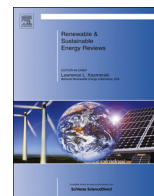




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# Financing instruments and channels for the increasing production and consumption of renewable energy: Lithuanian case



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## ABSTRACT

The growing demand for energy, commitments taken to reduce greenhouse gas emissions, fossil fuel depletion and other issues enforced to accept the decision to analyze financing issues of renewable energy sector worldwide. This paper addresses two financing issues – financing channels and instruments and their impact on energy cost. The analysis revealed that the governmental support in the form of tax reductions and subsidies, and international funds are important renewable energy sector financing channels in developing countries. Availability of private resources increases under the established public–private partnership agreements. Economically advanced countries use a greater variety of financing channels and instruments. Because of high growth of renewable energy sector, some new financing channels are available. The experience of Lithuania revealed that governmental policy encourages investment into the renewable energy sector. Banks found attractive renewable energy technologies after feed-in tariffs increased. EU Structural Funds and tax incentives are available, especially in subsidizing combined cycle electricity and heat generation. Innovative financing instruments provided under the JESSICA and JEREMIE initiatives, as well as investment subsidies are favorable to develop solar energy sector in Lithuania. Seeking to expedite solar sector development in Lithuania it is essential to review a feed-in tariff, which currently is too low and impedes implementation of solar PV technologies. Solar collectors could compete in the district heating sector even without a support.

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## Contents

1. Introduction . . . . .	260
2. Overview of renewable energy sector development worldwide . . . . .	260
2.1. Development of RES consumption . . . . .	260
2.2. Tendencies of new investment into the renewable energy sector . . . . .	261
3. Review of renewable energy sector financing channels and instruments worldwide . . . . .	261
3.1. Financing channels . . . . .	261
3.2. Financing instruments . . . . .	266
4. Methodology for assessment of impact of renewable energy sector financial channel and instrument on RES energy cost . . . . .	268
5. Lithuanian experience in financing renewable energy sector . . . . .	269
5.1. Development of RES consumption . . . . .	269
5.2. Existing renewable energy financing channels and instruments . . . . .	269
5.2.1. Electricity sector . . . . .	270
5.2.2. Heat sector . . . . .	271
5.3. Possible renewable energy financing channels and instruments . . . . .	271
5.3.1. JESSICA initiative . . . . .	271
5.3.2. JEREMIE initiative . . . . .	272
5.3.3. INVEGA fund . . . . .	272
6. Assessment of impact of financing instruments on the costs of solar energy and discussion . . . . .	272

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7. Conclusions .....	273
Acknowledgments.....	275
References .....	275

## 1. Introduction

The growing demand for energy, commitments taken to reduce greenhouse gas emissions, long-standing energy security, energy poverty, fossil fuel depletion and other global as well as regional issues enforce humanity to search for ways on how to develop their energy sectors in future. It is agreed that energy sectors should be developed sustainably, which means that, apart from other actions that are necessarily to be taken, it is essential to use the economically feasible potential of renewable energy. However, because of immaturity of (some) renewable energy technologies, high capital cost and unsuitable pricing of fossil fuel (not in all countries externalities are considered when price for fossil fuel is set), the potential of renewable energy is not sufficiently used. Seeking to increase the use of renewable energy at more rapid rates, governments are implementing various support policies. During 2005–2011 the number of countries with some type of support policy more than doubled, i.e. increased from 55 (2005) to 119 (2011) countries [55]. The implementation of support policy and various support measures highly contributed to increasing the consumption of RES (further in the text RES). However, more and more often scientists state that because of the above-mentioned global and regional issues, huge new investment will be necessary into the renewable energy sector in future. Thus, issues such as how the renewable energy sector should be financed to raise capital and what impact financing instruments will have on energy cost and price for consumer are of high importance. This issue is relevant both in developed and in developing countries in times of slow recovery of the global economy.

Canadian Renewable Energy Alliance [10] segregates three renewable energy sector-related financing issues. They are (1) policies that leverage increased investment into the renewable energy sector; (2) financing channels; and (3) financing instruments. Liming [41] suggests that instead of analysis of policy that leverages increased investment, financing environment should be analyzed. It is understood as favorable regulatory, legislative and policy conditions that are critical for financing renewable energy. This issue was widely discussed in the scientific literature. However, the latter two issues are under the investigation, especially in times of economic recession and slow recovery of the economies. Thus, this paper aims at discussing existing and possible renewable energy sector financing channels and instruments and computing the impact of selected innovative financing instruments on energy cost.

In this paper financing channel is understood as the source of financing renewable energy, i.e. it shows who is financing renewable energy and answers the question “where does renewable energy sector financing sources come through?” Financing instrument is determined as a delivering method of financing.

Section 2 discusses the current status of renewables sector and tendencies of investment into it. Section 3 analyzes renewable energy sector financing channels and instruments. It provides a structural view about financing sources used to invest into the sector and it is dedicated to present financing instruments by disclosing their advantages and disadvantages. Methodology for assessment of impact of selected financing instruments on energy cost is presented in Section 4. Section 5 is dedicated to an overview of the development of RES consumption and present experience of Lithuania in its financing renewable energy sector.

Possible financing channels and instruments are discussed here. Section 6 provides results of computation, which aims at assessing the impact of traditional and innovative financing instruments on energy cost. Considering the results of analysis a discussion on how the solar energy sector could be developed in Lithuania is provided. Finally, conclusions are drawn.

## 2. Overview of renewable energy sector development worldwide

### 2.1. Development of RES consumption

RES is a constituent part of the energy sector and because of benefits provided to the society and economy their role is increasing. With reference to data of International Energy Agency [32,31], RES accounted for 13.1% in global total primary energy supply (further in the text TPES) in 2004 and 2009. However, it is expected to increase the share till 18.1% at the end of 2035 [33] by reducing the share of exhausted energy sources such as oil, coal and natural gas.

Biomass and waste are the dominant types of RES, representing 9.9% in global TPES and 75.9% in global RES supply in 2009. However, their share in global RES supply has a tendency to decrease. Hydro is the second largest type of RES. It accounted for 2.3% in global TPES and 17.7% in global RES supply in 2009. This is by 0.1 and 1.0 percentage points less than in 2004. It is expected that during 2009–2035 the volume of hydro power will be increasing by 2.1% a year and will exceed the growth rates of fossil fuel and nuclear energy; however, the share of it will have a reducing trend. Geothermal energy is the third largest type of RES at the global scale. It provided 3.9% in global RES supply in 2009. This is by 0.7 percentage points more than in 2004. The contribution of wind, solar and tide energies is still minor. With reference to data of International Energy Agency [32], they accounted for 0.3% in world TPES and 2.5% in global RES supply. Because of the rapid development of wind, solar and geothermal capacities in future, the share of these types of energies will triple, i.e. will increase till 22.4% (2035) in the structure of global RES supply.

The data provided by the International Energy Agency showed that during 1990–2009 renewable energy sector grew at an average annual rate of 1.8%, which was slightly higher than the growth rate of global TPES (1.7% a year). Growth rates were particularly high for solar photovoltaic (further in the text PV) (43.5% a year) and wind power (25.1% a year) [32]. However, this is due to the fact that their bases were very low in 1990. Biogas had the third highest growth rate (14.9% a year), followed by the liquid biofuels and solar thermal, which both grew at 10.0% a year. Solid biofuels (including charcoal) experienced the slowest growth (1.2% a year) among the RES.

International Energy Agency [32] expects that renewable energy sector will remain one of the fastest growing energy sectors in the world during the next two decades. It will grow at an average annual growth rate of 2.5%, when the world primary energy demand will increase by half as big (by 1.3% a year), and will guarantee for future generations the supply of energy. But seeking that this will be realized additional new investment is required.

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