

**Zamfir Andreea**

Academy of Economic Studies Bucharest Faculty of Management 6th Piata Romana RO 010374 Bucharest Romania zamfir\_andreea\_ileana@yahoo.com +4021.319.19.00/250

*This study investigates the instruments used by governments in order to support renewable energy sources in the European Union. The findings of this study reveal that policy goals could be achieved by using a large variety of instruments. The study was carried out by combining a wide variety of sources, such as strategies, reports and regulations. The methodology and the results reported in this research could be used for designing new, harmonized policy instruments to support renewable energy sources in the European Union.*

*Key Words: renewable energy, environmental protection, policy instruments, supporting schemes*

*JEL Classification: M11, Q42*

**1. Introduction**

This study investigates how the governments could better promote the use of renewable energy sources. The manner in which renewable energies are supported is a highly debated issue these days because of renewable energies' role within the energy scenario. The main conclusion of this study is that policy goals could be achieved by using a large variety of instruments.

The research was conducted using a wide variety of sources, such as strategies, regulations, road map, as well as articles and reports. The research question was answered by analyzing published sources, evaluating and interpreting evidence. Answering the research question was difficult because some policy instruments used in several countries in order to support renewable energy generation are still too young to be evaluated.

**2. Background**

There are at least four reasons for valuing renewable energies: first, society relies mainly on fossil fuels, which are limited and non-renewable; second, fossil fuels will be exhausted in a foreseeable future; third, the use of fossil fuels has generated environmental effects that negatively affect social well-being beyond acceptable limits; fourth, renewable energy sources could satisfy the needs of modern society in terms of consumption and environmental impact.

Renewable energies promise some strategic improvements in the security of supply, reduce the long-term price volatility to which the European Union is subjected as a price-taker for fossil fuels and could offer an enhanced competitive edge for the European Union energy technology industry. In addition, renewable energies reduce air pollution and greenhouse gas emissions. They also facilitate improvement in the economic and social prospects of rural and isolated regions in industrialized countries and help meet basic energy needs in developing countries (Commission of the European Communities, 2006). Sustainable development is possible only when it is based on the real type of economic progress in harmony with the limitations in nature, especially the amount of natural sources and the regeneration and neutralization capabilities of the biosphere combined with human-made emissions (Pozeb & Kroppe, 2007). Therefore, the main research and development priorities are the development of renewable electricity, cost reduction and research on environment issues, as well as the need to adapt the electricity networks to new technological, economic, environmental and political realities (Kjaer, 2006).

The development and implementation of green electricity policies have evolved differently in European Union's member states. The current revenues expected for renewable electricity are largely dependent on the variety of national support systems. The revenues will be determined by market conditions, whereby competition between technologies determines the prices. In this context, member states' support systems for renewable electricity production may be extremely important.

**3. Policy Instruments Used for Promoting Renewable Energy Sources in the European Union**

European Union is applying a range of policy instruments to encourage electricity from renewable energy sources and to bring nature closer to an environment friendly consumption (Gan et al., 2007; Pozeb & Kroppe, 2007). According to Gan et al. (2007), a general tendency in European Union is that policies shift emphasis from research and development stimulation towards dissemination and market application of renewable energy technologies. The instruments used to promote renewable energy sources are usually grouped in more categories, the most widespread formula being direct and indirect instruments (Table 1).

**Table 1 Policy instruments used for promoting renewable energy sources**

No.	Policy instruments		
1.	Direct instruments	1.1. Financial measures	1.1.1. Subsidies and loans
			1.1.2. Tax exemptions or advantage
			1.1.3. Feed-in tariffs
			1.1.4. Green certificates
			1.1.5. Bidding
			1.1.6. Funding research and development
			1.1.7. Interconnection regulations
			1.1.8. Independent power producer framework
			1.1.9. Biofuels mandate
		1.2. Non-financial measures	1.2.1. Negotiated agreements between producers and government
1.2.2. Quota obligation on production			
1.2.3. Quota obligation on consumption			
2.	Indirect instruments	2.1. Information campaigns	
		2.2. Education and training	
		2.3. Labelling	
		2.4. Technology standards and certification	
		2.5. Grid connection standards	

Direct instruments could be financial measures or regulations, while indirect measures are represented by actions taken in other sectors that could influence the use of renewable energies, such as: education, information, standards. Taxes, subventions, environmental product marking, and green certificates are only some examples of such environmental instruments. The decision on what kind of instruments should be used is a very important one, as the instrument to be used will influence the outcome and the public expenses. How the decision is taken depends on the criteria used for the evaluation of the policy instruments. Usually, several criteria are used, and the final decision depends on how much weight is given to each criterion.

Electricity generation from renewable energy sources is promoted within the European Union by using different groups of support systems: feed-in tariffs, quota often combined with tradable green certificates, tender, and tax incentives or investment grants (Ragwitz et al., 2004; Pfaffenberger et al., 2006; Ragwitz et al., 2006; Swedish Energy Agency, 2008; Valle Costa et al., 2008).

It is to mention that policy instruments used to support renewable energies do not make any difference among various types of renewable energy sources. There are countries in the European Union where only one instrument is used to support wind onshore, biomass, biogas, small hydro and solar energy (Ragwitz et al., 2006; Howley et al., 2008; Swedish Energy Agency, 2008; Federal Ministry for the Environment, Nature Conservation and Nuclear Safety – BMU, 2008; Valle Costa et al., 2008). For instance, Austria, Denmark, Estonia, Portugal, Spain, Hungary and Lithuania use feed-in tariff as the only instrument to support all five renewable energy sources. For these renewable energy sources different instruments are used in different countries and all instruments could support each one of the renewable energy sources. Each country could choose any instrument or mix of instruments to promote renewable energy sources, taking into consideration the local conditions of renewable energy sources, the costs and the target for market penetration.

The use of renewable energy sources is stimulated in most countries by more than one instrument. This statement is based on surveying the support schemes applied by the different European Union countries to stimulate renewable energy development. National support is essential in order to ensure the development of renewable energy sources. A wide range of policy instruments are mixed support schemes, which vary among member states. Generally, a mix of instruments is essential and a key to success.

The dominant instruments for promoting the generation of electricity by renewable energy sources have been feed-in tariffs and quota with green certificates. These two instruments were also found as having high effectiveness (Dijk, van et al., 2003).

Feed-in tariffs are used by a majority of European Union's member states for promoting electricity generation from renewable energy sources. For instance, in Germany, Spain and Denmark they have been successful in supporting the expansion of wind, biogas and solar power production (Ragwitz et al., 2004; Ragwitz et al., 2006; Swedish Energy Agency, 2008). According to Ragwitz et al. (2006), this system allows independent electricity generators to sell green electricity at a fixed tariff for a determined period of time. The main advantages of feed-in tariffs system are the long-term certainty about receiving support, which may significantly reduce investment risks, and the

possibility of early market diffusion of less mature technologies, which may reduce costs for society in the long term. However, the system of feed-in tariffs was frequently criticised for not stimulating competition among electricity generators to a sufficient degree to bring down the costs of renewable energy technology investments (Ragwitz et al., 2004).

Green certificates or electricity certificate systems or quota obligations are used in several countries within the European Union (such as Sweden, Romania, Belgium etc.) and are based on the principle of imposing minimum shares of renewable electricity on consumers, suppliers or producers (Ragwitz et al., 2004; Ragwitz et al., 2006; Swedish Energy Agency, 2008). Compared to feed-in tariffs, quota systems are strongly market-oriented policy systems (Ragwitz et al., 2006), based on the interaction between the supply and demand of certificates. The producers receive additional revenue from certificates, in addition to that from the sale of electricity. This support system encourages expansion of the most efficient types of renewable electricity generation (Swedish Energy Agency, 2008), but there is a risk of supporting only lower-cost technologies, as forecasting the price of green certificates over a long period of time is difficult. A particular case in the European Union is Latvia which uses a quota system without certificates that includes elements of quota system and tenders. The Latvian system is based on quotas established yearly, determining the amount of installed capacity from renewable electricity that may be produced within the country.

The tender scheme, that has been used in the United Kingdom and Ireland and is still used only in France, is a quantity-driven mechanism (Ragwitz et al., 2006), meaning that the state calls for offers from companies wanting to supply renewable electricity on a contract basis at a particular price. The company submitting the most competitive tender receives the contract, and the consumers who purchase the electricity have to pay a fee element covering the additional costs arising in connection with production of the renewable electricity (Swedish Energy Agency, 2008). The main advantage of the tender system is related to the awareness of renewable energy investment opportunities (Ragwitz et al., 2004). Nevertheless, the market uncertainty and the risk of not covering the cost of electricity production through tenders lead to a much lower penetration of renewable energy sources than expected.

Tax incentives form a group of policy measures that include tax relief, exemptions from energy tax, grants and investment support (Ragwitz et al., 2006; Swedish Energy Agency, 2008). Frequently, these mechanisms are used in order to complement other types of policy measures for promoting renewable energy sources. For that reason it is difficult to evaluate the results of the tax incentives as instruments for promoting renewable energy sources.

#### **4. Conclusions**

The study reveals that policy goals in the renewable energy field could be achieved by using a large variety of instruments. This conclusion is based on the premises that (1) the local conditions of renewable energy sources, the costs and the target for market penetration influence one country's option for one instrument or a mix of instruments; (2) various instruments are used in different countries and all instruments could support each one of the renewable energy sources; (3) countries with more experience in this field use a variety of supporting schemes; (4) the market penetration of renewable energies is influenced by many factors; and (5) policy instruments complement each other in achieving the energy policy objectives.

The findings of this study could justify the effort invested in designing new policy instruments. This could be helpful in order to better address the problems encountered in supporting the use of renewable energies.

#### **References**

1. Commission of the European Communities (2006), "Green Paper Follow-up Action Report on Progress in Renewable Electricity", Brussels, COM (2006) 849 final.
2. Dijk, van A. L., Beurskens, L. W. M., Boots, M. G., Kaal, M. B. T., Lange, de T. J., Sambeek, van E. J. W. and Uyterlinde, M. A. (2000), "Renewable Energy Policies and Market Developments", REMAC 2000 project, last accessed April 10, 2009, <<http://www.ecn.nl/docs/library/report/2003/c03029.pdf>>.
3. Federal Ministry for the Environment, Nature Conservation and Nuclear Safety – BMU (2008), "Legal sources on renewable energy", Berlin, Germany, last accessed April 10, 2009, <<http://res-legal.eu/en/search-for-countries.html>>.
4. Gan, L., Eskeland, G. S., and Kolshus, H. H. (2007), "Green electricity market development: Lessons from Europe and the US", *Energy Policy*, 35, 144-155.
5. Howley, M., Gallachóir, B. O., Dennehy, E. and O'Leary, F. (2008), "Renewable Energy in Ireland. 2008 Report – Focus on wind energy and biofuels", Sustainable Energy Ireland – SEI, last accessed April 10, 2009, <[http://www.sei.ie/Publications/Statistics\\_Publications/SEI\\_Renewable\\_Energy\\_2008\\_Update/Renewable%20Energy%20Update%202008.pdf](http://www.sei.ie/Publications/Statistics_Publications/SEI_Renewable_Energy_2008_Update/Renewable%20Energy%20Update%202008.pdf)>.
6. Kjaer, C. (2006), "Taking Control of our Energy Future", *EU Power*, 2, EWEA, 23-25.
7. Pfaffenberger, W., Jahn, K. and Djurdjin, M. (2006), "Renewable energies – environmental benefits, economic growth and job creation", Bremer Energie Institut, Bremen.

8. Pozeb, V. and Krope, T. (2007), "Importance of Legal Protection and International Quality Standards for Environmental Protection", Proceedings of the 2nd IASME / WSEAS International Conference on Energy & Environment (EE'07), Portoroz, Slovenia, 89-90.
9. Ragwitz, M., Held, A., Resch, G., Faber, T., Huber, C. and Haas, R. (2006), "Monitoring and evaluation of policy instruments to support renewable electricity in EU Member States", Fraunhofer IRB Verlag.
10. Ragwitz, M., Schleich, J., Huber, C., Faber, T., Voogt, M., Ruijgrok, W. and Bodo, P. (2004), "Analysis of the renewable energy's evolution up to 2020", FORRES 2020, Fraunhofer IRB Verlag.
11. Swedish Energy Agency (2008), "The Electricity Certificates System 2008", last accessed April 10, 2009, <[http://www.swedishenergyagency.se/web/biblshop\\_eng.nsf/FilAtkomst/ET2008\\_09w.pdf/\\$FILE/ET2008\\_09w.pdf?OpenElement](http://www.swedishenergyagency.se/web/biblshop_eng.nsf/FilAtkomst/ET2008_09w.pdf/$FILE/ET2008_09w.pdf?OpenElement)>.
12. Valle Costa, do C., Rovere, La E. and Assmann, D. (2008), "Technological innovation policies to promote renewable energies: Lessons from the European experience for the Brazilian case", Renewable and Sustainable Energy Reviews, 12, 65-90.