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Introduction of Regional Energy Concepts

WP 5

Regional energy strategy & action plan

Task: 5.4.2



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REGIONAL ENERGY STRATEGY & ACTION PLAN

The development path is going to analyse different scenarios for RES and efficient use of energy in the pilot regions, based on the results of regional energy balance sheet and the participation fora.

The European Union (EU) has defined an ambitious goal with the decision of the 20-20-20 targets, namely to produce 20% less greenhouse gas emissions, to achieve a 20% share of renewable energies and to increase energy efficiency by 20% until 2020. The aim is to get independent from fossil fuels by 2020.

Therefore relating to different forecasts of economic growth, statistic data, development of utilisation of renewable energy and energy efficiency as well, different scenarios for regional planning and development should be analysed and occurred.

Three scenarios should be calculated in the balance sheet and built up on short, middle and long term goals based on the targets for 2020. Therefore, a key point for the strategy and action plan is to hold the 2nd participation fora. These scenarios have to be discussed with the political stakeholder or decision makers to select one main scenario for the concept region.

The strategy and action plan is going to give on the one hand side an overview of the region in the field of energy demand, resource potentials, supply chains as well as development path evaluated in the regional energy balance sheet. On the other side, the strategies and actions should be described, which however will conduct the selected scenario for achieving the goals for the concept region.

The regional energy strategy and action plan is going to be a guide for each concept region including measures, which will help by the implementation of the selected main scenario.

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1. Description of the concept region

1.1 Geographical situation

Savinjska Region comprises 2,384 km² and is named after Savinja River and stretches along the valley that lies to the east of central Slovenia and borders to Austria on the north and Croatia on the east. The neighbouring regions are Koroška in the north, Podravska in the east, Spodnjeposavska in the south, Zasavska and Osrednjeslovenska in the west. The region is very diverse in terms of natural geography; it comprises mainly the wooded alpine world attractive for tourists (the Upper Savinja valley and a part of the Kamnik-Savinja Alps), the fertile Lower Savinja valley with good conditions for growing hops, the Kozjansko hills and the Velenje basin with lignite deposits for the production of electricity.

The regional centre is Celje (48,000), the third largest city of the country, with three institutions of higher education: the Faculty of Logistics (member of the University of Maribor), a polytechnics for mechanical engineering and civil engineering, and a business-commercial college where more than 1,000 students study every year. Other principal towns include: Velenje (34,000) with its college for electrotechnics, informatics, miners and geotechnology, Žalec (20,900), Šentjur pri Celju (18,500), Slovenske Konjice (13,900) and Laško (13,900).



Figure 1: Map of Slovenia showing statistical regions and geographical position of Savinjska

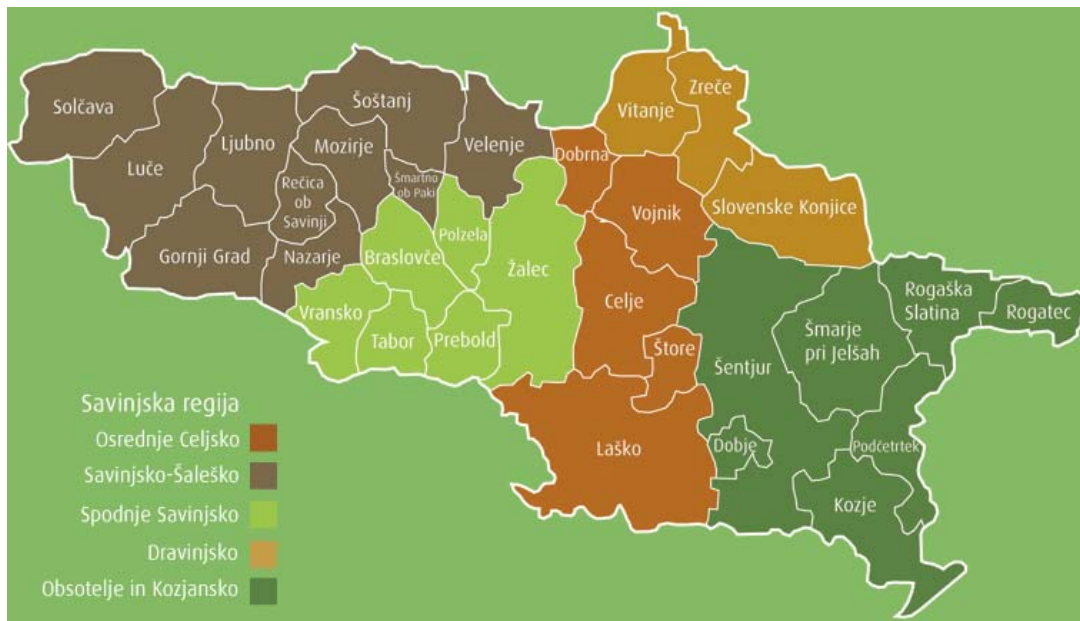


Figure 2: Map of Savinjska region showing municipalities and sub-regions

1.2 Demographical situation

1.2.1 Population

In 2013 the region had 260.217 inhabitants, which was 12.4% of all Slovenian inhabitants. The number is slightly growing already since 1995. The Savinjska region is the fourth Slovenian most densely populated region at 109.1 inhabitants per km², with Slovenian average at 101.2. The majority of people live in towns and settlements and a smaller part in country side in rural areas. Roughly 65/35% is the ratio.

In the table and figure below development of population in the period 2008 – 2014 is shown. From 2008 to 2014 the number of inhabitants decreased for 0.53% and is relatively stable.

Table 1: Population development in the period 2008 – 2014

	2008	2009	2010	2011	2012	2013	2014
Total	261.243	258.845	260.025	259.726	260.253	260.217	259.853
Men	130.199	129.118	129.967	129.441	129.791	129.929	130.054
Women	131.044	129.727	130.058	130.285	130.462	130.288	129.799

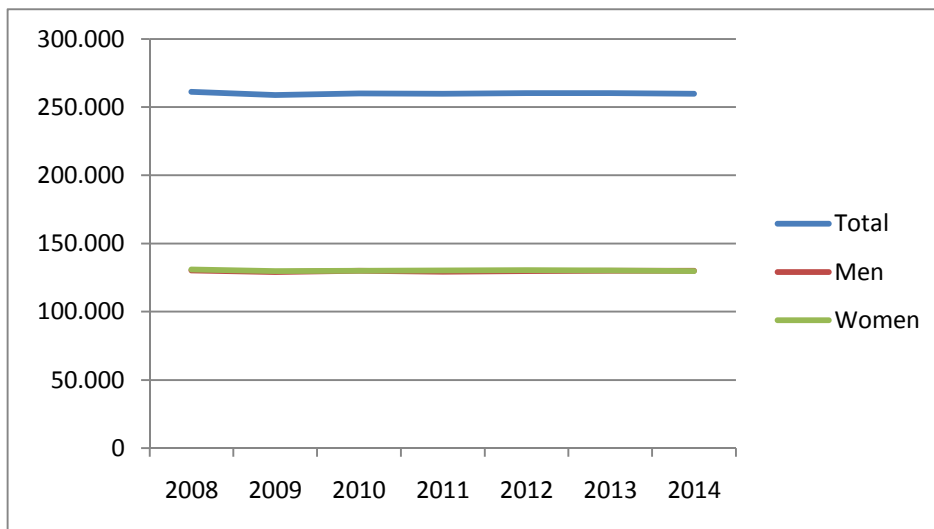


Figure 3: Demographic development of Savinjska since 2008 (Source: SORS, 2013)

1.2.2 Economic development and structure

The region has a long industrial tradition, a high concentration of businesses and is very export oriented. 75% of employees have found a job in the industry. In terms of revenue and headcount, manufacturing activities prevail. The backbone of the regional economy is formed by a number of large companies that provide around 36% of all employment in the region, creating 40% of added value.

The most significant sector of industry in the Savinjska Region is the production of machines and appliances – Gorenje, one of Slovenia’s largest companies, operates in the region employing one fifth of its workers and creating one quarter of its revenue. Other industrial sectors include: wood-processing, energy, textile & apparel, metal processing, ore extraction, chemicals, food, and coal-mining (to be closed down).

The region experienced a severe economy crisis in beginning of the 1990s, from which has still not fully recovered. Typically there were big industry companies that need to restructure and some finished in bankruptcy. There are also quite a few companies dealing with mining and energy in the region (Lignite mine, Thermal power plant Šoštanj).

Enterprises in the Savinjska statistical region represent around a tenth of all enterprises in the country and create a tenth of national turnover of all enterprises. Enterprises in the region are in terms of the average number of persons working in enterprises among the largest in the country (5.4 persons in 2010). According to the labour migration index, the number of persons in employment working in the region does not lag far behind the number of persons in employment living in it (98 in 2010). In 2010, 11% of enterprise births and 8% of enterprise deaths were recorded. Employment share of enterprise births was 2.2% of all active enterprises.

Savinjska region has good conditions for agriculture (especially for eco-farming), which is the basis for the strategic development of the countryside. The main agricultural activities are cattle raising, milk production, viniculture, fruit growing, and forestry. In the recent years more and more of the various supplementary activities on the farms are taking place and tourism on farms. The particularity of the region is the tradition of growing hops, which is unique in Slovenia and typical for the Lower Savinja valley. Agricultural land covers about 30% of the regional territory. In the region there were 8,721 farms in 2012, from which 360 organic, which is far less than in 2010, when Savinjska region was second in the country with a bit more than 11,400 farm holdings.

The region is also a popular tourist destination and in 2010 it recorded almost 11% of tourist arrivals in Slovenia; on average tourists stayed for four nights.

In the period from 2009 to 2013 the total persons in employment is decreasing in the period 2009-2012 while it is slightly increasing from 2012 to 2013. The number of persons in paid employment is decreasing from 2009 to 2013. The number of self employed persons is increasing in the same period. Overall a significant decrease in employment is apparent as it can be seen in figure below.

Table 2: Persons in employment in the period 2009 – 2013

	2009	2010	2011	2012	2013
Persons in employment - total	106,507	101,403	100,906	98,136	98,451
Persons in paid employment	93,761	89,213	88,059	85,080	84,799
Self employed persons	12,746	12,190	12,847	13,056	13,652

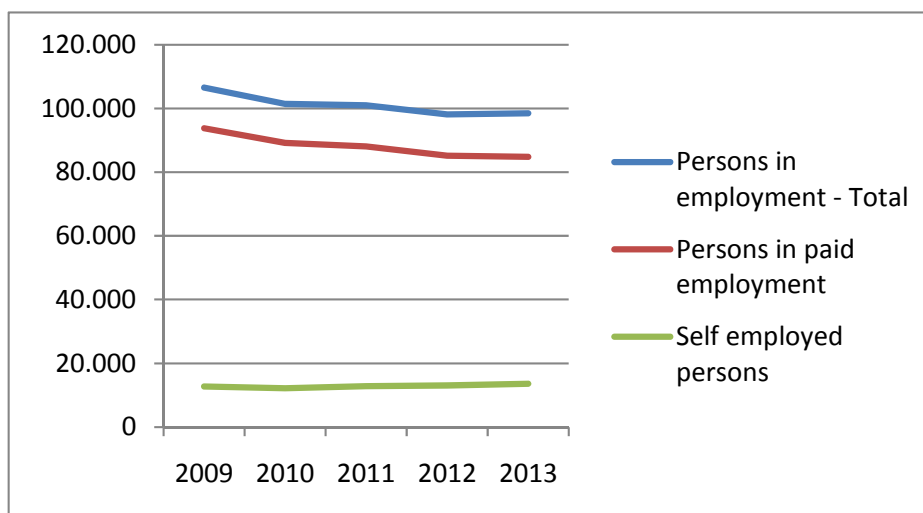


Figure 4: Employment in Savinjska in the recent years (Source: SORS, 2013)

Table 3: Some other data on economy of the region (2010, 2011)

Agriculture business share of the regional economy	3.1% (Slovenia 3.9%)
Number of persons in employment, 2011	102,430
Number of persons in paid employment, 2011	89,371
Number of self-employed persons, 2011	13,060
Number of registered unemployed persons, 2011	15,358
Average monthly gross earning, total, EUR, 2013)	1,466
Number of enterprises, 2011	18,696
Turnover of enterprises, mio. EUR, 2011	9,552
Regional gross domestic product, mio. EUR, 2010	4,084
Number of agricultural holdings, 2010	11,434
Utilised agricultural area, ha, 2010	67,297
Number of bed places, 2011	13,652
Number of tourist arrivals, 2011	359,051
Number of overnight stays, 2011	1,383,818
Number of passenger cars, 31. 12. 2011	133,539
Number of dwellings, estimation of dwelling stock, 31.12. 2011	104,160
Municipal waste collected, t, 2011	87,377
Municipal waste collected, kg per capita, 2011	343
Current expenditure for environmental protection, 1,000 EUR, 2010	59,568
Current investment in environmental protection 1.000 EUR, 2010	97,823

1.3 Overview of the Region (2013)

Table 4: Overview of the Savinjska region

Number of inhabitants	260,217
Density of population	109.3 inhabitants per km ²
Number of households	105,615
Area	2,384 km ²
Agricultural area	67,297 ha (in use)
Forestry area	64,208 ha
Non-used area	1,247 ha
Nominal GDP	4,099 mio. EUR
GDP per capita	15,730 EUR
per cent of the country GDP	90%

1.4 Regulatory framework and forecast

In Slovenia there are no regional specific regulatory frameworks as regions as political entities do not exist. Hence national regulation applies.

1.4.1 Subvention programs for private sector

Support programs in Slovenia are only national and in some minor extent also on local (municipality) level. E.g. some municipalities offer some support for heat pumps or educational workshops for their citizens or they organise a free energy consultancy office. Programs on regional level do not exist as regions in Slovenia are only statistical entities for now. There are also some funds available for farmers, for diversifying their activities. One of the possibilities is also production of energy from RES. Incentives are usually among 500 and 5,000 EUR per project. Municipalities sometimes offer help for getting state support for the renewable and energy efficiency projects. According to the energy law municipalities are obliged to prepare the local energy concepts (plans) and define their goals for the renewable energy shares that need to be consistent with national goals on renewable energy. In some municipalities these are more easily achievable than in others, hence also the measures can differ quite a bit from municipality to municipality.

Investment grants (on national level) for households are mainly available for wood heating systems, solar thermal and geothermal heating systems and heat pumps. Grants are in principle normative but are linked to the available resources. This means if they run out (before the call ends) the grant is not given. For the households support amounts to 20% of the eligible costs of the investment, which means purchase and installation of the boiler, storage, transport and safety equipment, regulation and buffer (heat storage). Not over 1,800 EUR though.

Soft loans are available from Eco Fund (Slovenian Environmental Public Fund) through public calls, a sort of national bank that is financing RES and energy efficiency projects mainly for households and multifamily houses. The Eco Fund allocates funds once a year to citizens and companies for investments in RES and CHP. In addition to the Eco Fund, favourable loans are also provided by other companies and institutions, for example by enterprise support programmes.

1.4.2 Subvention programs for municipalities

Investment grants for municipalities used to be available mainly for wood heating systems, solar thermal systems and geothermal heating systems and heat pumps. More recently also subsidies for energy efficiency of (public) buildings and lighting, waste management and water and air preservation are given. In the recent times also grants for public transport for purchasing of the new vehicles are available. The needed condition is the adopted plan for the clean air within

municipality. Grants are in principle normative but are linked to the available resources. This means if they run out (before the call ends) the grant is not given. Grants are available at Eco Fund.

Soft loans are also available from the Eco Fund through public calls. The Eco Fund allocates funds once a year to citizens and companies for investments in RES and CHP. In addition to the Eco Fund, favourable loans are also provided by other companies and institutions, for example by enterprise support programmes.

1.4.3 Subvention programs for public and industry

In principle the same possibilities exist for business and industry as for the households and municipalities. The source is the same, only the conditions seem to be more restrictive for this sector. Long procedures and many times unclear outcome is not really very appealing for them.

Investment grants are mainly available for wood heating systems, solar thermal systems and geothermal heating systems and heat pumps. Grants are in principle normative but are linked to the available resources. This means if they run out (before the call ends) the grant is not given. Grants are divided into two categories; households and larger entities (companies and institutions). There is also a special support for farmers. The Ministry of Agriculture, Forestry and Food publishes calls for proposals for obtaining grants for the diversification of non-agricultural activities and for the establishment and development of micro companies.

Soft loans are available from the Eco Fund through public calls. The Eco Fund allocates funds once a year to companies for investments in RES and CHP. In addition to the Eco Fund, favourable loans are also provided by other companies and institutions, for example by enterprise support programmes.

1.4.4 Feed-in tariffs

There is a combination of Feed in Tariff and fix premium systems in place. The producers of electricity from RES and by use of CHP on fossil fuels with high efficiency can choose among guaranteed purchase (GP; fixed, classic FIT) and so called operational support (OS) with a premium. The system is rather elaborated; there are also supplements for specific types of production as well as deductions when there were other subsidies involved.

For some power types of plants (solar, hydro or wind power plants) the GP after entering the system remains fixed and the OS level changes with regard to the reference market price of electricity.

The actual level is calculated for each technology and each size category separately, taking into account possible deductions or bonuses.

From the new Energy Law only an unofficial level of support for 2014 is available. The official calculation is performed on the basis of regulations in force and a final decision allocating support, issued by the Energy Agency of the Republic of Slovenia on the basis of an application by the beneficiary.

Table 5: Feed-in tariff system in Slovenia

Type of station	Power range (kW)	Tariff (GP) (€/MWh)
Hydroelectric power plants	micro - less than 50 kW	105.47
	small - less than 1 MW	92.61
	medium - from 1 MW up to 10 MW	82.34
	large - over 10 MW up to 125 MW	/; 37.59 (OS only)
Wind power plants	micro - less than 50 kW	95.38
	small - less than 1 MW	95.38
	medium - from 1 MW up to 10 MW	95.38
	large - over 10 MW up to 125 MW	/; 49.49 (OS)
Geothermal power plants	micro - less than 50 kW	152.47
	small - less than 1 MW	152.47
	medium - from 1 MW up to 10 MW	152.47
	large - over 10 MW up to 125 MW	/; (determined individually)
PP using wood biomass	micro - less than 50 kW	(determined individually)
	small - less than 1 MW	252.10
	medium - from 1 MW up to 10 MW	190.53
	large - over 10 MW up to 125 MW	/; (determined individually)
Wood biomass co- firing >5%	micro - less than 50 kW	/; 87.20 (OS)
	small - less than 1 MW	/; 85.90 (OS)
	medium - from 1 MW up to 10 MW	/; 85.46 (OS)
	large - over 10 MW up to 125 MW	/; (determined individually)

Biogas obtained from biomass	micro - less than 50 kW	165.55
	small - less than 1 MW	161.75
	medium - from 1 MW up to 10 MW	147.77
	large - over 10 MW up to 125 MW	/; /
Biogas from waste	micro - less than 50 kW	139.23
	small - less than 1 MW	139.23
	medium - from 1 MW up to 10 MW	129.15
	large - over 10 MW up to 125 MW	/; /
Biogas from wastewater treatment plants sludge	micro - less than 50 kW	85.84
	small - less than 1 MW	74.42
	medium - from 1 MW up to 10 MW	66.09
	large - over 10 MW up to 125 MW	/; /
Landfill gas	micro - less than 50 kW	99.33
	small - less than 1 MW	67.47
	medium - from 1 MW up to 10 MW	61.67
	large - over 10 MW up to 125 MW	/; /
Biodegradable waste	micro - less than 50 kW	/; /
	small - less than 1 MW	77.44
	medium - from 1 MW up to 10 MW	74.34
	large - over 10 MW up to 125 MW	/; (determined individually)
PV plants	Due to a large number of reference costs categories, support levels for solar PV plants are available in separate XLS-format documents, available at Borzen web page (www.borzen.si/en/).	

1.4.4 Photovoltaic feed-in tariffs

Table 6: Photovoltaic feed-in tariff system in Slovenia

	Power range [kW]	Tariff (€/ kWh)
Rooftop or building – integrated		
PV plants	Due to a large number of reference costs categories, support levels for solar PV plants are available in separate XLS-format documents, available at Borzen web page (www.borzen.si/en/).	

In the field of photovoltaics the situation changed dramatically in the recent years in Slovenia. Due to the overheated PV market in previous years, which was the result of FIT decreasing rate not following the actual decreasing investment costs, the FIT were first dramatically reduced (for the new projects) and then after the new energy act EZ-1 was adopted in 2014 changed the RES-E supporting system altogether as FIT are now only available in the second step – if the project get approved that is. It means a combination of quota and FIT system was introduced. The current governmental view on PV is that it already cost too much and that emphasize on other renewables should be given where bigger energy gains for the country could be reached. The stop came not only for PV but for all the new RES-E projects as there is no open call for entering the support scheme for the year 2014 nor it is expected to be.

For the reference there are old values for the year 2010.

Table 7: Photovoltaic feed-in tariff system in Slovenia

	Power range [kW]	Tariff* ¹ (€/ MWh)	Type of support available
Rooftop or building – integrated	up to 50 kW	415.46	GP/OS
	up to 1 MW	380.02	GP/OS
	up to 10 MW	315.36	OS
	up to 125 MW	280.71	OS

¹ Tariff here refers to the so called guaranteed purchase price. There is a combination of two systems in place. The producers of electricity from RES and by use of CHP on fossil fuels with high efficiency can choose among guaranteed purchase (GP; fixed, classic FIT) and so called operational support (OS) with a premium. The system is rather elaborated; there are also supplements for specific types of production as well as deductions when there were other subsidies involved. For bigger producers only the OS system applies.

2. SWOT ANALYSIS of the Savinjska region

In the table below SWOT analysis of the Savinjska region with the important key indicators is presented.

Table 8: SWOT analysis of the Savinjska region

Strengthens	Weakness
Big potential of unused renewable energy sources (biomass, geothermal, solar energy, a bit less hydro potential) which can assure a certain degree of energy self- sufficiency.	Not adequate construction of energy infrastructure in the region has effect on social and economic development.
High share of forest areas (60%) represent a source of energy and possible wood assortments processing.	The region has not fully exploited local renewable sources of energy. Also nor a comprehensive analysis nor plans of these opportunities have been prepared yet.
Most of population live in the two largest urban areas Celje and Velenje where district heating or gasification prevails.	Energy facilities represent a significant intervention in space. Harmful air pollutants resulting from the combustion of fossil fuels pollute the human environment.
Region has strong energy industry (energy production, extraction of natural energy resources).	A large number of individual stoves due to scattered settlements.
Region has good educational capacities and the average education level of inhabitants is among the highest of Slovenia.	In some part of the region bad road connections; e.g. Celje-Velenje and Celje-Laško-Zidani most corridors.
Small and medium -sized companies as dynamic segment of economic development	Low environmental awareness of the population and sometimes also local authorities.
	High share of energy consumption with respect to GDP.
	An important weakness is also the status of the region with a lack a political administrative unit.

Opportunities	Threats
The growth of the so called green jobs.	Further growth of energy consumption.
Big energy reduction potential in energy for buildings.	The sector of mobility contributes a great part of environmental problems through unwanted emissions and it could grow still. Big share of transit transportation on the roads.
Unused RES potentials, high potential for implementation of measures to increase energy efficiency in industry and general consumption, development of entrepreneurship in the energy sector.	Savinjska region has important strategic reserves of lignite which serve as feedstock for thermal power plant Šoštanj. These facilities have a significant effect and potential threat to the environment.
The use of wood biomass from forests.	The danger of environmental pollution in not appropriate use of available energy sources.
Energy autonomy of the buildings.	International connections of energy flows through Savinjska region affect the environment which is reflected in negative public opinion about the construction of electricity transmission network and main gas pipelines.
The region is one of the most advanced and with a vast experience in renewable energy in Slovenia. It means there is an opportunity to share the gathered knowledge to other regions at home and abroad.	The use of hydro energy potential in upper Savinja valley represents a risk of devaluation of the best preserved parts of water courses.
Development of cross border cooperation with Austria and Croatia.	
Region has got a lot of natural preserved areas which represent big patrimony and value and with potential for the so called eco-tourism and eco-farming.	

Important corridor for possible construction of international energy networks with thermal power plant Šoštanj.

3. Regional energy balance sheet

Due to inexistent energy regional balances in Slovenia mainly a combination of two approaches was used. One main source was local energy concepts with energy data from municipalities. However not all municipalities responded and sent them. Therefore average values were calculated from the municipalities with the known data and applied to the missing ones taking into account the number of inhabitants. In some case the real data were used instead when available. These could derive from multiple sources; such as reports from other projects, energy suppliers, regional development documents, etc. The other approach was based on national energy statistics data and taking into account the GDP and inhabitants share of the region vis a vis to the national ones. The method proved to be quite accurate as figures from both sources (where both available) proved to be rather similar. Nevertheless for proper planning a regional energy statistics should be available or local one with the possibility for aggregating the data to the regions. The new regulation implemented with the new Energy Act in 2014 implies some mandatory providing of the energy data from bigger consumers and energy providers for the statistical purposes. On top of that Statistical Office of Slovenia together with some other actors are preparing some changes in order to make the energy data gathering based on smaller geographical units than just a state possible and operational. Therefore in the future these data should be more readily available and energy planning, e.g. on regional/subregional level, made easier.

3.1 Energy demand of the concept region

Total energy demand of the region Savinjska presented is a mix of calculated and recorded energy data on demand in households, public buildings and other buildings. Total energy demand resulting from the data and estimations from the local energy concepts reaches about 5.600 GWh.

Energy demand divided per energy carrier is shown in figure below. The data for the region are not known and the gathered ones are incomplete hence that of the national statistic are used. When comparing the regional and national data however, there are a lot of similarities, except for the transport sector, where there is an apparent discrepancy, mostly because of lack of data of the transport sector in local communities.

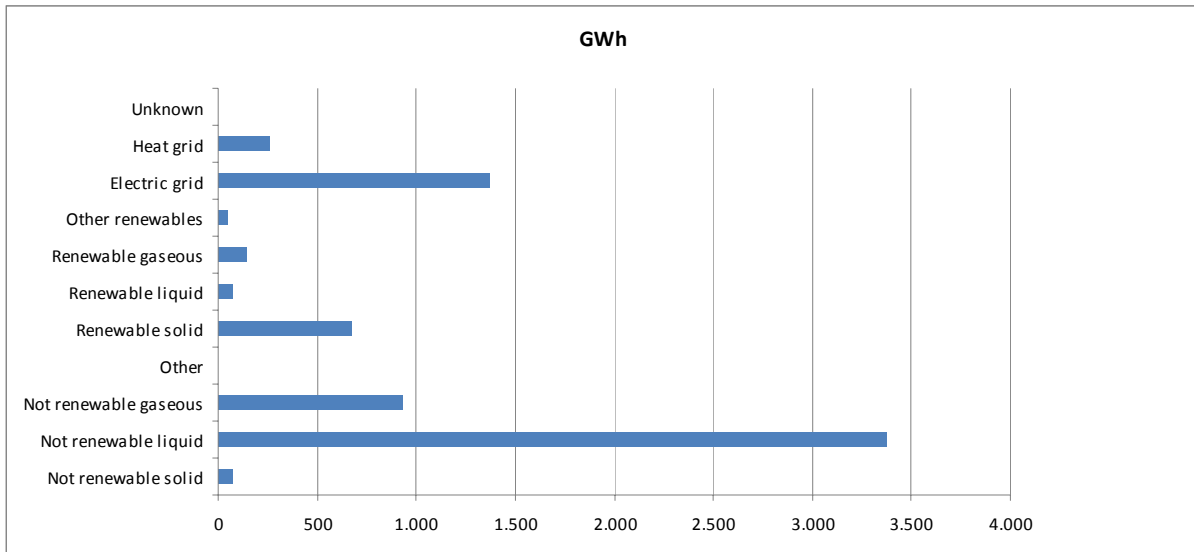


Figure 5: Total energy demand by types of energy carriers (Source: ApE calculation)

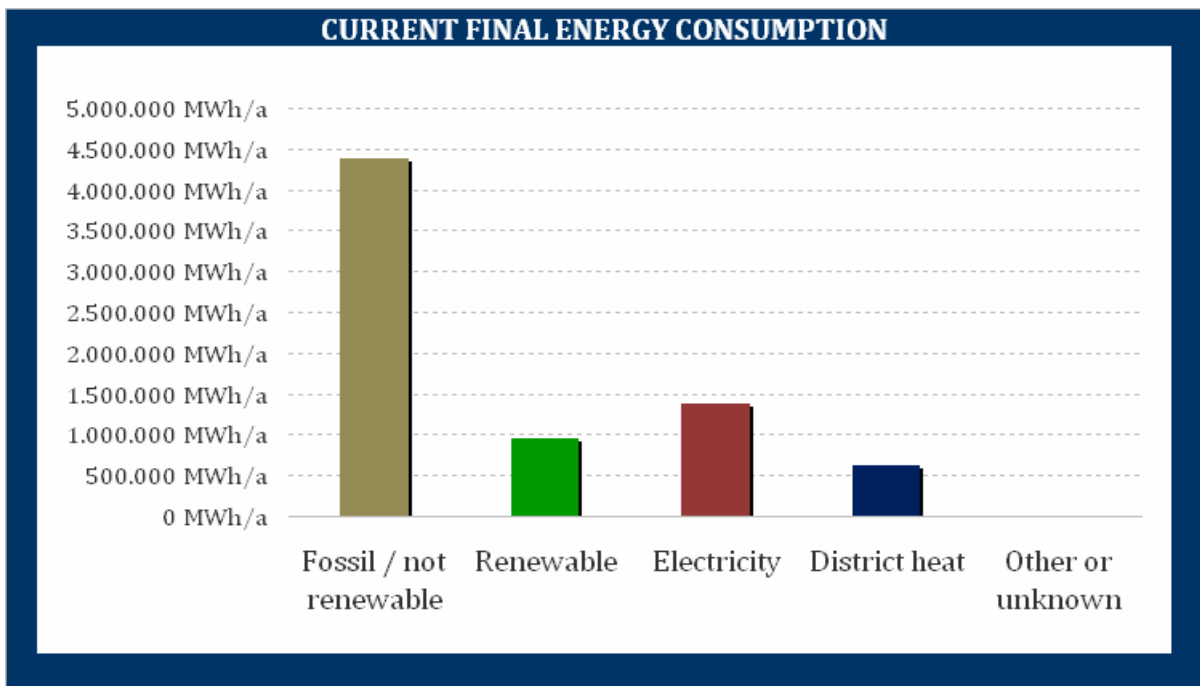


Figure 6: Total energy demand by types of energy carriers (Source: ApE calculation)

Energy demand shares by sector are showed in the figure below. It can be seen that households and industry have about the same share with the tendency to decrease demand in households and increase in industry. The biggest share, however goes to the transport sector, which is also the less addressed so far on both national as local level.

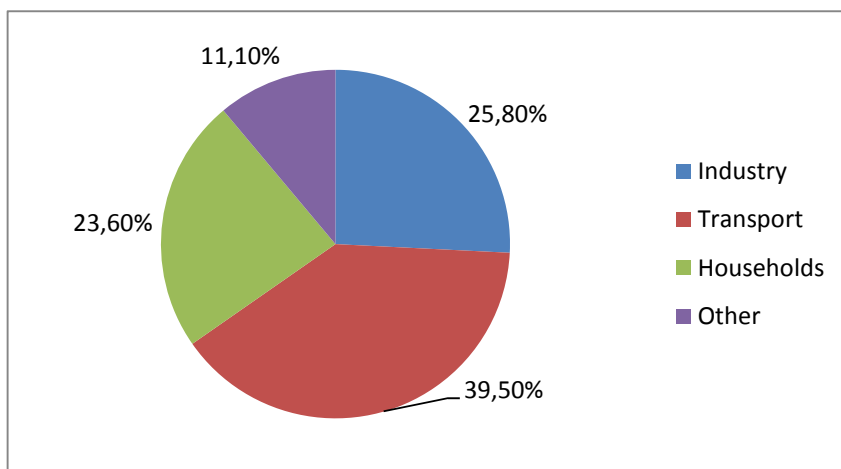


Figure 7: Total energy demand by sectors of consumption (Source: ApE calculation)

If we look how the shares changed over the past two decades we can see that the total energy demand in the country grew from around 3,300 ktoe to over 5,000 ktoe in 2008 and is now just below that figure. There are also two main characteristics to be seen; first there was a significant decrease of the energy demand in households (gray) in the nineties and then in the new millennium the share remains stable around 24%. Even more pronounced (and of greater impact and concern) is the growing share of the transport (orange), which grew from 27 to over 41% in 2012, mainly to expense of the industry sector. All this stands true also for the region Savinjska.

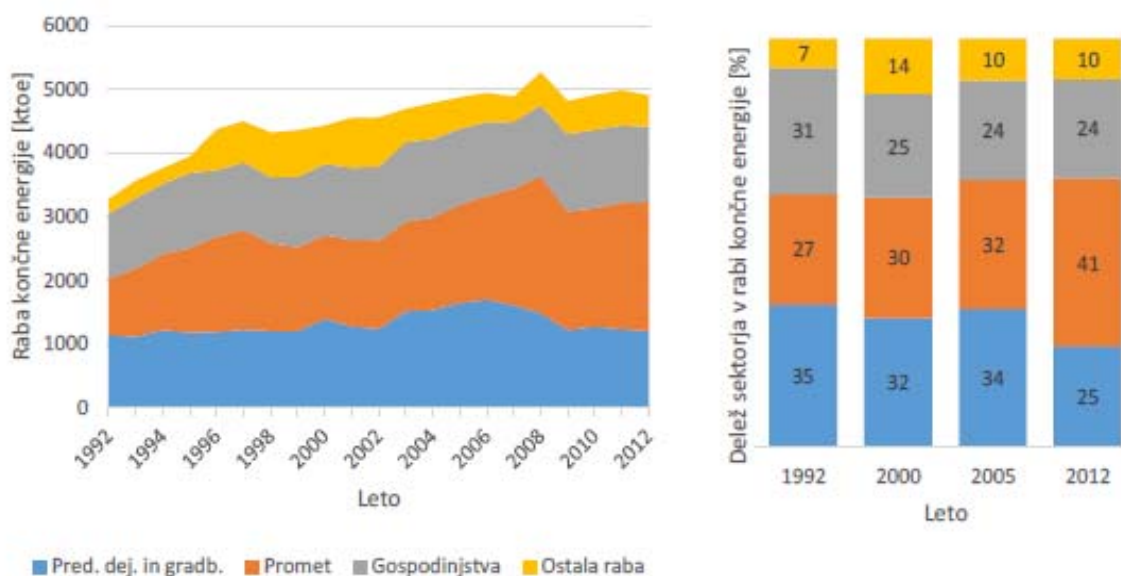


Figure 8: Total final energy demand dynamics by sectors (Source: AN URE)

3.1.1 Electricity generation

Total regional electricity generation is about 4,650 GWh/year. In total electricity generation fossil fuels still prevail with 98%, while renewables have only 2% share. Fossil fuels apart from lignite are imported while renewable electricity is produced from regional resources. Here is important to say that the share of fossil electricity production is that high because of the fact that the biggest power plant of Slovenia is located in Šoštanj and it is using the domestic lignite from the nearby Velenje coal mine. It was recently upgraded with the so called 6th block (TEŠ 6) which will substitute the older ones. Carbon dioxide emissions would be decreased by 35% and all other environmental pollution would also be reduced.

The Šoštanj thermal power plant (TEŠ) is the biggest in Slovenia and the most important electricity producer in the region and one of the key national power plants. TEŠ is a limited company, with Holding Slovenske elektrarne (HSE) as the sole partner. The company's principal activity is generation of electricity and district heating energy. HSE is a state owned firm.

With an installed power of 779 MW, the thermal power plant Šoštanj generates, on average, one third of the energy in the country, and in periods of crisis, it can cover more than one half of the national demand. The average annual electricity production ranges from 3,500 and 3,800 GWh.

The modern coal-fired power plant has been in operation since 1972. It is the only thermal power plant in Slovenia that is using lignite as energy source. TEŠ's installed capacity is 779 MW. It has five separate units. All units use electrostatic precipitators for fly ash removal. Unit 4 has also installed a wet flue gas desulphurization system. Yearly approximately 4,000,000 t of coal is burned and approximately 800,000 t of slag and ash is deposited near Lake Velenje. Approximately 2,000 tons of fly ash is emitted into the atmosphere with flue gases. A basement inversion normally protects the bottom of the valley against pollution.

In total electricity generation there are two types of systems: systems that use combustion in the process (CHP) and systems without combustion. In the former the highest share in annual electricity generation from fossil fuels have fossil solid fuels (lignite) with 4,252 GWh/a. The share of fossil gaseous fuels is 272 GWh/a and for fossil liquid fuels 900 MWh/a. The annual waste combustion and landfill gas is 6,600 MWh/a. The annual electricity generation of renewable solid fuels is 13,800 MWh/a and renewable gaseous fuels about 11,200 MWh/a.

In the second group of systems without combustion solar radiation prevails with 56,100 MWh/a. Hydro power is also important with 22,600 MWh/a.

The picture below shows total regional electricity generation.

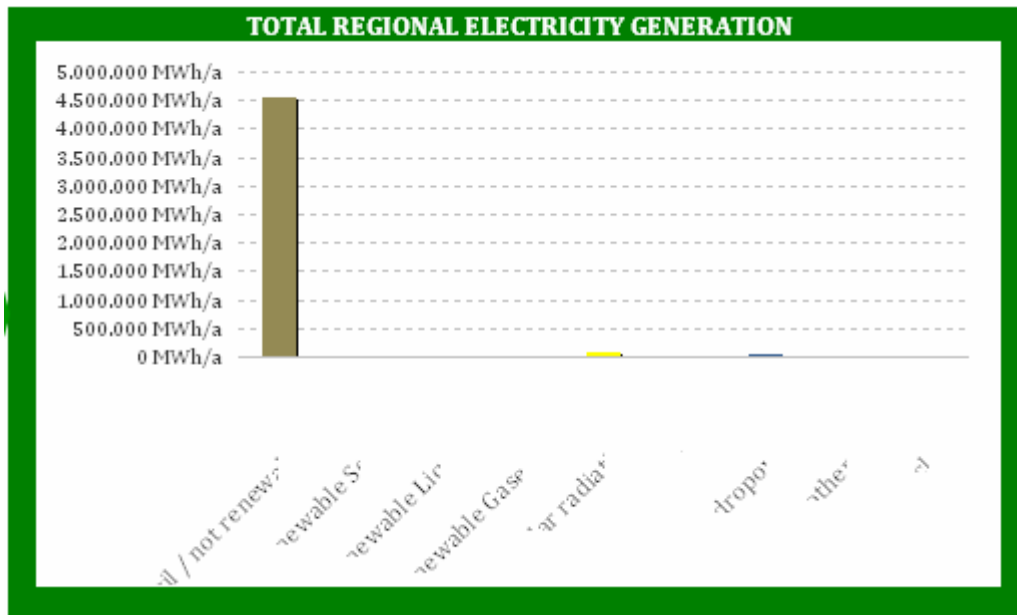


Figure 9: Total electricity generation

3.1.2 Heat generation

Total regional heat generation is 1.296.352 MWh/a. In total heat generation in Savinjska region the highest share have fossil fuels with 58%. The share of renewables is 42% and is higher than in electricity generation.

In total regional heat generation there are two groups: district heat generation and direct heat generation. In district heat generation fossil fuels prevail with 89% while the share of renewables is 11%. In total district heat generation 312.833 MWh/a is from sole district heat and 39.595 MWh/a from CHP. Sole district heat generation from fossil fuels is 280.954 MWh/a and CHP generation 31.611 MWh/a. Sole district heat generation from renewables is 31.879 MWh/a and CHP generation 7.984 MWh/a. All renewable district heat is generated from regional resources while fossil resources are imported.

In direct heat generation 439.974 MWh/a of heat is produced from fossil fuels and 503.951 from renewables.

The picture below shows district heating generation.

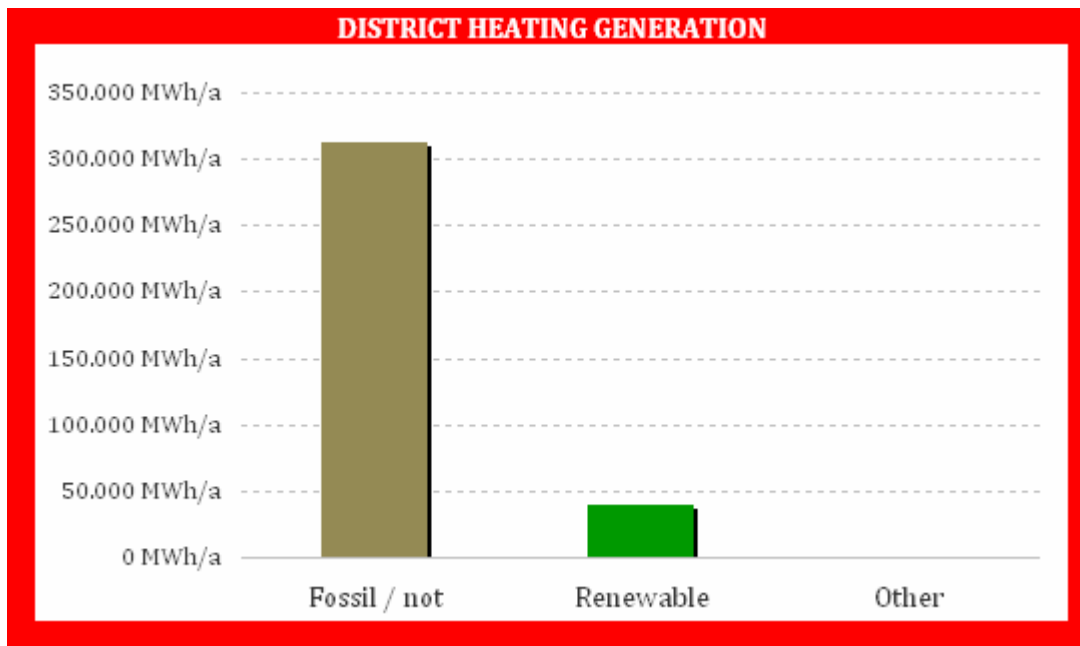


Figure 10: Total regional district heating generation

3.1.3 Liquid fuel generation

At the moment there is no liquid fuel production in the region. Based on the national strategy a potential 55.000 GWh production would be possible.

3.2 Energy potential of the concept region

3.2.1 Fossil Energy sources

There are no fossil energy sources available in the region as all fossil fuels are imported.

3.2.2 Renewable Energy sources

Total current use of regional renewable energy resources is 89.088 MWh/a. The highest share has solar electricity with 56.108 MWh/a and hydro power with 22.640 MWh/a. Also geothermal heat with 7.870 MWh/a and solar heat with 2.471 MWh/a are important in Savinjska region.

The estimated total potential of regional renewable energy resources are 1.168.050 MWh/a. The highest potential has the possible use of forestry products and byproducts with 663.000 MWh/a. On the second place is solar radiation heat with 256.600 MWh/a and solar radiation electric with

110.000 MWh/a. Hydro power has the potential of 57.350 MWh/a, geothermal heat of 26.600 MWh/a and wind of 16.800 MWh/a.

The picture below shows regional resources.

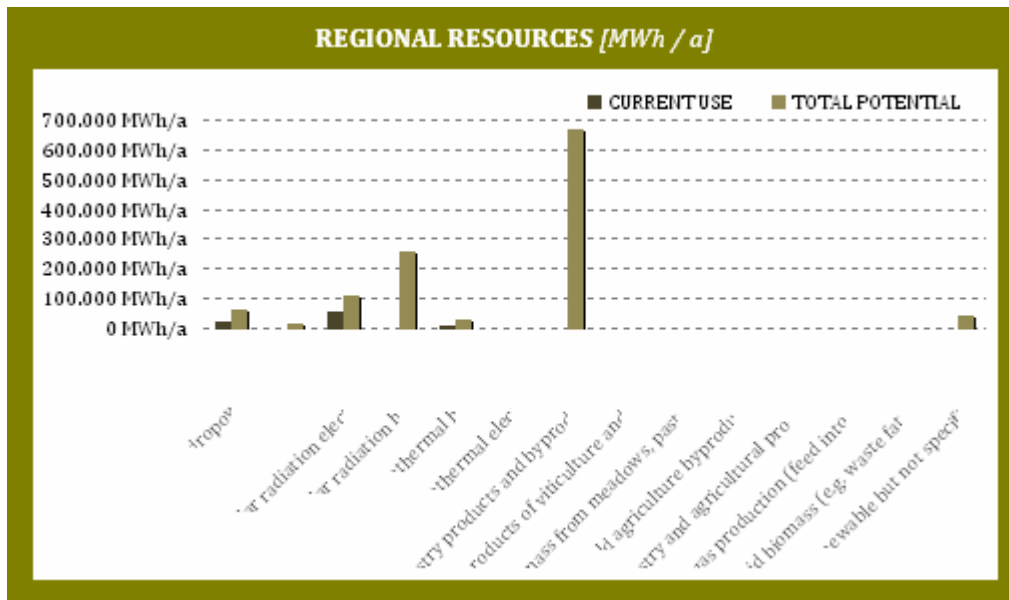


Figure 11: Regional resources available and used

3.3 Comparison of the available resources & current energy demand in the CR

Energy demand in comparison to energy resources and supply in Savinjska region varies a lot from sector to sector. Whilst a complete self-sufficiency is achieved when electricity is concerned the situation is completely different in transport sector, where almost all the energy carriers are being imported. The situation with heating is somewhat in between, whereas fossil fuels (apart from lignite) are imported renewables are in big majority of local origin.

The most important energy carrier of the region is without any doubt the lignite for the production of electricity (and district heating) and wood for the production of heat. Thermal power plant Šoštanj (TEŠ) is the biggest national producer of electricity. Electricity being “exported” to other regions (statistical) hence the real share is not known, however it is very high as the hydropower, the main renewable energy source for electricity production is much below the national average due to the fact that there are no major rivers located within the region. If we take the presumption that all electricity is consumed on spot first and not exported elsewhere and later imported from other location (from big hydropower for example), than the share is almost 98% as shown in the balance the rest is small hydropower and solar energy.

3.3.1 Covering rate of regional production

TEŠ is one of the most important and biggest electricity producers in Slovenia not just in the region. Covering more than 1/3 of all the electricity needs of the country obviously means all the needs within the region (12% share of Slovenia) can be covered. Hence we could say that the covering rate for regional electricity consumption is 100%.

This is far from true for heating and even less for the transports sector as all the liquid fossil fuels (oil and natural gas) are being imported.

As the region is not really an administration unit, there are no (official) specific regional targets set. There are however those set on the national level that municipalities need to comply with. Hence the national targets are also local/regional ones. More about them below in the scenario chapter.

3.3.2 Covering rate including free resources potentials

The covering rate in heating could be raised in heating by use of more domestic renewable sources (wood). Fewer opportunities are there for the transport energy carriers, where more should be done on promoting and developing the public transportation for people especially in bigger towns as Celje and Velenje. On the other hand there is a significant increase in recent years in load transportation, mostly on roads and a big share comes from international transit. The region is not the right level for addressing this issue, it is the national and (international one), however the message to government would be much more powerful if it would come from some kind of regional level.

4. Possible scenarios for the concept region

The national targets in % share of renewable energy are shown in the table below.

Table 9: The national targets in %

RES	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Heating and cooling	20.0	22.3	23.3	24.4	25.4	26.3	27.3	28.0	28.7	29.4	30.1	30.8
Electricity	28.5	32.4	32.3	32.3	33.7	33.5	35.4	36.0	36.1	38.1	38.6	39.3
Transport	0.3	2.6	2.8	3.1	3.5	4.0	4.7	5.6	6.6	7.7	9.0	10.5
Share of RES	16.2	17.7	18.2	18.7	19.5	20.1	21.2	21.8	22.4	23.6	24.3	25.3

Related to the local energy concepts as of December 2015 municipalities need to give evidence to the government that they follow the national RES share targets and comply with the following documents:

- National Energy Program (NEP),
- Operational Program for Reduction of CO₂ emissions until 2012,
- RES Action Plan 2010-2020 (AN OVE),
- National Energy Efficiency Action Plan (AN URE) 2008–2016.

As for the energy efficiency Slovenia is still above the EU average level of the energy intensity (primary 112% in 2010) although is being reduced around 1% per year with a target of 1.6%. A bit better is the situation in industry where the intensity is below the EU average at 95% with 3.3% yearly reduction for the 2000-2010 period. Energy consumption per capita in Slovenia has been slightly above the EU average since 2005 (3.5 toe in 2010). It grew by 1.7 percent/year between 1990 and 2008 but fell sharply in 2009 (by nearly 10 percent) as a result of the global economic downturn. It rose by 1.9 percent in 2010, reaching 7.1 Mtoe, but remained below its 2004 level.

The main targets of national energy efficiency action plan are:

- 4.3 TWh of end-use energy savings by 2016,
- 1.6 TWh of end-use energy savings in industry by 2016,
- 18% of CHP in final energy consumption by 2016.

The main 4.3 TWh target remains in the second NEEAP adopted in 2011. There are quite some measures presented that could make it possible to achieve up to 6.9 TWh of energy savings by 2016. 25% of which would be achieved in transport, 24% in industry, 23% in the residential sector, 6% in the public sector, 4% in services and 18% through cross-sectoral measures. By 2020, these measures could save up to 10.3 TWh. The NEEAP involves financial incentives, mainly for the households and services sectors, for the thermal retrofitting of existing buildings and the construction of energy-efficient buildings, high-efficiency heating systems and rational electricity

use. Moreover, it establishes minimum energy efficiency requirements for electrical appliances. Therefore some experts remain sceptical about the possibilities on reaching the set targets.

If we compare the number of measures taken in order to reach the above targets however, we can see that Slovenia ranks among the countries with fewer measures and of less diversity.

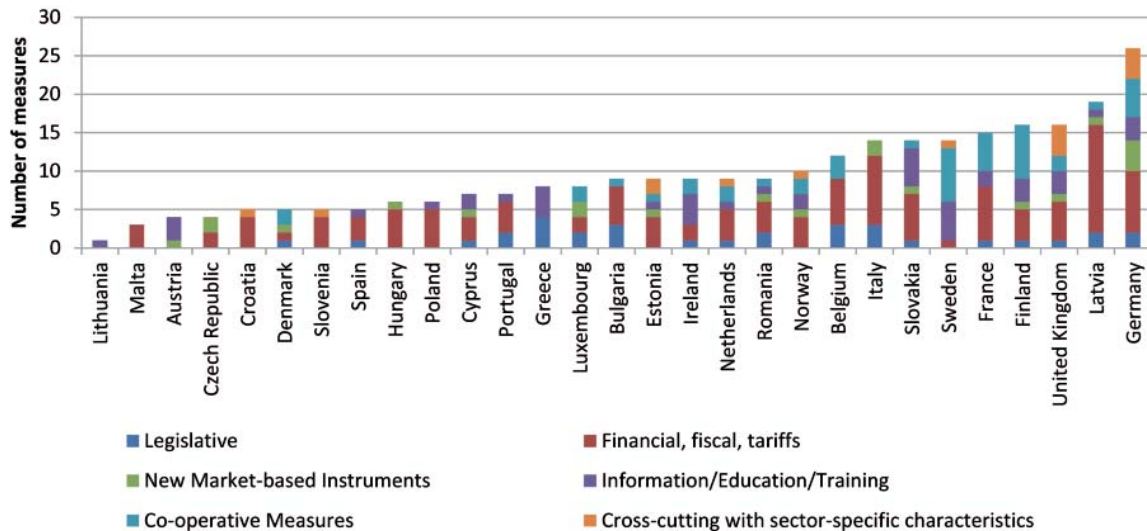


Figure 12: On-going measures by type and country (source: MURE project)

4.1 Scenario without any measures – trend scenario

The following chart is showing a development in scenario, which is the forward projection of the trend between 2005 and 2011 (year of balance). The first scenario shows that without any measures the expected final energy demand is slightly growing and further departing from the 20-20-20 targets. The trend prolongation is showing, that the supply target of RES and the target of energy efficiency would not be reached if nothing changes.

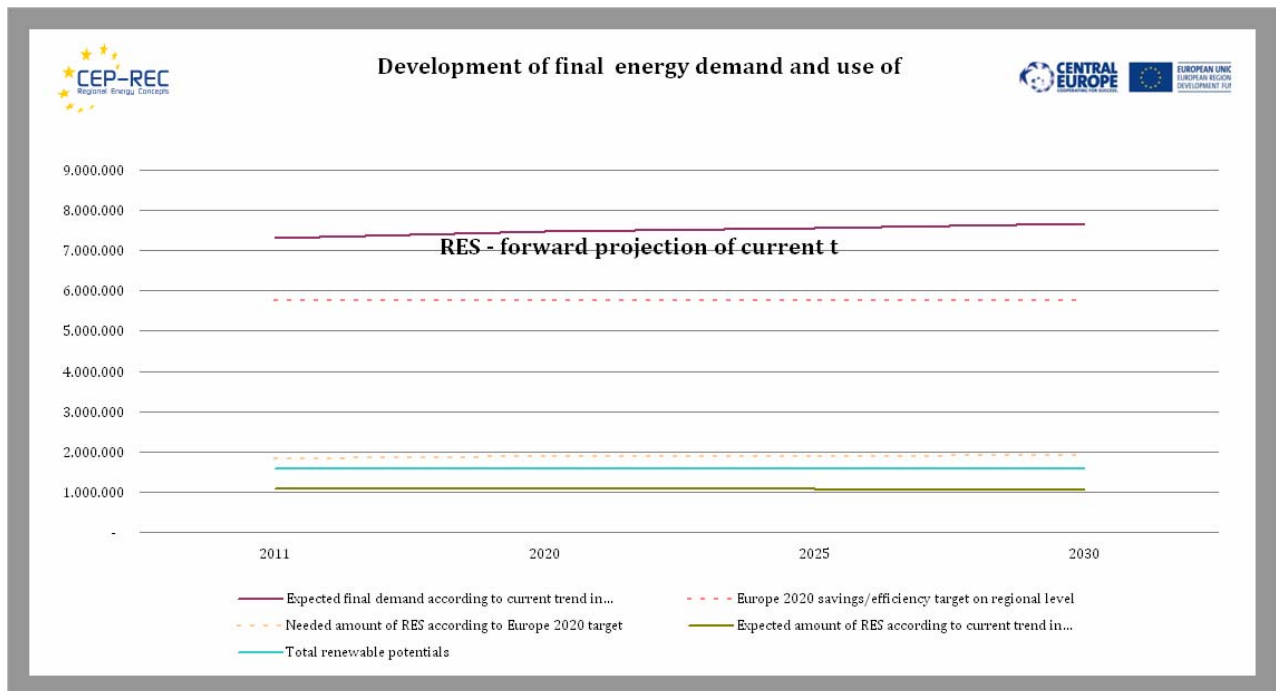


Figure 13: Scenario of On-going measures by type

4.2 Scenario based on energy efficiency and RES use

Much more probable scenario is however the one that includes further RES investment and energy efficiency measures applied. According to this scenario the goals 20-20-20 would be reached, with a delay however. The charts below is showing the development of the energy demand in case of the implementation of energy efficiency measures. In this case the demand is shrinking the long run to a value of the European 2020 requirements (red dashed line). It means the demand reaches the criteria of Europe 2020 in the long run, though with a 10 years delay. RES targets are still not met however, although the value gets quite close to the desired one.

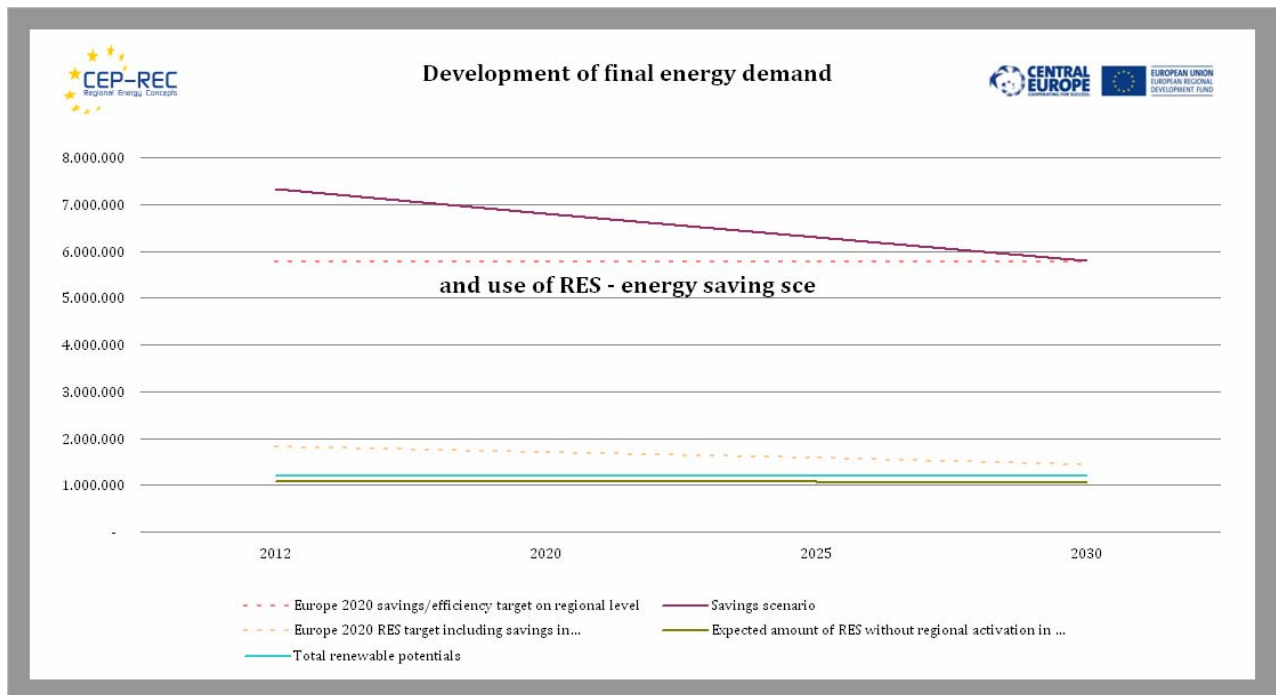


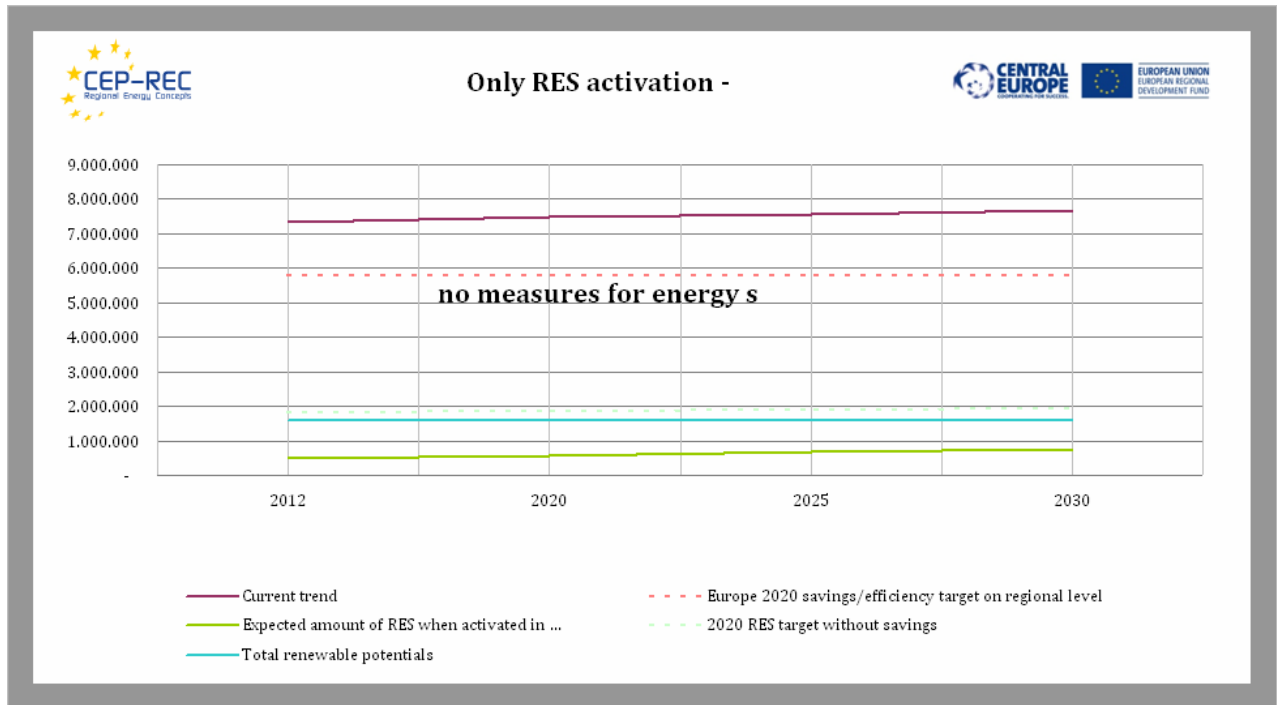
Figure 14: Scenario of energy efficiency and RES use

4.3 Scenario based on activation of resources with or without energy savings

The following figure shows the development of the region's energy balance if regional RES are fully activated. In case of the pilot region Savinjska the most prosperous are the biomass (mostly wood) and solar energy, an important resource is also geothermal energy. It can be seen that the renewable potential (blue line) as estimated is almost enough to cover the RES 2020 targets. The most important here are biomass in particularly wood and wood processing by-products, solar energy and in long run also geothermal energy in particular for heat production. The use of solar radiation for energy purposes is still vastly unused although it received the biggest growth in the recent years and it is now came to almost a complete stop due to the changed support system. In order to reach the RES 2020 target solar energy can't be avoided. In order to achieve those targets also general energy demand should decrease by applying energy efficiency measures.

RES (wood) use in heating households has got a long tradition in the region. Hence the share of renewables for heat supply in household is rather high at 40% and above the national

average of almost 30%. The general share of RES, at the moment, is 37% and thus already higher than the national target of 36% in the Europe 2020 documents.



5. Development path

5.1 Main scenario for the region

The selected scenario follows what we could call “De minimum” principle. In that municipalities are mainly following the directions given by the national legislation regarding the local energy concepts. According to the (new) Energy Act EZ-1 they are obliged to comply with the goals set in national REAP. This alone is already quite a task for some of the local communities and for some also mission impossible (e.g. in electricity production). Therefore some kind of combining forces comes natural to them although many times difficult because of local peculiarities of historical nature (most of the municipalities are relatively young). Due to all these factors participating municipalities’ representatives decided to follow the path they could reach rather than to ambitious targets that are even more difficult to achieve. The milestones used in nREAP are hence applied.

The national targets in % share are shown in **Table 9**.

The starting point for the region are the obligations that are set in the nREAP and the main declared commitment expressed in Declaration for the sustainable development signed by municipalities and many institutions and companies.

According to the **national reports** we are more or less in line with the targets for the energy efficiency (9% target) and slightly below the RES targets (about 1.5 percentage point).

One important new factor in the equation is also the new governmental politics and renewable energy ‘support’. After turning from FIT to sort of combined quota system, the open call for new projects is simply not there anymore, because of the “lack of money”. The overheated PV market brought some overspending for FIT that were too high (did not follow the decreasing investment cost fast enough) which resulted in much increased interest in building PV plants and ended up with an abrupt lowering of FITs, change of the support system and finally stop of the support to all new projects (not just PV).

Apart from PV all other RES projects were much less appealing for investors; hence greater efforts were needed for realising them. Without state support the new projects needed for raising the RES share are much more difficult to realise and when the common praxis in municipalities is considered they are not very likely. Therefore at least in 2014 and probably 2015 would not be possible to maintain the desired growth of the renewables. Therefore the minimal - national RES development scenario chosen by municipalities is rather logical.

5.2 Measures for the achieving the main scenario

In the beginning of July 2014 the development council of the Savinjska region adopted proposal of the Regional development program of Savinjska region for the period 2014-2020. Regional development program also focuses on measures for the use of renewable energy sources and energy efficiency. This programme also identifies potentially interested investors active in the given fields.

Name of the measure: 1. Wood development centre		Start of the activity: 2014
		End of the activity: 2020
Short description of the measure:		
Establishment of regional technological development centre of wood.		
Aims out of the measure:		
⇒ Regional technological development centre of wood		
Milestones and Results:	Date (M/Y):	
⇒ Regional wood development centre		

Name of the measure: 2. Supportive environment for wood processing		Start of the activity: 2014
		End of the activity: 2020
Short description of the measure:		
<p>Project office for the development, promotion and marketing. Establishment of promotional exhibition centre with 10-15 houses, where potential buyers would have the possibility to stay.</p>		
Aims out of the measure:		
<p>⇒ Project office for the development, promotion and marketing</p> <p>⇒ Promotional exhibition centre</p>		
Milestones and Results:	Date (M/Y):	
⇒ Development, promotion and marketing project office		
⇒ Centre for exhibition and promotion		

Name of the measure: 3. Energy efficient region of Celje	Start of the activity: 2014 End of the activity: 2020
Short description of the measure:	
<p>3.1 Energy retrofit of public buildings of Celje municipality 3.2 Upgrade of Celje district heating plant with an additional turbine for the production of electricity 3.3 Replacement of lamps in Celje municipality 3.4 Establishment of public lighting in accordance with regulation - replacement of lamps 3.5 Energy retrofit of public infrastructure facilities 3.6 Energy retrofit of public buildings 3.7 Energy self-sufficiency in Laško municipality 3.8 Energy retrofit of public lighting in Štore municipality 3.9 The energy efficiency of public buildings (school, municipal building, associations facilities) 3.10 Energy self-sufficiency in Vojnik municipality 3.11 Energy retrofit of public buildings.</p>	
Aims out of the measure:	
<p>⇒ Energy retrofit of public buildings of the municipality of Celje ⇒ Upgrade of Celje district heating plant with an additional turbine for the production of electricity ⇒ Replacement of lamps in the municipality of Celje ⇒ Establishment of public lighting in accordance with regulation - replacement of lamps ⇒ Energy retrofit of public infrastructure facilities ⇒ Energy retrofit of public buildings ⇒ Energy self-sufficiency in the municipality of Laško ⇒ Energy retrofit of public lighting in the municipality of Štore ⇒ The energy efficiency of public buildings (school, municipal building, associations facilities) ⇒ Energy self-sufficiency in the municipality of Vojnik ⇒ Energy retrofit of public buildings</p>	
Milestones and Results:	Date (M/Y):
<p>⇒ Energy retrofit of public buildings</p>	

⇒ Upgrade of Celje district heating plant
⇒ Establishment of public lighting and replacement of lamps
⇒ Energy retrofit of public infrastructure facilities
⇒ Energy self-sufficiency in the municipality of Laško
⇒ The energy efficiency of public buildings
⇒ Energy self-sufficiency in the municipality of Vojnik

Name of the measure: 4. Energy in Obsotelje and Kozjansko region		Start of the activity: 2014
		End of the activity: 2020
Short description of the measure:		
<p>4.1 Energy retrofit of public buildings 4.2 Energy retrofit and sustainable construction of kindergartens 4.3 Energy retrofit of schools in the region Obsotelje and Kozjansko 4.4 Energy retrofit of health centre in Planina pri Sevnici 4.5 Photovoltaic power plant SFE Pristava.</p>		
Aims out of the measure:		
<p>⇒ Energy retrofit of public buildings ⇒ Energy retrofit and sustainable construction of kindergartens ⇒ Energy retrofit of schools in the region Obsotelje and Kozjansko ⇒ Energy retrofit of health centre in Planina pri Sevnici ⇒ Photovoltaic power plant SFE Pristava</p>		
Milestones and Results:		Date (M/Y):
⇒ Energy retrofit of public buildings		
⇒ Energy retrofit of kindergartens		
⇒ Energy retrofit of schools		
⇒ Energy retrofit of health centre		
⇒ Photovoltaic power plant SFE Pristava		

Name of the measure: 5. Energy retrofit of public buildings		Start of the activity: 2014
		End of the activity: 2020
Short description of the measure:		
<p>5.1 Energy retrofit of local community facility in Andraž 5.2 Energy retrofit of cultural centre in Polzela 5.3 Energy retrofit of mountaineering lodge on the Gora Oljka 5.4 Energy retrofit of community health centre in Polzela 5.5 Energy retrofit of adult education institute in Žalec 5.6 Energy retrofit of the Municipality Žalec building 5.7 Energy retrofit of pre-school facilities in Žalec municipality 5.8 Energy retrofit of elementary school in Šempeter.</p>		
Aims out of the measure:		
<p>⇒ Energy retrofit of local community facility in Andraž ⇒ Energy retrofit of cultural centre in Polzela ⇒ Energy retrofit of mountaineering lodge on the Gora Oljka ⇒ Energy retrofit of community health centre in Polzela ⇒ Energy retrofit of adult education institute in Žalec ⇒ Energy retrofit of the building of the Municipality Žalec ⇒ Energy retrofit of pre-school facilities in the municipality of Žalec ⇒ Energy retrofit of elementary school in Šempeter</p>		
Milestones and Results:		Date (M/Y):
⇒ Energy retrofit of local community facility		
⇒ Energy retrofit of cultural centre		
⇒ Energy retrofit of mountaineering lodge		

⇒ Energy retrofit of community health centre
⇒ Energy retrofit of adult education institute
⇒ Energy retrofit of the building
⇒ Energy retrofit of pre-school facilities
⇒ Energy retrofit of elementary school

Name of the measure: 6. The use of RES		Start of the activity: 2014
		End of the activity: 2020
Short description of the measure:		
<p>6.1 Construction of the district heating system with the use and renovation of an existing boiler room in the elementary school of Polzela</p> <p>6.2 Construction of small hydro power plants</p> <p>6.3 Eco camp with own energy supply - small hydroelectric power plant Brode</p> <p>6.4 Geothermal power plant Vransko 1: Construction of a pilot project of a cascade system utilization of geothermal energy in combination with the use of biomass</p> <p>6.5 Geothermal centre Podlog pri Šempetru in Žalec municipality: Establishment of geothermal centre and sports-recreational areas at the source of hot water in Podlog</p> <p>6.6 Energy retrofit of health centre in Velenje: Energy retrofit of the facilities.</p>		
Aims out of the measure:		
<p>⇒ District heating system on wood biomass in Polzela</p> <p>⇒ Construction of small hydro power plants</p> <p>⇒ Construction of small hydro power plant and eco camp</p> <p>⇒ Geothermal power plant Vransko</p> <p>⇒ Geothermal centre Podlog pri Šempetru</p> <p>⇒ Energy retrofit of health centre</p>		
Milestones and Results:		Date (M/Y):
⇒ District heating system on wood biomass in Polzela		
⇒ Construction of small hydro power plants		
⇒ Construction of small hydro power plant and eco camp		
⇒ Geothermal power plant Vransko		

⇒ **Geothermal centre Podlog pri Šempetru**

⇒ **Energy retrofit of health centre**

Name of the measure: 7. Energy retrofit of the health centre Velenje		Start of the activity: 2014
		End of the activity: 2020
Short description of the measure:		
Energy retrofit of the health centre Velenje.		
Aims out of the measure:		
⇒ Energy retrofit of the health centre Velenje		
Milestones and Results:	Date (M/Y):	
⇒ Energy retrofit of the health centre Velenje		

Name of the measure: 8. The use of alternative and renewable sources		Start of the activity: 2014
		End of the activity: 2020
Short description of the measure:		
Construction of the biogas plant.		
Aims out of the measure:		
⇒ Construction of the biogas plant		
Milestones and Results:	Date (M/Y):	
⇒ Biogas plant construction		

Name of the measure: 9. Energy retrofit of public and multi family buildings		Start of the activity: 2014
		End of the activity: 2020
Short description of the measure:		
Retrofit of building envelope and heating system, integration of RES and RUE.		
Aims out of the measure:		
<ul style="list-style-type: none"> ⇒ Retrofit of building envelope ⇒ Retrofit of heating system ⇒ Integration of RES ⇒ Integration of RUE 		
Milestones and Results:	Date (M/Y):	
⇒ Building envelope retrofit		
⇒ Heating system retrofit		
⇒ RES integration		
⇒ RUE integration		

Name of the measure: 10. Renewable energy sources		Start of the activity: 2014
		End of the activity: 2020
Short description of the measure:		
Investment in solar, wind and small hydro power plants, micro district heating systems on wood biomass (in areas where there is no district heating), heat pumps and cogeneration units.		
Aims out of the measure:		
<ul style="list-style-type: none"> ⇒ Solar, wind and small hydro power plants ⇒ Micro district heating systems on wood biomass ⇒ Heat pumps ⇒ Cogeneration units 		
Milestones and Results:		Date (M/Y):
⇒ Solar, wind and small hydro power plants		
⇒ Micro district heating systems on wood biomass		
⇒ Heat pumps		
⇒ Cogeneration units		

Name of the measure: 11. Energy efficient lighting		Start of the activity: 2014
		End of the activity: 2020
Short description of the measure:		
Installation of supervisory and control systems (smart public lighting); replacement of energy inefficient lamps.		
Aims out of the measure:		
⇒ Smart public lighting		
⇒ Replacement of energy inefficient lamps		
Milestones and Results:	Date (M/Y):	
⇒ Installation of supervisory and control systems		
⇒ Replacement of energy inefficient lamps		

Name of the measure: 12. Clean public transport		Start of the activity: 2014
		End of the activity: 2020
Short description of the measure:		
Hydrogen, electric and/or hybrid buses, intermodality.		
Aims out of the measure:		
⇒ Hydrogen, electric and/or hybrid buses		
⇒ Intermodality		
Milestones and Results:	Date (M/Y):	
⇒ Hydrogen, electric and/or hybrid buses		
⇒ Intermodality		

Name of the measure: 13. TEŠ VI		Start of the activity: 2014
		End of the activity: 2020
Short description of the measure:		
Continuation and completion of the project TEŠ VI (thermal power plant).		
Aims out of the measure:		
⇒ Completion of the project TEŠ VI		
Milestones and Results:	Date (M/Y):	
⇒ Completion of the project TEŠ VI		

Name of the measure: 14. Wood processing of the Savinjska region	Start of the activity: 2014 End of the activity: 2020
Short description of the measure:	
<p>14.1 Technology development centre for wood processing: Building of a regional centre for wood processing means to obtain integrated support environment for the development of successful Slovenian wood development story - for the development and introduction of new technologies, for the development and introduction of new products, including laboratories and design centres, for the effective promotion and marketing, for the education.</p> <p>14.2 Establishment of centres for wood processing</p> <p>14.3 Wood development and promotion centre: Establishment of a wood chain / wood cluster in the Savinja region; establishment of joint R & D potential for development and transfer of technology innovations in end products and in the production.</p> <p>14.4 Development of chains: Brand development for wood (for Solčavsko or SAŠA region), the development of wood chain from tree to wood product, with an emphasis on design for wooden products, revival of old crafts, creation of chains of local raw materials to the final product, creation of the conditions for greater self-sufficiency in the field of food</p> <p>14.5 Mobi-house - the network for the manufacture of mobile wooden houses: Setting up of a project network that connects the entire chain of wood processing in Zgornja savinjska dolina (15 traders) with academic and research institutions for new constructive solutions in mobile prefabricated houses made of wood and wood composites. The involvement of small producers from metal, electrical and mechanical branch.</p>	
Aims out of the measure:	
<ul style="list-style-type: none"> ⇒ Technology development centre for wood processing ⇒ Wood development and promotion centre ⇒ Development of chains ⇒ The network for the manufacture of mobile wooden houses 	
Milestones and Results:	Date (M/Y):
<ul style="list-style-type: none"> ⇒ Technology development centre for wood processing 	
<ul style="list-style-type: none"> ⇒ Development of wood chains 	
<ul style="list-style-type: none"> ⇒ Mobi-house - The network for the manufacture of mobile wooden houses 	

Name of the measure: 15. Energy supply of the Savinjska region	Start of the activity: 2014 End of the activity: 2020
Short description of the measure:	
<p>15.1 Smart specialization in energy and environment: Implementation of the new R & D and pilot projects in the field of energy and the environment, promotion and implementation of innovative solutions RES and EE, employment of young professionals in the energy sector, the establishment of the Institute for Energy</p> <p>15.2 Green and environmentally friendly energy: Establishment and support for the operation of "green energy consortium" of regional companies</p> <p>15.3 Energy monitoring: The mechanism for energy monitoring and thus to reduce energy consumption.</p> <p>15.4 Awareness of the energy consumption in the private sector: Raising awareness of economic operators in the private sector</p> <p>15.5 Energy efficient region of Celje: Energy retrofit of public buildings</p> <p>15.6 Energy in Obsotelje and Kozjansko region : Energy retrofit of public facilities and private firms</p> <p>15.7 Energy in SAŠA region: The use of alternative and renewable energy sources, energy retrofit of public buildings, apartment buildings, energy-saving street lighting</p> <p>15.8 Energy retrofit of public buildings: Energy retrofit of public buildings</p> <p>15.9 The use of RES: Construction of energy infrastructure for the use of RES and EE</p> <p>15.10 Energy in Obsotelje and Kozjansko region: Energy retrofit of kindergartens</p> <p>15.11 Reference centre for renewable energy: Integration of foreign knowledge and experience with local knowledge and the transfer of the ways to solve the energy problems of the general public in a modern way</p> <p>15.12 Intelligent micro-grid of sustainable energy (biomass / 3generation + micro hydro power plants + PV plants): The common performance of energy producers of intelligent micro-grid, the establishment of the synchronization of power plants with micro-network for the self-sufficiency of local communities.</p>	
Aims out of the measure:	
<ul style="list-style-type: none"> ⇒ Smart specialization in energy and environment ⇒ Green energy consortium of regional companies ⇒ Energy monitoring ⇒ Raising awareness of economic operators in the private sector ⇒ Energy retrofit of public buildings in Celje ⇒ Energy retrofit of public buildings and private firms in Obsotelje and Kozjansko ⇒ Reference centre for renewable energy ⇒ Intelligent micro-grid of sustainable energy 	
Milestones and Results:	Date (M/Y):

⇒ Smart specialization in energy and environment
⇒ Green energy consortium
⇒ Energy monitoring
⇒ Raising awareness
⇒ Energy retrofit in Celje, Obsotelje and Kozjansko
⇒ Reference centre for renewable energy
⇒ Intelligent micro-grid of sustainable energy

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