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Taxes Incentives to Promote Res Deployment: The Eu-27 Case

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1. Introduction

The share of renewable energy source (RES) in gross final energy consumption was 10.3% in the European Union (EU-27) in 2008; the remaining 89.7% was covered through the use of conventional fuels such as natural gas or oil products (Eurostat, 2010). The renewable energy share in gross final energy consumption was used for the production of heat (5.5%), electricity (4%) and transport fuels (0.8%).

Deployment of RES contributes to two of the four targets of the EU-27 energy strategy: the need to reduce primary energy dependency and the stress of demand on primary energy resources. In addition, the Green House Gas (GHG) abatement due to a more intensive use of RES contributes to improve the EU-27's target related to climate change, this being the fourth target in its energy strategy.

From a legal point of view, The Green Paper (EC 1996), which was the first attempt of establishing a common policy on renewable energies in the European Union, settled down the goal of duplicating the contribution of RES in the gross domestic consumption in 15 years. From the year 1996 until the present, the European Union has developed an intense ruling activity around the promotion of RES.

An important step forward the construction of the Community framework about harmonized fiscal treatment was the passing of the Directive (EC, 2003/96), that restructures the community regime about taxation over energy products and electricity.

In order to improve on energy efficiency, the most important EU policies for the households sector are the EPBD (EP&C, 2010), "The Energy Services Directive (ESD)" (EP&C, 2006) and "The Eco-design Directive" (EP&C, 2009).

The renewable energy Directive 2009/28/EC covers renewable energy use in three sectors:

1. Gross final consumption of electricity from renewable energy sources;
2. Gross final consumption of energy from renewable sources for heating and cooling (H & C); and
3. Final consumption of energy from renewable sources in transport.

IEA (2009) has recently pointed out that part of renewable energies growth is due to strong policy support. Therefore, policy measures to promote RES are becoming an interesting issue in its deployment.

In November 2010 the Commission presented the new strategy for competitive, sustainable and secure energy (COM 2010/0639). The communication, named “energy 2020”, fixes the priorities in the field of energy for the next ten years and the actions that should be performed to save energy, achieve a competitive market, and guarantee the safety of supply, promoting at the same time technological leadership.

Focusing on green electricity, RES for Heating and Cooling and its use in transport, this chapter offers an overview of the main tax incentives that have been implemented to promote their use by the Member States (MSs) of the EU-27. In a general way, along with the reduction of investment costs, tax incentives can also be used to make the energy generated from RES more profitable than that generated by conventional energy sources.

Chapter has been structured as follows. Section 2 analyzes tax incentives to promote green electricity. Section 3 is dedicated to study the same topic in promoting RES for H & C. Section 4 focus on the way MSs promote the use of biofuels in transport by using tax incentives. Finally, section 5 includes a political discussion and main conclusions.

In a summarized way, Section 2 provides a comprehensive overview of the main tax incentives used in the EU-27 MSs to promote green electricity. Sixteen MSs use tax incentives to promote green electricity along with other promotion measures as quota obligations and price regulation. Section 3 shows the main tax incentives used to promote RES for H&C by EU-27 countries up to 2009. Although subsidies is the most widely used instrument to promote RES for H&C, twelve MSs have used tax incentives as deductions, exemptions and reduced tax rates. Section 4 analyses the tax incentives that MSs have used to reach the target of a share of 5.75 % in final consumption of energy biofuels in transport in 2010. This is the target fixed by Directive 2009/28/EC. Although green electricity for transport and hydrogen vehicle are included in the Directive 2009/28/EC framework, this chapter focuses on the policy measures, mainly those related with taxes, that have been used to promote the use of biofuels in transport.

2. Tax incentives to promote green electricity

This section provides a comprehensive overview of the main tax incentives used in the EU-27 MSs to promote green electricity¹. As stated Cansino *et al.* (2010), in promoting green electricity, there are probably no “perfect” fiscal incentives that should be widely applied in all situations and countries. These incentives are applied simultaneously with other promotion’s measures, specially quota obligations and price regulation.

In UE-27, seventeen MSs have used fiscal incentives to promote green electricity. Mainly designed as tax exemptions, rebates on taxes, tax refunds and by applying lower tax rates on activities promoted. However, not all disposable technologies are always promoted. Table 1 provides an overview of the use of these tax incentives in the EU-27 MSs.

Fiscal incentives in direct taxes are used to promote electricity from RES by seven MSs. Czech Republic, Belgium, France and Luxembourg use the personal income tax as it allows either tax deductions or exemptions depending on the source of income and the capacity installed.

¹ In this section, in addition to the country-specific information, we have taken into account the country reports in EREC (2009) titled “Renewable Energy Policy Review”, the information obtained from Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (2011), the “Taxes in Europe” database published by the European Commission (2011) and the paper of Cansino *et al.* (2010).

Czech Republic has a total exemption of the tax revenues that the taxpayer obtains coming from the generation of this type of energy. A similar exemption is also contemplated in the corporate tax. In Belgium and in France an exemption is allowed in the personal income tax (on the taxable income) on behalf of the cost of the investment of the system installation PV. In the French case, the exemptions not only cover the cost of the investment in system PV but also in the systems with small capacity which use wind energy, hydraulics and biomass. Luxembourg promotes solar photovoltaic electricity with an exemption from income tax of the sale of electricity generated by this system and whose capacity is small.

	Personal Income Tax	Corporate tax	Property Tax	VAT	Others Excise Duty Exemptions	CCL	Other Taxes
Belgium	✓	✓					
Czech Rep.	✓	✓					
Denmark					✓		
Finland							✓
France	✓			✓			
Germany					✓		
Greece		✓					
Italy			✓	✓			
Luxembourg	✓						
Netherlands							✓
Poland					✓		
Portugal				✓			
Romania					✓		
Slovakia					✓		
Spain		✓	✓				
Sweden					✓		
United Kingdom						✓	

Source: Cansino *et al.* (2010)

Table 1. Fiscal incentives to promote green electricity

Belgium, Greece and Spain allow the deduction of a percentage of the investment made in systems that generate green electricity from the net tax base in the corporate tax. In the first two cases, the exemption is allowed by the company that has spent the funds in building the systems that generate green electricity. In Spain, it is allowed a deduction of a percentage of the investment that the company carries out in the installation of systems for the green electricity from the net tax base.

Finally, only Italy and Spain have used property taxes to promote green electricity. In Italy, municipalities may establish rates lower than 4 per 1000 of ICI (‘Imposta comunale sugli immobili’) for taxpayers who install or have installed a system of renewable energy to produce electricity or heat for domestic use. In Spain, municipalities may reduce the IBI, which is a similar tax to ICI, under specific conditions, up to 50% of the full share of the tax for real state to promote the establishment of solar energy systems. However, this measure has been used by few municipalities because are borne by them.

Fiscal incentives in indirect, pigouvian and others taxes are used to promote electricity from RES by twelve MSs. The Value Added Tax is theoretically one of the most suitable indirect tax to promote renewable energies. However, only three MSs have chosen this tax as an instrument to boost green electricity: France, Italy and Portugal.

A cut in the Value Added Tax rate has to follow European guidelines about state helps that favour the environment (EC, 2001) and also has to get the Commission's authorization in order to prevent disproportioned effects over competition and economic growth. France allows a 5.5% reduction when buying basic products related to improvements, changes and installation in residential buildings that incorporate technology based on solar power, wind power, hydro-electric power and biomass. Italy charges a reduced tax rate on sales and services related to wind and solar power generation. There is also a reduced tax on investments in green electricity distribution networks. Finally, Portugal allows a reduction in buying systems which generate green electricity.

Electric energy excise duty exemption is the most pervasive measure to encourage the use of renewable electricity of all. Actually, six MSs use it: Germany, Denmark, Romania, Slovakia, Sweden and Poland. In general, they use this measure because produces two types of benefits, known as the double dividend (Goulder, 1995). The first is to preserve the environment and the second can be obtained in several ways, as a positive impact on employment levels (De Mooij, 1999). This measure has been also use for reducing the higher prices of production of this type of energy. In that sense, this type of exemption is being usually applied to biofuels sales (Bomb *et al.*, 2007; Van Beers, C *et al.* 2007). Nevertheless, some EU countries have applied to renewable electricity with the same propose. Fossil fuels and nuclear generations' benefit of a competitive advantage with respect to RES because its lower marginal costs than new renewable technologies and they are able to cope with downward price pressure. Because of that, taxation is important for decreasing most costs of RES sector, by allowing exemptions, reductions and accelerated depreciations (Di Domenico, 2006).

In Germany the law provides exemptions to encourage the use of friendly sources of energy when the electricity is generated exclusively from renewable sources and taken for use from a power grid. In the same sense, Romania has included an exemption from the payments of excises duties for energetic products and electricity when the electricity is generated by RES. is (also) promoted in Slovak Republic renewable energy is promoted through the exemption of the excise duty on electricity. Finally, the new Polish legislation continues to exempt from excise duty electricity from RES.

In the other hand, some countries have introduced electricity excise exemptions for renewable electricity only if they are generated by determinate technology. In Denmark, it is only exempt for excise duty, the electricity produced by wind, waterpower or solar cell systems or in a small plant. In Sweden, the electricity produced in a wind power station is not taxable if it is for own consumption although the electricity surplus might be sold. The exemption value depends on the consumption area. Also, during a transition period all wind energy production has been also entitled a tax reduction (environmental bonus).

Some other tax exemptions are used to promote green electricity. In the United Kingdom, electricity from RES is exempted from the 'Climate Change Levy -CCL-', which can characterize as a typical pigouvian tax. This tax is borne by agents that generate carbon emissions because it pursues to reduce negative externalities which come from human activities (Viladrich, 2004). The CCL was forecast to cut annual emissions by 2.5 million tons by 2010, and forms part of the UK's Climate Change Program.

The CCL has to be paid by the electricity suppliers, who pass the costs to the industrial and commercial final consumers. To be tax-exempt, is required an authorization which may be given only under some conditions which involve consumers, suppliers and electricity producer. As requirements in the contract enter the electricity consumer and the electricity supplier, an agreement enters the electricity supplier and the electricity producer and some obligation of the electricity producer with the Office of Gas and Electricity Markets.

In Netherlands, electricity from RES is granted by a reduction of the ecotax, if it is produced within and outside the Netherlands but with the condition that has to be supplied to Dutch. All technologies used for the generation of electricity from RES are promoted.

Finally, in Finland, the consumption of electricity from RES is also taxable by the excise duty electricity. Nevertheless all operators of plants generating electricity from RES are entitled to a subsidy by statutory law, in order to offset the tax they must pay, which normally is transferred to the consumer. So, this subsidy is used to reduce the price of renewable energies. The application for the subsidy has to be lodged with the Customs District of the area of the domicile of the power plant and no subsidy is paid when the volume of electricity referred to in the application is small.

3. Tax incentives to promote RES for H&C

This section shows the main tax incentives used to promote RES for H&C by EU-27 countries up to 2009. Although subsidies is the most widely used instrument to promote RES for H&C, twelve MSs have used tax incentives as deductions, exemptions and reduced tax rates (Cansino *et al.*, 2011).

In addition to subsidies, RES H&C are often promoted through a range of tax incentives, although with a lower intensity compared with green electricity and biofuel promotions (Cansino *et al.*, 2011 and Uytterlinde *et al.*, 2003). The main tax incentives used by EU-27 MSs are deductions, exemptions and reduced tax rates.² Table 2 provides an overview of the use of these tax incentives in the EU-27 MSs.

3.1 Deductions

There are six MSs that offer different direct tax deductions to encourage the use of RES H&C (Belgium, Finland, Greece, Italy, The Netherlands and Sweden), as Table 2 shows.

In Belgium, all RES H&C technologies benefit from a tax deduction from taxable profits. For all RES and CHP installations, companies can receive a tax deduction of 13.5% for all investments in equipment used to reduce energy consumption. Since January 2003, the Federal Public Service of Belgium offers tax reductions for individuals undertaking energy efficiency and certain renewable energy investments in their homes. In 2009, a tax reduction of 40% of the investment cost was introduced on personal income tax with a maximum of 2,770 € for investment in heat pumps and biomass heating, and 3,600 € for investments in solar boilers. However, for every investment, the taxpayer can only obtain the maximum support for four years.

² In this section, in addition to the country-specific information, we have taken into account the country reports in EREC (2009) titled "Renewable Energy Policy Review", the Intelligent Energy Europe (2010) report titled "Re-Shape Renewable Energy Country Profile", the EuroACE (2009) report on tax incentives that affect buildings in Europe, the "Taxes in Europe" database published by the European Commission (2011) and the paper of Cansino *et al.* (2011).

	Deductions	Exemptions	Reduced tax rates
Austria		✓	
Belgium	✓		
Bulgaria		✓	
Denmark		✓	
Finland	✓	✓	
France			✓
Germany		✓	
Greece	✓		
Italy	✓		✓
The Netherlands	✓		
Sweden	✓	✓	
UK		✓	✓

Source: (Cansino *et al.*, 2011)

Table 2. Member States that use tax incentives to promote RES H&C

Finish consumers can also benefit from tax deductions provided the expenses are used to promote the use of more efficient systems and RES. Since 2006, a 60% household tax deduction has been available to offset labor costs incurred in replacing, upgrading and repairing the heating systems of small residential houses. The maximum amount of the tax deduction per household is 6,000 € (EuroACE, 2009).

Related to Greece, a 20% deduction is available on personal income tax up to 700 €, for money spent on the installation of RES, such as solar panel systems, thermal insulation and district heating. In Italy, personal income tax deductions up to a total of 55% of the investment outlaid on solar thermal systems (and any other energy efficiency investment), spread over ten years, can be obtained. This deduction decreases to 36% if the national fund set aside for each year is exhausted.

In the case of The Netherlands, in order to stimulate investments in RES, a scheme implemented by Senter Novem and the Dutch Tax Authorities allows Dutch companies that investment in RES (including those related to H&C) a deduction of 44% on such investments from their fiscal profit up to a national maximum of €108 million per year. The investment threshold is 2,200 € and no investment allowance is granted for investments exceeding 113 million € in a tax year.³ Among the criteria for the deduction is whether the purchased equipment is on the 'Energy List'. The allowable list of technologies included in the Energy List has varied over the years around an average of 50. The Energy List 2010 contains examples of investments that have proven, in practice, that they meet the International Energy Agency (IEA) criteria. These examples are not exclusive – all investments that meet the energy-performance criteria are eligible for IEA support. However, if investments are not listed among the examples, entrepreneurs will need to prove that they meet the IEA criteria. For example, solar-thermal systems are on this list.

Sweden sponsors innovative programs to promote the use of alternative fuels for home heating. For example, a central furnace that consumes biological fuels if it is used to provide hot water for nearby homes. Oil furnaces have been replaced by boilers that use wood-based

³ A more detailed study of these measures can be found in the report for the RES-H Policy Project by Menkveld and Beurskens (2009).

pellets, thereby dramatically reducing Sweden's dependence on oil for home heating. Among the actual fiscal measures that exist in Sweden to promote the use of alternative fuels, tax rebates for consumers to stimulate market adoption of renewable technologies should be mentioned. This measure is reinforced with a high carbon tax on fossil fuels (by applying the Polluter Pays Principle). According to the EuroACE (2009) report (related to the fiscal incentives that are applied to European buildings), since 2006, households in Sweden benefited from a 30% tax credit when converting from direct electric heating and oil-based heating to systems based on biomass or heat pumps. Solar heating support was prolonged until 2010.

3.2 Exemptions

Seven MSs have implemented tax exemptions to promote RES H&C (Austria, Bulgaria, Denmark, Finland, Germany, Sweden and UK).

Biomass fuels used for heating are also exempt from fossil fuel taxes in Austria. According to the EuroACE (2009) report, a Building Tax Exemption has been in place in Bulgaria since 2005. From 6 July 2007, the Amendment to the Local Taxes and Fees Act established that the owners of buildings, having obtained a category A certificate issued under the terms of the Energy Efficiency Act and Building Certificate Regulation, are exempt from building tax for a term of 10 years. This exemption starts from the year after the year of issue of the certificate, and is only valid if RES are used in the building's energy consumption. Under the same terms and conditions, buildings with a category B certificate are exempt from building tax for a term of 5 years.

In the case of Denmark, solar heating plants are exempt from energy tax. Meanwhile, in Germany, to promote environment-friendly sources of energy for heating, there is a tax exemption on the energy tax for all solid biofuels used for heating as stated in the Energy Duty Law. In Sweden, bioenergy solid waste and peat are tax-exempt for most energy uses while taxes on fossil fuels have risen.

Finally, in the UK, renewable heat installations commissioned since July 2009 are due to receive a Feed-In Tariff, or the Renewable Heat Incentive of around 0.06 € per kWh. This income received by domestic users and other income tax payers will not be taxed.

3.3 Reduced tax rates

While the use of reduced tax rates to promote RES is an instrument largely used in RES promotions such as biofuel use (see Del Río and Gual, 2004 and Uytterlinde *et al.*, 2003), only three MSs (France, Italy and the UK) have introduced reduced value-added tax (VAT) rates on components and materials required for eligible heating and cooling systems (EuroACE, 2009).

In France, a reduced VAT of 5.5% is applied to the supply of heat if this is produced from at least 60% biomass, geothermal energy from waste, and recovered energy. Consumers in Italy can also benefit from a reduced VAT (10% instead of 20%) in the case of the refurbishment of a house when this includes the installation of solar-thermal systems. Finally, in the UK, a reduced VAT of 5% is charged on certain energy-saving materials if these are used in non-business buildings or village halls.⁴

Furthermore, in the case of Finland, taxes on heat are zero for RES.

⁴ The reduced VAT covers installations of solar panels, wind and water turbines; ground-source and air-source heat pumps and micro-CHP; and wood/straw/similar vegetal matter-fuelled boilers.

4. Promotion of biofuels in transport via tax incentives

A large variety of biofuel support policies have been in place in MSs, ranging from command and control instruments such as standards and quotas, over economic and fiscal measures such as tax exemptions, to information diffusion⁵. However, from the early 90's of the past century there have been two main instruments which were the basis of biofuels supports schemes in EU: those were subsidization to compensate extra costs of biofuels compared to fossils fuels or prescription of a mandatory uptake in the market.

The first option has been usually implemented by tax exemptions schemes and the second one obliges fuel suppliers to achieve a certain biofuel share in their total sales. Any case, in practice both instruments can be used by national authorities of EU at the same time of others promotion measures.

We focus on tax incentives instruments oriented to promote the use of biofuels in transport. Sections develop above include tax incentives to also promote the biofuels use for green electricity generation and for H & C uses.

From Pelkmans *et al.* (2008) we can conclude that MSs strategies to reach the biofuels targets differ strongly from country to country. This is a result we observe also in the cases of green electricity and H & C exposed above. Some MSs have focused mainly in pure biofuels, while others have stimulated low blending from the beginning.

This section contains an actualized overview in which authors will mention the main tax incentives. It is not intended to give a comprehensive overview.

The use of tax exemptions to promote biofuels in EU is feasible under the conditions settled by the EU Energy Taxation Directive⁶. The most relevant conditions are:

- The tax exemption or reduction must not exceed the amount of taxation payable on the volume of renewable used.
- Changes in the feedstock prices are accounted for in order to avoid overcompensation.
- The exemption or reduction authorized may not be applied for a period of more than six consecutive years, renewable.

But before the EU Energy Taxation Directive came into force, some MSs with a large agricultural sector introduced some tax incentives at the same time at the European Common Agricultural Policy (CAP) reform of 1992. Those were the cases of Germany and France⁷. The fact of having a large agricultural sector with a long tradition and social influence motive those MSs to stimulate the production and use of biofuels. Next, environmental protection was also added as an additional and significant driving force.

The cases of Germany and France were followed in the following years by others MSs as the same time the EU area were expanded. In fact, some MSs add tax incentives to promote biofuels with direct subsidies to farmers who produce feedstock for biofuels uses (i.e. France, Bulgaria, Slovenia, Latvia, Lithuania, Poland and Czech Republic).

⁵ Wiesenthal *et al.* (2009) give information about these complementary policies and measures: support to the cultivations of agricultural feedstock production in the framework of the Common Agricultural Policy, capital investment support to biofuel production facilities and biofuel standards to estimate the wide market introduction of biofuels.

⁶ Council Directive 2003/96/EC of 27 October restructuring the Community framework for the taxation of energy products and electricity.

⁷ Eastern countries like the Czech Republic also introduced tax exemptions in theses years although wasn't an EU MSs in 1992.

A correct overview of tax measures to support biofuels in transport must divide incentives into three main groups. Firstly tax incentive measures have been implemented as tax exemptions included in national mineral oil tax. Secondly, others taxes on GHG emissions have been also used to implemented these types of measures. Thirdly, some incentives were introduced to reduce taxation on ecological cars and biofuel industry.

Related with the first group of measures and following Pelkmans *et al.* (2008), since 1993 until 2003, the German fiscal authority determined that pure biofuels were exempted from the national mineral oil tax although mixed biofuel components fall under full taxation like traditional fossil fuels. However, an amendment of the Mineral Oil Tax Act up to 2004 established that not only pure biofuels, but also mixed biofuels were exempted from the excise tax on mineral oils in proportion to the amount of biofuel that they contain. In 2006 the government switched from the tax exemption policy to obligation schemes. The Netherlands authorities have followed a similar path.

Since 1991 pure biodiesel enjoys a full tax exemption in the Austria's mineral tax and since 2007 there is a tax reduction also for gasoline blended with bioethanol. Tax exemption for ethanol is also allowed in Sweden since 1992 but for all of biofuels full tax exemption is only permit for pilot projects since 1995.

The France incentive system is particularly conducive to the development of biofuels. Since 1992 biodiesel enjoys a total exemption from the internal tax on petroleum products (TIPP). In the case of bioethanol incorporated as ETBE in gasoline the exemption is a partial one (80 %). An interesting tax reform was implemented in France up to 2005. In order to raise the share of biofuels in the market, the French Parliament introduced a general tax on polluting activities (TGAP) for fuel resellers. TGAP is zero if an annual target percentage biofuels is reached⁸.

Joint with France, the Spanish incentive system is particularly conducive to the development of biofuels as they enjoy total exemption from the hydrocarbons tax until 31 December 2012. This special rate is applied to the biofuel volume contained in the mixture.

In 1992 Czech Republic established a zero excessive duty on produced biodiesel. This incentive was valid until 2007 when national government decided to change to a compulsory system (mandatory quotas). Different from Czech Republic, the Poland government maintains the tax exemption introduced in 1993. Incentives also remain valid in the United Kingdom where a duty incentive of 0.30 euro per liter for biodiesel is allowed since July 2002 and for bioethanol since January 2005. Incentives also remain valid in Lithuania (since 2005).

Over the past 4 years, a number of MSs have moved towards obligation or mixed systems to lower the revenue losses. Belgium is a significant case of mixed system where since 2006 exist a quota system for biodiesel (2007 for bioethanol) with tax reduction.

If we considered now taxes on GHG emissions –the second group of tax incentives–, since 2002 CO₂ neutral fuels are exempted from the Sweden CO₂ tax. This is also the case of Denmark.

⁸ A similar scheme was introduced in Germany since 2006 when the government switched from the tax exemption policy to obligation schemes. Then the Germany authorities introduced penalties in case of non-compliance the annual targets for biofuels consumptions. Penalties for non-compliance were been set rather high (> 0.50 euros/litre). As Pelkmans *et al.* (2008) pointed out this gave a good motivation for fuel distributors to fulfil the obligation.

Finally, a third group of tax incentives involves a heterogeneous set of measures oriented to promote industrial activities (biofuels production and the installation of points of sales for biofuels in traditional gas stations) or to promote ecological cars.

Many MSs as Germany have implemented tax incentive in the corporate tax to biofuels industry and to firms with projects related with biofuels.

Flexible Fuel Vehicles (FFV) have also enjoyed tax incentive in some MSs. In 2007, Spain implemented a reduction in the tax on matriculation of vehicles (Cansino and Ordoñez, 2008). This tax exemption is a total one in Ireland and in the case of electrical cars.

Table 3 summarizes our analysis and gives an overview of the MSs which have implemented tax incentives to promote biofuels in the last years.

	Low biodiesel blends (B5)	B30	B100	Low ethanol blends (E5/ETBE)	E85	PPO
Austria	✓		✓	✓	✓	✓
Belgium	✓				✓	✓
Bulgaria	✓		✓	✓		
Cyprus	✓		✓	✓		
Czech Rep.	✓	✓				
Denmark	✓			✓		
Estonia	✓			✓		
Finland						
France	✓	✓		✓	✓	
Germany	✓		✓	✓	✓	✓
Greece	✓					
Hungary	✓			✓	✓	
Ireland	✓		✓	✓	✓	✓
Italy	✓	✓				
Latvia	✓	✓	✓	✓	✓	✓
Lithuania	✓			✓		
Luxembourg	✓		✓	✓		✓
Malta	✓					
The Netherlands	✓			✓		✓
Poland	✓	✓	✓	✓		
Portugal	✓					
Romania	✓			✓		
Slovakia	✓			✓		
Slovenia	✓		✓	✓		
Spain	✓			✓		
Sweden	✓		✓	✓	✓	
UK	✓			✓		

Source: Pelkmans *et al.* (2008)

Table 3. EU MSs and tax incentives

As tax exemptions provoke the losses in revenues for governments, it is interesting the case of Belgium. In this country and to overcoming the revenue losses, authorities promoted a simultaneous increase in the fossil fuel tax so as to render the policy budget-neutral.

The use of tax exemptions to promote biofuel has an additional advantage. As Wiesenthal *et al.* (2009) pointed out; the increasing number of available production pathways with different characteristics in terms of GHG emissions, production costs and potentials implies that MSs may employ differentiated biofuel strategies, favoring specific types of biofuels in order to better serve the objectives underlying their biofuel support policy.

However, the use of tax exemptions provokes a revenue loss. This explains that in the last years it is observed a switch from these types of measures to obligation schemes.

5. Political discussion and main conclusions

Proliferation of RES is a political question. Many measures can be implemented for it. Among them, tax incentives have been used to promote green electricity, RES for H&C and biofuels. Table 4 summarizes these tax measures. This Table also shows the electricity generated from renewable sources as a percentage of gross electricity consumption, the combined heat and power generation as a percentage of gross electricity generation and the share of renewable energy in fuel consumption of transport in 2006 and the incremental points in 2006-2008.

In general, countries that show high percentages also are those that have implemented tax incentives. However, these data do not allow us to assess specifically the effects of tax incentives as they are not isolated actions but in general all countries use a mix of measures to advance the development of RES. Among these measures, the fiscal measures, the others economic measures and the non economic measures such as advertising campaigns are some of them. Among the economic measures should be highlighted feed in tariffs and financial incentives. Among the non-financial measures include the regulation especially important for buildings and fuel. Therefore, besides presenting the data in Table 4, the specific effects of the measures in each country are discussed below.

After analyzing the energy policies of EU-27 MSs, it can be pointed out that the main tax incentive used to promote green electricity by the MSs is the exemption from the payments of excises duties for electricity when the electricity is generated by RES (Germany, Romania, Slovak Republic, Denmark, Sweden, Poland and Finland). This measure has been basically used for reducing the higher prices of production of this type of energy. With the same aim, tax incentives in CCL are implemented in the United Kingdom, a reduction of the ecotax is implemented in Netherlands and some subsidies are used in Finland to offset the excise duty on electricity. Also, lower tax rates in VAT are applied in three MSs, France, Italy and Portugal. Fiscal incentives in direct tax are applied in personal income tax, corporate tax and in property tax. In direct taxes, Belgium and France have designed these incentives as a deduction on the taxable income, which is calculated as a percentage of investment cost of system installed. While Czech Republic has designed it as a tax exemption of the taxpayers income that come from generate green electricity and Luxembourg as a tax exemption to electricity producers that produce electricity exclusively for their own use. The corporate tax incentives consist mainly in a deduction of the profit obtained (Belgium, Greece and Spain), but in Czech Republic, it consist in a tax exemption of the income obtained from generating green electricity. Finally, it can be said that only Spain and Italy uses fiscal incentives in terms of a tax exemption.

UE-27	Green electricity			Heating and Cooling			Biofuels		
	F.I.	2006	Δ2006-2008	F.I.	2006	Δ2006-2008	F.I.	2006	Δ2006-2008
Austria		16.1	-0.8	✓	16.1	-0.8	✓	2.2	4.9
Belgium	✓	8.7	---	✓	8.7	---	✓	0.1	1.1
Bulgaria		6	4	✓	6	4	✓	0.2	0
Cyprus		0.3	0		0.3	0	✓	0	2.1
Czech Rep.	✓	15.1	-0.9		15.1	-0.9	✓	0.1	0.1
Denmark	✓	40.7	5.4	✓	40.7	5.4	✓	0.3	0
Estonia		10.7	-2.1		10.7	-2.1	✓	0	0
Finland	✓	34.9	0.7	✓	34.9	0.7		0.4	1.8
France	✓	3.2	-0.1	✓	3.2	-0.1	✓	2	3.6
Germany	✓	12.5	0	✓	12.5	0	✓	6.7	-0.2
Greece	✓	1.7	0.2	✓	1.7	0.2	✓	0.7	0.3
Hungary		22.4	-1.3		22.4	-1.3	✓	0.1	3.8
Ireland		5.6	0.6		5.6	0.6	✓	0.1	1.1
Italy	✓	9.8	-0.3	✓	9.8	-0.3	✓	0.9	1.4
Latvia		42.6	-9		42.6	-9	✓	1.1	-0.2
Lithuania		14.3	-1.6		14.3	-1.6	✓	1.6	2.4
Luxembourg	✓	10.9	1		10.9	1	✓	0	2
Malta*		0	0		0	0	✓	0	0
Netherlands	✓	29.9	3.7	✓	29.9	3.7	✓	0.4	2.1
Poland*	✓	16	0.9		16	0.9	✓	0.9	2.4
Portugal	✓	11.6	0.3		11.6	0.3	✓	1.3	1.1
Romania	✓	18	-8.4		18	-8.4	✓	0.8	2
Slovakia	✓	27.6	-3.6		27.6	-3.6	✓	0.5	5.8
Slovenia		7.4	-0.7		7.4	-0.7	✓	0.4	1.1
Spain	✓	7.2	-0.2		7.2	-0.2	✓	0.7	1.2
Sweden	✓	8	1.6	✓	8	1.6	✓	4.9	1.4
UK	✓	6.3	0.1	✓	6.3	0.1	✓	0.5	1.5

Source: Own elaboration.

Table 4. Effects of fiscal incentives to advance RES deployment

Literature about energy requirements for heating and cooling has largely focused on new building standards. Government interventions in heating and cooling have mainly consisted of establishing construction standards for buildings in an attempt to increase energy efficiency with respect to heating and cooling requirements.

The revision of the energy policies of EU-27 MSs and the government interventions concerning energy use with respect to heating and cooling, make us to conclude that 23 MSs have adopted additional measures to promote the use of RES for heating and cooling. The implementation of such measures corroborates the opinion of those experts who explain that the increased use of RES can only be achieved if it is accompanied by additional support from government authorities.

Twelve MSs have used tax incentives with a dual purpose, to reduce investment costs and to make renewable energy profitable through a decrease in relative prices. In the first case, the use of tax deductions has the advantage of involving ex-post incentives, although they do not lower the hurdle of the initial upfront payment. Some MSs have thus resorted to reducing tax (VAT) rates to overcome this. In the second case, these measures have been relatively successful when they have been accompanied by other measures that tend to increase the price of alternative energy sources.

Finally, if we focus on the tax measures to support the use of biofuels in transport, we can conclude that, until now, subsidies through partial or total exemptions have proven to be the most successful instruments to raise the share of biofuels use for transport, especially when tax incentives are complemented by other measures.

Additionally, the tax exemptions allow steering the market by applying different reduction rates to various types of biofuels by considering its effects on GHG emissions.

However the losses in revenues for governments which have implemented tax exemptions become high with rising market volumes. As a consequence of that over the past 7 years, a number of MSs have moved towards obligation or mixed systems to lower the revenue losses.

The actual economic crisis has forced the MSs to review the incentive measures of RES. All the measures studied are linked to tax restrictions, so that in times of deficit reduction, all these policies may be affected.

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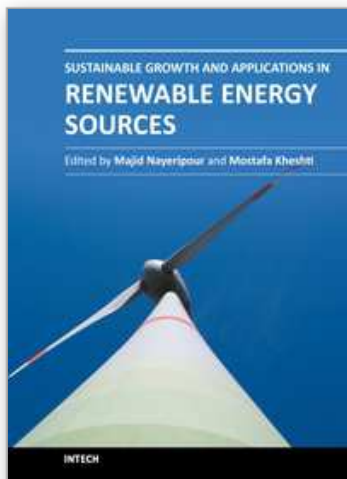
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