



Targets, strategies and measures till the year 2020 on the field of green electricity production in Slovenia

Summary

1. Introduction

The Republic of Slovenia became a member of European Union in May 2004. With the membership in EU Slovenia adopted European legislation which part is also Directive 2001/77/EC. The purpose of this Directive is promotion of electricity produced from renewable energy sources in the internal electricity market.

This document contains data about present status on the field of green electricity production in Slovenia as well as support mechanisms of financing of projects for green electricity production. Targets on the field of green electricity production, measures for reaching those targets and calculated theoretical potentials for green electricity production from different sources are also presented in this document.

2. Present status & potentials

2.1. Present status on the field of green electricity production in Slovenia

Because electricity consumption grow faster than the generation of electricity from renewables, the share of electricity obtained from renewable sources fell from 31.7% in 2000 to 29.1% in 2004. Hydrological conditions have caused some sharp peaks and troughs over the years, for example 22% in 2003, which was drought year. In the primary balance in 2004 the share of renewables was 11.7% or 1.2 percentage points higher than the year before; however there is no increase in the long term.

A long-term tendency towards a gradual increase in electricity generation from renewables can be observed (besides hydro power, production from wood biomass and landfill gas is also increasing). However, owing to the faster growth in consumption, the share of renewables in electricity consumption is falling and is therefore moving us further from achieving the target of 33.6% which is an obligation under Slovenia's EU accession treaty.

2.2. Mechanisms for financing of projects for green electricity production

Valid financial mechanisms for financing of green electricity projects are divided on public (state) and private financial mechanisms.

Public financial mechanisms are:

- ◆ Soft loans of the Ecological fund of the Republic of Slovenia (Eco fund),
- ◆ Subsidies of RES-e projects without connection to electricity network,
- ◆ Feed-in tariffs
- ◆ Climate change levy

Private financial mechanisms are momentarily limited on Third Party Financing (TPF).

2.3. Potentials for green electricity production in the year 2010

Hydro

Total theoretical potential of Slovenian rivers is 14546.2 GWh/a. Technical potential is in amount of 9145 GWh/a, but economic potential is in amount between 7000 and 8500 GWh/a. With large hydropower plants we are momentarily exploiting approx. 46% of economic potential of Slovenian rivers.

Solar

For calculation of theoretical potential of electricity produced from solar power plants the covering of all houses with solar cells are expected. If the area used for covering of one house is 150 m², the potential of solar radiation which falls on the areas of all houses amounts to 85722 GWh/a. That potential represents approx. 8572 GWh of electricity produced on annual level.

Wind

Theoretical potential of wind energy is defined with the fact that 0.1% of solar radiation is transformed into wind energy. Theoretical potential of solar radiation which falls on Slovenian area is 22938888 GWh/a, therefore theoretical potential of wind energy amounts to 22938 GWh/a. Since the highest theoretical efficiency of wind mill is 59%, theoretical potential of electricity produced from wind power plants amounts to 13533 GWh/a.

Wood biomass

Theoretical potential of wood biomass is calculated on the way that 57% of the whole annual increase is used in energy purposes. Theoretical potential of wood biomass in energy purposes therefore amounts to 9583 GWh/a, but for electricity production in amount of approx. 2875 GWh/a.

Vegetable biomass

Theoretical potential of vegetable biomass is calculated on the way that all vegetable biomass is used for ethanol production. Since the whole agricultural areas cannot be used for planting with feed beet, theoretical potential is estimated at planting areas in growing. At planting with feed beet this amounts to 2428 GWh/a and represents approx. 728.4 GWh/a of electricity production.

Biogas

Theoretical potential of animal waste is calculated on the way that from all animal waste biogas is produced which is then transformed into electricity. If therefore all animal waste is used for biogas production and then that biogas is burnt, theoretical potential on annual level would amount to 7083 GWh, which represents 2125 GWh/a of electricity production.

Sewage sludge gas

Theoretical potential of sewage sludge gas is estimated on the basis of quantity of waste water collected in public sewage systems. With consideration of quantity of sediment organic substances in the mud, population equivalent, time of one year and calorific value of the fuel, theoretical amount of sewage sludge gas amount to 249 GWh/a which represents approx. 75 GWh/a of electricity production.

Landfill gas

Theoretical potential of landfill gas is estimated on the basis of quantity of waste collected on refuse dumps. If the whole amount of waste is used for landfill gas production, theoretical potential on annual level amounts to 589 GWh which represents 177 GWh/a of electricity production.

Geothermal energy

Theoretical potential of geothermal energy in Slovenia is estimated on the basis of heat which is annually produced on Earth and with comparison of Slovenian area with the whole Earth area. On that way calculated theoretical potential of geothermal energy in Slovenia amounts to 5467 GWh/a, which represents approx. 301 GWh/a of electricity production.

3. Process towards regional RES-e strategy

3.1. Seminars and meetings in the framework of RES-e Regions project

One-day regional seminar with the title "Resources and Technologies for green electrical energy production" has been organized in the framework of RES-e Regions project. The seminar was targeted to all companies which are involved into green electricity production as well as representatives of municipalities which are in charge for development of electricity production in their municipalities. The aim of the event was to present technologies and legislation for installation of power plants on renewables. A discussion regarding possibilities for different technologies was at the end of each presentation.

3.2. Technology Map results

In the framework of the same project a document with the title "Technology Map" has been prepared. A present state, the main barriers and strategies for their overcoming as well as short and long-term perspectives for different technologies are presented in that document. Important companies, organizations and other institutions on the field of green electricity production are also presented. The document concludes that in Slovenia the most utilized renewable energy source for electricity production is water energy since we have over 375 small hydropower plants.

3.3. Inquiry regarding administrative procedure for grid access

A short analysis of representatives of different institutions for grid access and administrative procedures was carried out at the Faculty of Mechanical Engineering in Ljubljana in June 2005. A document which contains data and information regarding grid access for electricity producers, administrative procedures and barriers associated with this has been prepared. The document includes conditions for grid access where system for connection to the grid is schematically presented. 10 main steps necessary for grid access, some systems for promotion of green electricity and certificates about origin of green electricity are also presented in the document. At the end thoughts of examinees regarding what should be changed for easier and friendlier grid access for investors are given.

3.4. Analysis of green electricity in Slovenian municipalities

Analysis of green electricity in Slovenian municipalities was also carried out in June 2005. It was made with inquiry of competent persons of different municipalities. Most of examinees are in general very favorable for renewable energy sources and also for electricity production from those sources. They affirm that share of renewable energy sources in primary energy balance must increase if we would like to follow the developed European countries. They say that state should more inform, advise and educate inhabitants of individual municipalities about green electricity. But also all of examinees agree that systems for green electricity production should be set up on places where this is economically reasonable.

4. Targets proposed for Slovenia

4.1. Regional targets at different sources for green electricity production (short-term to 2010, long-term to 2020)

Hydropower plants

Short-term perspectives are the increase for 76.5 MW of new capacities of large hydropower plants with total annual electricity production of 237 GWh and for 5 MW of new capacities of small hydropower plants with total annual electricity production of 20 GWh. Long-term perspectives are the increase for 769.3 MW of new capacities of large hydropower plants with total annual electricity production of 2621 GWh and for 80 MW of new capacities of small hydropower plants with total annual electricity production of 320 GWh.

Solar power plants

As short-term perspective is setting up for 3 MW of new capacities of solar power plants which represents approx. 3.4 GWh of annual electricity production. As long-term perspective is setting up for 10 MW of new capacities of PV plants which represents approx. 11.3 GWh of annual electricity production.

Wind power plants

As short-term perspective is construction a field of 33 windmills with total power of 26.4 MW on Volovja Reber. As long-term perspective is construction wind power plants with total power of 256.5 MW.

Wood biomass

Short-term perspective is electricity production from wood biomass in total power of 20 MW which represents approx. 110 GWh of annual electricity production. Long-term perspective is electricity production with total power of 40 MW which represents approx. 220 GWh of annual electricity production.

Vegetable biomass

Short-term perspective is introduction of biodiesel which should in the year 2010 meet 1% of fuel consumption in traffic. That corresponds to approx. 15,000 ton of biodiesel production annually or 2% of the whole consumption of diesel fuel in traffic. This perspective is for transport fuel only and not for electricity production.

Biogas

Short-term perspective is the increase for 3.8 MW of new capacities of biogas power plants which represents approx. 18.8 GWh of annual electricity production. Long-term perspective is the increase for 5.8 MW of new capacities of biogas power plants which represents approx. 28.9 GWh of annual electricity production.

Sewage sludge gas

Short-term perspective is the increase for 3.7 MW of new capacities of power plants on sewage sludge gas which represents approx. 18.5 GWh of annual electricity production. Long-term perspective is the increase for 5.7 MW of new capacities of power plants on sewage sludge gas which represents approx. 28.5 GWh of annual electricity production.

Landfill gas

Short-term perspective is the increase for 17.9 MW of new capacities of power plants on landfill gas which represents approx. 125 GWh of annual electricity production. Long-term perspective is the increase for 18 MW of new capacities of power plants on landfill gas which represents approx. 126 GWh of annual electricity production.

Geothermal energy

Short-term perspective is the increase for 20 MW of new capacities of geothermal power plants which represents approx. 100 GWh of annual electricity production. Long-term perspective is the increase for 40 MW of new capacities of geothermal power plants which represents approx. 200 GWh of annual electricity production.

4.2. Common target

Common target of National energy program in Slovenia is raising the share of renewable energy sources in the primary energy balance from 8.8% in 2002 to 12% by 2010:

- ◆ increasing the share of renewables in the supply of heat from 22% in 2002 to 25% by 2010,
- ◆ raising the share of electricity from renewables from 32% in 2002 to 33.6% by 2010,
- ◆ to ensure up to 2% share of biofuels for transport by the end of 2005.

For reaching this target of 33.6% of green electricity production the total electricity consumption in the year 2010 should amount to 14362.2 GWh.

5. Measures for reaching Slovenian targets

5.1. Raising the share of electricity from renewables from 32% in 2002 to 33.6% by 2010

For reaching this target it is necessary:

- ◆ to make analyses of potentials and to prepare strategies of development of individual renewable energy sources for electricity production,
- ◆ to ensure mid-term stability of feed-in tariffs for power plants on RES,
- ◆ to introduce a certification of green electricity,
- ◆ into legislation which manages with connection to the grid, to introduce a standardized method of connection of micro and small scale power plants to the grid on the basis of power of power plant and characteristics of network,
- ◆ to make possible a voluntarily purchase of electricity from qualified producers,
- ◆ to accept regulation which defines the share of RES in public buildings and
- ◆ to carry out programs for higher informing, consciousness and qualification of potential consumers of energy, investors and other target groups (informative material, best case examples, education and qualification, publishing of promotion leaflets and brochures which present in detail an individual renewable energy source). Promotion activities should be carried out by institutions which do not have direct interest at sale of their equipment.

5.2. Mid-term increasing of hydropower share in electricity production

To increase the hydropower share in electricity production, it is necessary:

- ◆ to finish a chain of hydropower plants on lower Sava,

- ◆ to study thoroughly and to start with procedures of including into space and to start building hydropower plants on middle Sava,
- ◆ to prepare conditions for invitations of conferring concession on middle Sava,
- ◆ to investigate possibilities for construction of pump hydropower plants in river basins of Drava, Sava and Soča,
- ◆ to estimate once again not utilized hydro potentials in the Republic of Slovenia.

5.3. Mechanisms to ensure a technical reliable operation of energy networks and rise of supply quality

Technical reliable and quality operation of both energy and earth gas networks is determined as follows:

- ◆ reliable, quality and sufficient supply of consumers,
- ◆ reliable and efficient operation of production devices,
- ◆ reliable connection with neighboring systems,
- ◆ fulfillment of diverse demands for protecting the nature,
- ◆ controlling their impacts in space,
- ◆ having equal rights for grid access and
- ◆ economic-technical efficient operation.

5.4. Doubling of electricity share from CHP plants from 800 GWh in 2000 to 1600 GWh in 2010

For doubling the electricity share from cogeneration plants, an entire regulation for cogeneration stimulating has to be done which will beside determination of manner of cogeneration stimulating, include the following:

- ◆ regulation of system services as are “peak power” which is required for covering of peak consumptions and “reserve power” which is required in the case of loss from own electricity production from cogeneration system;
- ◆ standardized manners of connection of micro and small scale qualified power plants to the network with regard to power of the plant;
- ◆ verification of possibilities for cogeneration system at every new installation or at exchange of boilers with heat power higher than 500 kW.

5.5. Inclusion of sustainable energy treatment into educational process

Education of schoolboys in elementary schools, students and also wide public regarding sustainable development, efficient treatment with energy, reducing negative impacts of energy use on natural environment and reducing of energy use and their costs is very important process which will influence on long-term treatment with energy in Slovenia. With education and consciousness an active role of individuals at suitability energy use is developed and also younger generations can influence on consumer habits of older people.

6. Costs & benefits

6.1. Capital needed for execution of RES and efficient energy use programs

Financial means for realization of the programs on annual level amounts to 58.3 millions €. Total costs of the programs in the period from 2004 to 2010 amount to 408.3 millions €. Financial means, stated under subsidies for RES and efficient energy use, should be allocated as direct subsidies in form of soft loans with subvention of investments into efficient energy use till 30% and subvention of rate of interest or as facility at paying of CO₂ tax.

To realize ambitious targets of energy policy considerable financial means for stimulating programs of RES and efficient energy use should be ensured in the period from 2004 to 2010. With subvention of investments in efficient energy use till 30% and RES till 40% members of communities, economic societies and public institutions will be stimulated that they will ensure needed investment means.

6.2. Needed financial means for stimulating electricity from renewables and cogeneration systems

For reaching targets of electricity share from renewables and cogeneration systems, means for subvention of electrical energy should be ensured. Only electricity from cogeneration systems on wood biomass which is not suitable for industrial remaking will be subsidized. As subvention is considered only part of purchase price of electricity from qualified producers, which represents the difference between purchase price and price at which electricity is sold by network managers. Expected market price in the year 2010 is 0.036 €/kWh which is price that is in different studies estimated as so-called long-term market price of electrical energy.

7. Conclusion

Present document is only a small stone in a mosaic of electricity production which is consisted by different activities.

In the year 2004 the total electricity consumption has amounted to 15272 GWh. As regards to calculation in the chapter 4.2., the total electricity consumption should be reduced for 909.8 GWh by the year 2010. That will be hard to reach since electricity consumption is every year higher.

For reducing electricity consumption (33.6% share of electricity produced by renewables) a lot of things must be done on the field of efficient energy use. That means exchange of old engines and devices with new ones which have smaller electricity consumption and utilization of economical electric lamp for lighting of spaces.

Due to insufficient development in recent years, for reaching obligated targets on the field of renewable energy sources it is at intensive implementation of measures for reducing of electricity consumption growth, necessary to considerable improve supporting instruments (above all to adapt feed-in tariffs), which is also finding and recommendation of European Commission (DG TREN).



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