % of all electric energy produced from RES. In 2008 production of electric energy from PV increased by 150 % and rose to 1.5 GWh. In 2007 eight solar plants with an installed power of 82 kW were able to obtain a status of a qualified producer of electric energy, in 2008 there were already 56 solar power plants with the installed power of 1,250 kW. The increase of solar power plants installation is mostly due to a decree for support of electric energy produced from RES with its premium feed-in tariffs for RES. Environmental development fund of Slovenia gives household and businesses soft loans for investments in RES.

Biomass

The potential of **solid biomass** is high, with over 57 % of land covered with forests. Biomass has recently started to penetrate the market. In electricity production it has the second biggest market shares of all RES after the use of hydro-energy. Use of biomass represents the market for the agriculture and forestry sector, new jobs and decrease in demography problems. The proper development is even more important for agriculture than for the energy. The traditional use of wood in households and wood residues in furniture industry represent the second most important share among RE in Slovenia. On the other hand the modern use of biomass in small individual and bigger boilers for district heating systems gives one of the best potential amongst all RES. Biomass produced heat is the main category of RE. Its growth rate exceeds that of solar thermal heat and geothermal heat. Biomass on-line trading portal Borzen is available from April 2004 and its goal is to contribute to a better and clearer overview of the biomass market. It is freely accessible and is aimed for companies and individuals working in this market, as well as the general public.

Biogas production started in Slovenia at the end of 1980th. First two biogas plants were for the anaerobic digestion on municipal plants – central wastewater treatment and big pig farm. Energy utilization of biogas from the anaerobic digestion sewage, manure or agricultural wastes and landfill gas is present in Slovenia, but it has at this moment a negligible impact on energy balance, while the important impact is the reduction of emission of greenhouse gases. Use of biogas from central wastewater treatment (CWWT) is necessary, especially from the aspect of reducing methane emission. Energy of biogas covers partly the energy need of the wastewater treatment. The energy produced is used in the plant for heating the fermentors (digesters) and partly covers the electricity needs. In Slovenia exist eight central wastewater treatments (CWWT) installed systems for biogas production, but only four of them use biogas for production of heat and electricity (CHP). In others, the biogas is burned on torches. Total installed electricity power on sewage gas is less than 1 MW.

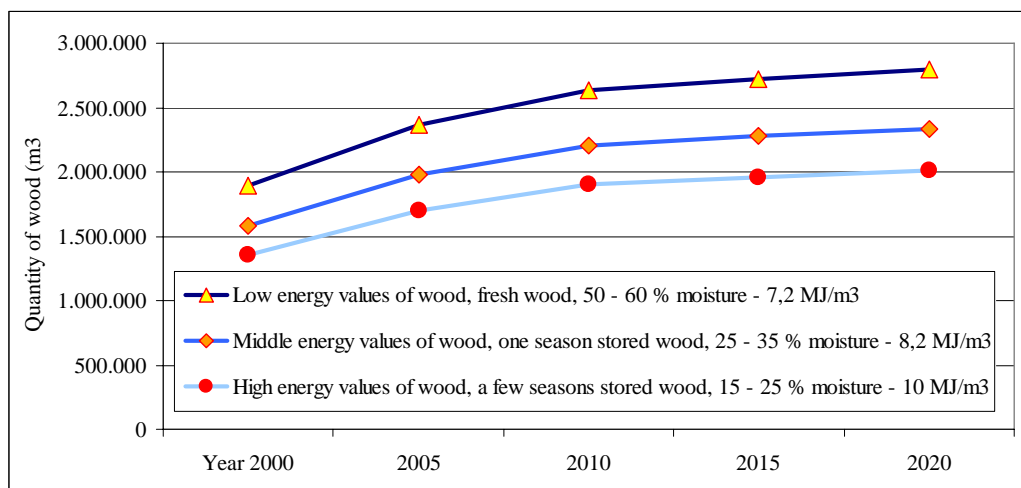
The **biofuel** production in Slovenia began in 2005 and reached 0.1 GWh in that year. The use of biofuels is not in line with the objectives set at the moment. The only biofuel in Slovenia is biodiesel. It was mainly sold as a biodiesel-diesel mixture, with less than 5 % being used as a pure biofuel, predominantly in the Ljubljana city buses (Civitas Mobilis project). The amount of

biodiesel sold in 2005 represented 0.35 % of the energy value of the fuels sold. The target value for the said year, which was considered a test year, stood at 0.65 %, whereas the Decree on the Promotion of Use of Biofuels (2006) has envisaged a share of not less than 1.2 % already for 2006. The meeting of target values in Slovenia will be aggravated in particular by insufficient agricultural production areas. Production of the pure plant oil reached 8,000 t in 2007 and with the new plants planned should reach up to 50,000 t.

3.9.2 Energy from biomass

Firewood is a renewable domestic fuel, which usage contributes to the reduction of the greenhouse effect and trough that contributes to the realisation of the Kyoto's Protocol objectives as well as of energy dependence from the import. In Slovenia firewood is used for different heating purposes, nowadays mostly in small scale heating. Beech is the most common wood species, but other wood materials are also used.

For the production of 1 PJ of energy, produced from wood, we need from 100 to 140 thousand m³ of wood, depending from the sort of wood, moisture and specific weight. Figure shows the total quantity of wood necessary to ensure the planned primary energy in Slovenia until 2020. Three different energy values of wood were considered in that (1 m³ of wood contains 7.2, 8.6, or. 10.0 MJ of energy).



Solid biomass

In Slovenia still the most used kind of biomass for energy is firewood. Contemporary heating methods enable highly efficient use of energy, minimum emissions of harmful substances and comfortable heating. Their introduction is hindered by high investment expenses, making public subsidies indispensable.

Firewood in modern type stoves, tile ovens and fireplaces therefore still remains an interesting form of energy especially for forest owners and people living on the countryside.

To increase the contribution of biomass the government has initiated the project "Removing Barriers for the Increased Use of Biomass in Slovenia", with which it promoted the development of woody biomass energy use, especially biomass based district heating systems. The project, supported by Global Environmental Facility (GEF), promoted the increased use of biomass also by removing barriers to, and reducing the implementation costs of biomass based district heating projects in local communities.

The GEF project supported 23 feasibility studies and 10 were supported under more restrictive co-funding conditions:

District heating system	Heating power [kW]	Operation starting date
Vransko	3,200	2004
Kočevje	4,500	2005
Mozirje (school)	500	2007
Mozirje (Podrožnik)	610	2006
Luče	610	2006
Loče	1,000	2007
Črnomelj	2,200	2007
Solčava	220	2007
Total	12,840	

All together now in Slovenia we have 20 biomass based district heating systems. The oldest one is from 1978. But most of them were built in years 2004 – 2007.



Biomass based district heating systems (www.engis.si)

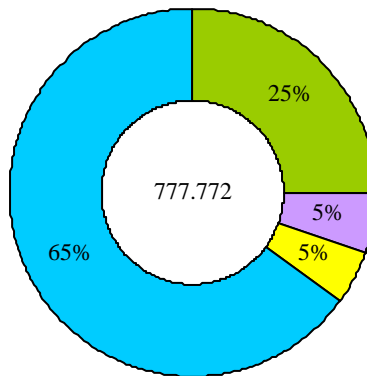
There are six biomass based CHP systems in Slovenia:

CHP	El. power (kW)	Operation starting date
Železniki	600	2006
Tisa 1 and Tisa 2	1.280 + 980	2002 + 2003
Merkscha (industrial)	6.750 + 700	2007 + 2002
Bohor Šentjur	552	2007
Tanin Sevnica (industrial)	1.300	2002
Novoles	1.900	2006
Total	14.070 kW	

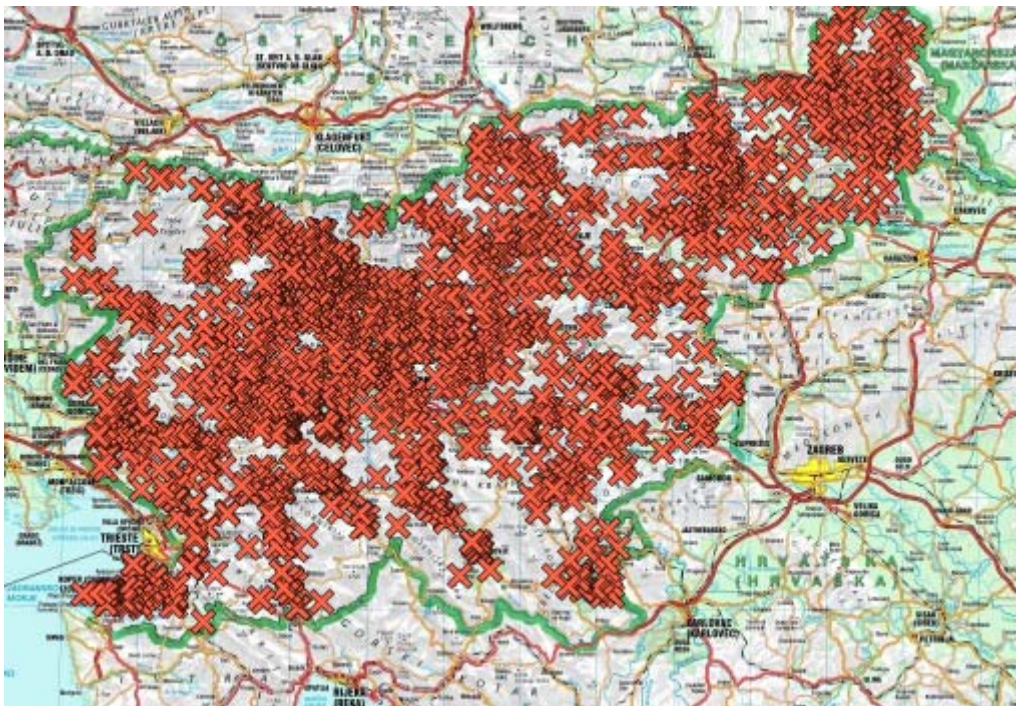


Biomass based CHP systems (www.engis.si)

In Slovenia there are 777,772 dwellings (Census 2002). Analysis of dwellings, according to the source of heating shows that 25% of dwellings in Slovenia are heated with wood biomass as the only source of heating. Moreover, wood biomass is used for heating in additional 10% of dwellings, however in this case wood biomass is not the only, but the main (5%) or secondary (5%) source of heating. More than half of dwellings (65%) are not of heated with wood. Among the most important sources of heating are fuel oil and gas.



Dwellings according to source of heating (Census 2002)



Biomass boilers (www.engis.si)

Biogas

Biogas production is available on three farms. The total power capacity of installed gas motors on mentioned farms is 0.577 MW. The utilization of landfill gas has been in only three waste dumps: Ljubljana, Maribor and Celje. The landfill gas is used for electricity production in gas CHP systems. The power capacity of all installed plants is 3.5 MW. The production of biogas from sewage and agriculture farms was about 240 TJ in 2003 (221 TJ of landfill gas and 19 TJ of biogas).

3.9.3.1 Thermal energy plants

Mozirje Podrožnik district heating system

By implementing this system the objective of the community to join public buildings and others newly built buildings to the DHC. In the boiler room in industrial zone Podrožnik the existing trade facilities are connected Tuš Market, local restaurants, small apartment and office building, administration building and commercial centres of Mozirje cooperative and Hofer. The contractor undertaking the project was company Biomasa Ltd.



Technical data:

- year of construction: 2007
- capacity: 610 kWth
- length of network: 587 m
- biomass: wood chips (local)
- consumption: 2,940 t/a
- running time: 1,716 h/a
- total budget: 379,270 EUR

Vransko district heating system

Wood has traditionally been the source of heating in the Vransko area in Slovenia. In 2002 about 60% of households in the municipality of Vransko were using wood for heating, either as the only fuel or as a supplementary fuel. Individual houses, industrial buildings and all the public users, financed by the municipality, were using mostly old, inefficient individual wood or oil fuelled boilers for heating purposes.



Technical data:

- year of construction: 2004
- capacity: 3,200 kWth
- length of network: 4,700 m
- biomass: wood chips (domestic)
- consumption: 9,000 m³/a
- running time: 2,063 h/a
- CO₂ savings: 1,607 t/a
- total budget: 2,285,000 EUR

3.9.3.2 Electric energy plants

CHP Heat plant Železniki

At heat plant Železniki reconstruction and replacing of an old system with hot water boilers with manual loading of wood biomass with a new steam boiler with an automatic injecting wood biomass as well as a steam engine was performed. New plant so allows simultaneous production of heat for district heating system and sells electricity to the public network. Implementation of the new cogeneration system also has impact on the emissions, since the old heating plant could no longer follow the legal requirements. On the district heating system, which is the oldest in Slovenia, more than 360 flats in multi-facility buildings, 9 public institutions, 22 companies and 170 individual houses are connected.



Technical data:

- year of construction: 2006
- capacity: 600 kWe + 7,000 kWth
- length of network: 7.8 km
- biomass: wood residue (local)
- consumption:
- running time: 5,100 h/a
- CO₂ savings: 2,415 t/a
- total budget: 2,865,000 EUR

Tisa 1 and 2 CHP

On the area of former furniture company couple of smaller companies have formed, that are supplied with thermal energy by Tisa Ltd. Electricity is sent to the national grid (feed-in-tariff system). Tisa collects wood residues from various locations from all over Slovenia. With fuel they also supply biomass-fired power stations and heating plants across Slovenia.



Technical data:

- year of construction: 2002
- capacity: 2,400 kWe + 9,300 kWth
- biomass: wood chips (domestic)
- consumption: 70,395 t/a
- running time: 5,950 h/a

3.9.3.3 Biogas plants

Marjan Kolar's biogas plant

The farm of Marjan Kolar has 2000 ha of own and rented land. Outside the village there's a pig farm where also biogas device is set. The primary substrates for the production of biogas are:

pig manure, corn silage and grass silage. Silos for silage they also have in other places and are delivering it if necessary. Heat energy is used for heating digestors at pig farm and grain dryers. Electricity is used partly for the biogas plant operation, but most of it is sent to the public grid.



Technical data:

- year of construction: 2007
- power: 835 kW_e
- biomass: pigs manure, grass and corn silage (local)
- consumption: 11,200 t/a + 3,200 m³/a

Biogas plant Nemšćak

Pig farm Nemšćak is one of the ten food producing companies associated in Panvita Group. In 2005 a special company "KG Rakičan–Ekoteh" was established in order to undertake the project of the construction of a biogas plant. The main purpose of building the biogas plant was to treat the animal by-products from this farm and from the other Panvita Group companies as well and to utilise the energy in an environmentally friendly way.



Technical data:

- year of construction: 2006
- capacity: 1,500 kW_e
- fuel: organic substances (70% of animal origin, 20% of corn, 10% other organic origins)
- consumption: 240 t/day
- CO₂ savings: 9,000 t/a
- total budget: 8,300,000 EUR

**Table 1 - SMALL – MEDIUM – LARGE SIZE BIOMASS PLANTS
Thermal Energy Plants (kWth)**

kWth	Technology (1)	Biomass Type (2)	Biomass Source (3)	Biomass Consumption t/a	Residue Usage (4)	Running Time h/a	Efficiency % (5)	Employment (6)
<1000 (Mozirje Podrožnik) 610 kW	combustion	wood chips	local	2,940 t/a		1,716 h/a		
>1000 (Vransko) 3200 kW	combustion	wood chips	local	3,510 t/a		2,063 h/a		
CHP Eventual								
Other								
Note:								

- (1) Combustion, gasification, pyrolysis, etc. (Short description of the components for medium-large size plant)
 (2) Pellet, chips, briquette, logs, sawdust, vegetal oil, biodiesel, etc..
 (3) Domestic, import, local availability, distance of source, etc.
 (4) Recycle, agricultural use, by-products, waste, etc.
 (5) Thermal, electric, total.
 (6) Local, direct, indirect, possible improvement, etc.

**Table 2 - SMALL – MEDIUM – LARGE SIZE BIOMASS PLANTS
Electric Energy Plants (kWe)**

kWe	Technology (1)	Biomass Type (2)	Biomass Source (3)	Biomass Consumption t/a	Residue Usage (4)	Running Time h/a	Efficiency % (5)	Employment (6)
< 1000 (Železniki) 60 kWe	gasification (CHP)	wood residue	local			5,100 h/a		
> 1000 (Tisa 1+ 2) 1280 + 980 kWe	combustion (CHP)	wood chips, wood residue	domestic	70,395 t/a		5,950 h/a	thermal 90% electric 47%	
CHP Eventual								
Other								
Note:								

- (1) Combustion, gasification, pyrolysis, etc. (Short description of the components for medium-large size plant)
(2) Pellet, chips, briquette, logs, sawdust, vegetal oil, biodiesel, etc.
(3) Domestic, import, local availability, distance of source, etc.
(4) Recycle, agricultural use, by-products, waste, etc.
(5) Thermal, electric, total.
(6) Local, direct, indirect, possible improvement, etc.

**Table 3 - SMALL – MEDIUM – LARGE SIZE BIOMASS PLANTS
Biogas Plants**

kWe	Technology (1)	Biomass Type (2)	Biomass Source (3)	Biomass Consumption t/a	Residue Usage (4)	Running Time h/a	Efficiency % (5)	Employment (6)
< 1000 (Marjan Kolar) 835 kWe	combustion (CHP)	pigs manure, grass silage, corn silage	local	11,200 t/a + 3,200 m ³ /a	agricultural use			
> 1000 (Nemšćak) 1500 kWe		organic substances (animal origin and corn)	local	240 t/day	agricultural use			direct
CHP Eventual								
Gas Grid								
Other								
Note:								

- (1) Anaerobic Digestion, other. (Short description of the components for medium-large size plant)
- (2) Agricultural residues, Agro-industrial residues, etc.
- (3) Domestic, import, local availability, distance of source, etc.
- (4) Recycle, agricultural use, by-products, waste, etc.
- (5) Thermal, electric, total.
- (6) Local, direct, indirect, possible improvement, etc.

3.9.4 Administrative procedures of authorization necessary in the lead up to project realization

Building and operation biomass plant requires a set of official document and confirmation for building and operation of biomass plants. Permits and license are described chronologically. It has to be emphasized that not all permit are required for specific biomass plant since it depends on several factors. When you are building a plant that will be for your needs only than you need only building and operating permit. In case that you sell produced energy that you have to acquire also energy license for plant above 1 MW and energy permit. When using organic wastes for biogas production than plant operator has to acquire a permit for waste processing/recovery.

Plan for land use – Permit to build

Building any kind of object is allowed only on building land set in Municipal spatial plan. If the potential location of the biogas plant is not addressed as building land than the category of that area should be changed. In many cases municipality asks also for town planning scheme. Both plans can be obtain by the municipality. The whole procedure is normally long lasting and complicated. It usually takes around 6 months.

Energy license

The energy license is required for power plants above 1 MW. Agency for Energy approves the license based on the application for period 5 years. It is relatively easy to obtain the license and it takes around one month.

Energy permit

The investor must obtain energy permit for power plants above 1 MWe before applying for the building permit. With this permit it is set:

- location and area of the plant,
- type of the plant,
- conditions for performing energy activities on the plant,
- conditions related to the plant commissioning.

Permit for waste processing/recovery

In case of using organic wastes for biogas production the plant operator must obtain permit for waste recovery. Ministry for spatial planning sets with the permission:

- source and quantity of the wastes that can be treated on the plant,
- procedure of processing,
- objects and devices for waste recovery.

Nevertheless, it is possible to process the wastes without the permission in case of:

- non hazardous wastes,
- the processing is on the location of source of the wastes,
- processing only own wastes and
- meeting all requirement for waste recovery.

Building permit

For biomass plants it is necessary to obtain building permit.

Declaration

An owner or a leaseholder that is producing or is going to produce electricity from renewable energy sources (RESs) or in a high-efficiency cogeneration of electricity and useful heat (CHP), first has to file an application for obtaining a declaration for the production facility with the Energy Agency of the Republic of Slovenia. If a production facility fulfils all the conditions for obtaining a declaration and a producer files a complete application form, the Energy Agency

issues, in an administrative procedure, a decision on granting a declaration for the concerned production facility. Following the decision, a producer receives a document confirming the finality of the obtained declaration for a production facility. A declaration is obtained for a specific period, in the case of the production facilities producing electricity from RESs, it lasts for up to five years, and in the case of the production facilities producing electricity from CHP, it lasts for one year. Prior to the expiry of the current declaration's validity, a producer shall file a new application for obtaining a declaration, or it shall obtain a new declaration for a production facility after the expiry of the validity of the obtained declaration. If a producer fails to do so, its eligibility to receive support will cease after the expiry of the declaration.

3.9.5 Lesson Learned

Bad promotion has much greater reach than positive one. If not all the stakeholders and actors are concerned and general public is involved in starting phases of the project, this many times causes problem. Promotion in it self it is not enough if because of non existent regulation or its control, other partial interests prevail.

3.9.6 Renewable energy principal actors

The main players are companies that are active in the field of technological production, planners and energy advisers. The RUE and RES Cluster, PV Cluster, Thermosolar Platform and Slovenian Forest-Based Technology Platform were set up, whose vision is to develop cooperation of various institutions. The primary objective is to address the development of domestic science, knowledge and specialized equipment and the removal of barriers to greater use of solar energy in Slovenia.

Governmental institutions

Ministry of the Economy

Directorate of Energy, Sector for Energy Efficiency and Renewable Energy

Ministry of the Environment and Spatial Planning

Ministry of Agriculture, Forestry and Food

Energy Agency of the Republic of Slovenia

Slovenia Forest Service

Research institutions

University of Ljubljana

University of Maribor

Jozef Stefan Institute - Center for Energy Efficiency

Slovenian Forestry Institute

Agricultural institute of Slovenia

Other

Borzen RES - Biomass Trading

Chamber of Commerce and Industry of Slovenia - Energy Industry Chamber of Slovenia,
Forestry Association and Furniture and Wood Processing Association

Slovenian Biomass Association

Chamber of Agriculture and Forestry of Slovenia

3.9.7 References

www.engis.si (Geographic Information System for RES)

www.stat.si (Statistical Office of the Republic of Slovenia)

www.aure.gov.si (Ministry of the Environment and Spatial Planning. Public Services and Investments Directorate, Department of Efficient Energy Use and Use of Renewable Energy Sources)

www.hse.si (Holding Slovenske elektrarne)

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