Scientific Online

SOP TRANSACTIONS ON ECONOMIC RESEARCH
ISSN(Print): 2372-3246 ISSN(Online): 2372-3254
VOLUME 1, NUMBER 2, JUNE 2014

SOP TRANSACTIONS ON ECONOMIC RESEARCH

Endorse of Renewable Energy Plants, Still An Alternative Investment in Spain?

Inmaculada Guaita-Pradas[1]* and Bernabé Marí Soucase[2]

[1] *Departament d' Economia i Ciències Socials, Universitat Politècnica de València, Camí de Vera s/n, 46022 València, Spain.*

[2] *Departament de Física Aplicada, Institut de Disseny I Fabricació, Universitat Politècnica de València, Camí de Vera s/n, 46022 València, Spain.*

***Corresponding author**: iguaita@esp.upv.es

Abstract:
The development of renewable energy technologies depends on two main factors: progress of the related technologies and incentive policies. Long-term incentive policies are essential to achieve progress and spreading of clean energies. However, this scenario is not always met and in some countries some confusion emerge owing to the lack of stable incentive policies. This paper deals with the financial and economical analysis of a standard investment in renewable energy photovoltaic systems in Spain. Main investment parameters related to photovoltaic solar energy plants in Spain during the last decade have been analyzed. Net present value, payback and internal rate of return of a typical 20 kWp photovoltaic solar plant have been calculated in the frame of the recent history of energy policies in Spain. Despite the high variations of incentive policies withdrawn by renewable energy plants, we demonstrate that the evolution of related technology and market has been able to surpass the absence of long-term policies and even nowadays the photovoltaic systems can still be considered as a profitable investment from the economic point of view.

Keywords:
Renewable Energy; Photovoltaic; Rate of Return; Corporate Profits

1. INTRODUCTION

Future challenges in sustainable development include the use of renewable energy sources. Some countries are making efforts in this direction to battle climate change such as global warming and exhaustion of natural resources. Thus some countries have launched disparate legislation in order to promote the use of sustainable energy sources [1]. A key issue to encourage the diffusion of sustainable technologies should meet simultaneously two issues; the technical effectiveness and economic efficiency. Technical effectiveness depends on the progress of technologies involved. Economic efficiency is essential for dissemination and progressively replacement of other technologies that do not meet sustainability requirements. A good example can be found in Spain in the promotion of electricity through solar energy.

The Energy Sector has moved from a regulated and monopolistic sector to a deregulated, uncertain and highly competitive sector. Forecasting of growth for renewable energy sector is, without any doubt, a crucial fact. And this represents an opportunity business that companies could not afford to pass

up. Investment decisions today can lead to situation in the future that will be unsustainable even the bankruptcy of firms.

The present scenario concerning climate changes and global warming has indeed favoured investments in alternative energy sources, which are characterised by their sustainability and respect for the environment. Among these conditions we can underline: economic stability, low interest rates, high-energy prices, and change in the cultural values [2]. In addition the development of new and appropriate technologies, issues related to their financial and economic viability and financing of renewable energy systems are being given considerable importance. However, despite all the above the promotion of clean energy strongly depends on incentive policies, as was the case in the countries were these technologies has developed: USA, Great Britain, German and Spain; even though these incentives have not been the panacea to the energy problems [3].

Photovoltaic (PV) solar energy generation development in Spain began in the early 90's due to the first Government announce of incentives for the generation of energy from renewable sources. The Royal Decree (RD) 2266/1994 established some facilities for the generation of energy from renewable resources under what was call 'special regime'. The main argument of RD 2266/1994 and subsequent RD 2818/1998 was the possibility for grid connexion of the energy generated from renewable resources as well as the establishment of a tariff for the energy supplied to the grid. However, regarding PV solar energy generation, very few activity was developed during this period mainly because the industry was not still prepared for bursting the production of PV installation components and because the electrical companies were not interested in facilitate the grid connexion to small PV installations. This scenario changed drastically after the release of RD 661/2007, which provides the duty to electrical companies for regulating and facilitating the grid connexion of all PV installations. This RD created a spectacular rise in the number and power of grid-connected PV installations as well as in the number of all kind of companies devoted to take profits from renewable energy-related incentives [4].

However, after this initial spread of PV installations and industry, the consecutive Spanish governments released several Royal Decrees all of them pointing to a continuous lowering of PV-produced energy tariff. The main consequence of these RD released from 2008 to nowadays have led to the practical annihilation of the Spanish PV industry.

PV industry is presently expecting the publication of the market regulations for grid parity and self-consumption. Until the publication of the grid-parity RD the Spanish PV industry is in stand-bye and the few Spanish companies that have succeeded in surviving to convulsive last three years are awaiting the establishment of durable policies that impede or reduce the chaotic situation recently experienced.

In this paper, we analyse the evolution of the costs of PV installations and their comparison with the changes of tariffs and incentives for the generation of energy with PV origin. Return analysis and other financial parameters of PV installations in Spain and its dependence with the release date of such PV installations have also been analysed. The main conclusion is that in spite of the elimination of all kind of incentives to renewables energies both industry and market have succeeded in lowering the cost for PV installations and PV solar energy investments are still able to provide profits.

2. LEGAL AND ECONOMICAL FRAMEWORK

With the technological evolution in the production of energy with PV plants and the political target for environmental sustainability a variety of policy initiatives has set ambitious implementation aims for the installation of building-integrated PV plants in grid-connected allocation.

In 2005 Spain launched the first 'Plan de Energías Renovables 2005-2010'. Since then the regulation of the Renewable Energy has been through a sequence of Royal Decrees without a coherent plan with

well-defined target in the long term. Successive Royal Decree designate rules on the supply side: setting fees, limiting production, displaying the time horizon, establishing energy policy guide-lines in each one of the RD. In 1998 was published the firstRoyal Decree dealing with regulation of energy production from renewable sources, where the remuneration fees depended on the market price and special supplement for reactive energy. So the fees were 66 pts/Kwh (39.75 c€/Kwh) for PV installation smaller than 5 Kw and 36 pts/Kwh (21.69 c€/Kwh) for the rest. The change from the "peseta" to the euro was implemented the RD 841/2002 in the same way that the previous RD. The most effective change for promoting the production of electricity through PV was introduced by RD 436/2004 when the tariff was in fact attractive on account of it was a percentage (525%) of the publishing tariff for the first 25 years and 460% for all other years. This percentage was reduced to this advantageous conditions were limited to a power less 100 Kw. For larger plants, the conditions were equally favourable with 300% of the publishing tariff plus 10% on incentives and a premium of 250%, after year 25 the conditions were also very favourable. According to the Spanish Association of photovoltaic Industry, this status was unsustainable, so in 2007 it has been reached of 643 MW for PV supply [5].

Consequently a new RD published in May 2007 fixed a tariff of 44.0381 cents€/kWh for the first 25 years in installation of less than 100 kW, and 32.2305 cents€/kWh for all other years. For more powerful installations till 10MW tariff was enhance near 4%, but for large-scale installations tariff declined in 47%. The main target in the RD was the sustainable development, what justifies the economic public investment and the market stability.

In 2008, RD 1578/2008 was published with the aim of fostering research and development expenditure to reach a reduction in cost for manufacturing of solar panels; and to ensure that a high yield does not attract speculative capital flows. Consequentiality the tariff became dependent on the quota of the installed power in each quarterly call: if less than 75% of the quota was covered then the current tariff is maintained. In other cases a relation is established in order to reduce the tariff and the return. This RD also distinguishes between installations on ground-mounted and rooftop; in order to promote the multifuncionality of the second one a starter high tariff was established. A special support for installation less than 20 Kw was fixed so as to provide more favourable conditions in small plants on roof designees to industry that diversifies business.

With the scenario previously described the growth of the solar photovoltaic sector was outstanding and with increased impact on expenditures side of public budget. This is at the origin of the main criticisms of the detractors of renewable energies. According to the 'Comision Nacional de los Mercados y la Competencia (CNMC)' tariff deficit, which directly affects the public budget, is estimated in 4.481 million euros for 2013, although only 31% is incurred by the regulated tariff for all renewable (solar, biomass and wind). Data provided by the same CNMC indicate that the increased deficit rate from 2002 to 2012 is due to renewable energy incentives by 38% and the rest (62%) is due to other factors, among which we can highlight the lack of income adequacy of the costs in the electricity sales.

Despite the obvious opportunity cost of the regulated tariff, the effects on the environment and its positive impact on future generations have also been taken into account.

To lessen the impact on the public budget, a new RD was published in 2010 in order to limit the production hours and reduce tariff deficit.

After the general election, in November 2011, the new government suspended the effective legislation regarding to new photovoltaic plants. At the moment in Spain we wait for new enactment concerns energetic policy.

To illustrate the importance of certain financing variables on PV plants, a financial analysis model used in the private industry is applied [6, 7]. In the case of PV systems, it is necessary to work out its economic viability so that the users of the technology may know its importance and can utilize the area under their command to their best advantage. An effective economic analysis can be made by the knowledge of

cost analysis, using cash flow diagrams. First of all, we define the Cash-Flow is as the movements of money into and out of any business; it is the primary indicator of business health [8]. For analysing the profitability of the inversion several Capital Budgeting Criteria have to be used. Pay-Back (PB), Net Present Value (NPV) and Internal Rate of Return (IRR) are widely used to perform profitability analysis. Let us define these criteria [9, 10].

The PB is the number of years necessary to exactly recover the initial investment (Capital Outlay), is computed by summing the annual cash flow values and estimating the period through the relation. PB analysis provides an easy to apply and intuitive decision process. However, PB suffers many well-known deficiencies as an investment analysis tool with the most obvious being the inability to distinguish between short and long-lived investment.

The NPV is the difference between the value of incomes and the expenses from an investment, up to date at the investment time, thus the NPV provides an estimate of the net financial benefit provided to the organization if this investment is undertaken [11]. A positive NPV means a positive surplus indicating that the financial position of the investor will be improved by undertaking the project. Obviously, a negative NPV would indicate a financial loss.

$$NPV = -K + \int_{j=0}^{n} \frac{Cash\ Flow_i}{(1+k)^j} \tag{1}$$

where K is the capital outlay, k is the interest rate, and n is the technology life [12].

Despite of the NPV is an easy to use, intuitive tool which also presents some limitations related to (i) the discount rate chosen for its estimation; with a very low value of interest rate, an alternative with benefits spread far into the future may unjustifiably appear more profitable that an alternative whose benefits are more quickly realized but is of a lower amount in undiscounted terms; (ii) the distinction between project with capital outlay and smaller cost, thus the NPV does not give any indication of the scale of efforts required to achieve the results.

The IRR is a discounted of investment worth and is used as an index of profitability for the appraisal of projects. The IRR is defined as the rate of interest that equates the NPV of a series of Cash-Flow to zero. Mathematically the IRR satisfies the equation [13]:

$$0 = -K + \int_{j=0}^{n} \frac{Cash\ Flow_i}{(1+IRR)^j} \tag{2}$$

IRR is widely accepted and used in the appraisal of projects because it is an indicator of the expected return of investment profitability. IRR can be easily compared with the banking worth rates or the cost of the funds used to finance the project.

3. RETURN FOR A SOLAR PV PLANT (2004-2013)

To show the evolution of the profitability of a PV plant we have analyzed the cost of installation of a PV facility from 2005 to 2013 as well as the returns provided by such installation. **Table 1** displays the average cost of a PV power plant in €/Wp(column b). Column (c) shows the capital outlay for a typical installation of 20kWp, which starts for 130,000 €in 2005 and drops to 50,000€in 2013. The cost values for PV installations are the average of prices given by three Spanish PV modules suppliers (Eurener, Siliken and Isofotón) specialized in fabrication and supply of solar PV installation under the method call 'Turnkey'. Turnkey projects are suitable for investors because no technical knowledge is required. The full responsibility of the PV installation depends exclusively on the supplier. It is worthy to notice that the cost of PV power plants has been reduced 2.6 times over the period 2005-2013. This is a clear indicator of the evolution experienced of PV technology and also the broadness of the related market.

Table 1. AVERAGE MARKET COSTS FOR PV POWER PLANTS

(a) YEAR	(b) COST (€/Wp)	(c) CAPITAL OUTLAY FOR A 20kWp PV PLANT (€)	(d) PV electric tariff (c€/kWh)
2005	6.5	130,000	42.1498
2006	6.4	128,000	44.0381
2007	5.5	110,000	44.0381
2008	5.3	106,000	45.5134
2009	4.5	90,000	35.6672
2010	3.8	76,000	34.9398
2011	3.0	60,000	31.3542
2012	2.7	54,000	26.6208
2013	2.5	50,000	16.1134

(a) Time period. (b) The cost per Wp is the average in every year for PV plants supplied in the modality 'turnkey'. The average was calculated from the prices given by three important Spanish PV module producers and suppliers (Eurener, Isofoton and Siliken). (c) This column displays the capital outlay for a typical PV plant with a power of 20kWp. (d) PV electric tariff in c€/kWh. Its value depends on the RD in force during the year.

Column (d) shows the tariff for electric energy provided for PV plants in the frame of the RD in force in every moment. From 2005 to 2009, a moderate decrease of costs of PV plants occurs while the electric tariff rises. As a result higher profitability for PV plants are expected and this fact attracted lot of investors looking for safe returns for PV investments in Spain.

The origin of the decrease in the installation cost of PV systems is related to the attempt to maintain their profitability, which could decrease by lower electricity tariffs, as shown by the fact that in 2009 the tariff has decreased more than 15%. In 2013 the budgetary unsustainability of this system leads to the abolition of the special regime for the production of solar energy. So since 2013 the market fixes the electric tariffs.

The development of new and appropriate technology entails its corresponding financial and economic viability. This area involves: project cost control, profitability analysis, analysis planning, etc. The main factors that affect to economic analysis are: capital outlay, tariff electricity, solar hours (production), annual maintenance cost, annual insurance cost, and life of the solar PV installation and salvage value.

To make clear the profitability variation of an investment in a photovoltaic power plant due to successive amendments of the managerial regulation in electricity market and public subsidies to the production of electric energy through solar panels, in this research we have applied the capital budgeting criteria to photovoltaic power plant of 20 kW peak, mounted over a warehouse roof or any other roof with a surface of 200 square metres around.

In the same way we apply capital budgeting criteria to a 20 kWp solar PV installation, taking the starting activity at the beginning of year from 2004 to 2012, inclusive. So, the costs and benefits of eight PV plants have been carefully analysed.

The energy production of a PV system is the product of the peak power of the installation and the average of Peak Sun Hours (PSE) in Spain, taken as 1,494 h. Technical specifications for solar panels warn power degradation estimated in 0.5% each year, this characteristic/detail has been taking in account in all SPV analyses.

The applied tariff for solar PV electricity generation has been the current tariff published each year; and it has make use of prevalent legislation every year; and later each solar PV installation is studied with a lifetime of 25 years, because the PV modules manufacturer guarantee an electricity production of PV modules higher than 80 % after 25 years. In the appraise of the tariff we have been taking into account an

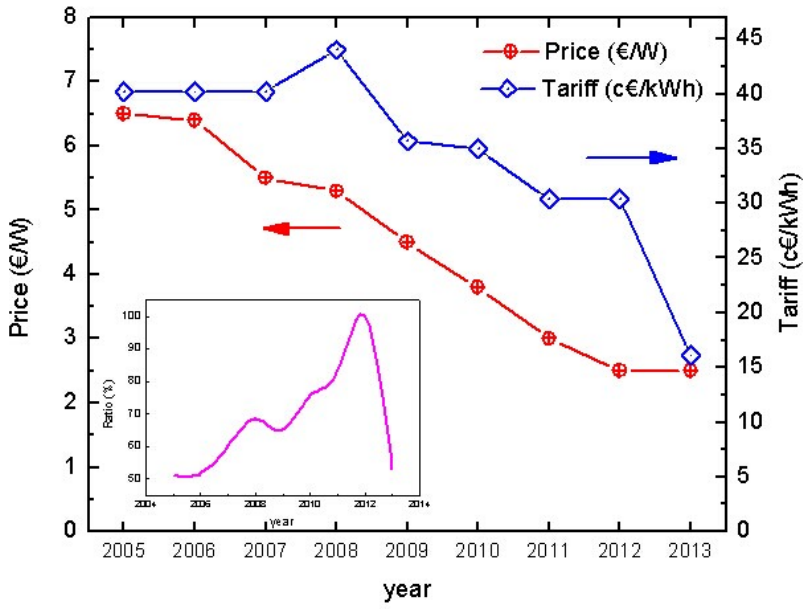

Figure 1. Temporal evolution of Cost and Tariff for solar PV plants in Spain. Inset: Ratio Tariff/Cost normalized to its maximum.

inflation rate of 2% yearly.

The expenditures considered in the solar PV installations are insurance and maintenance. With the aim of include inflation these payments were conditioned to yearly incomes, and prevailing market conditions. In Spain these charges are estimated to be 3% of income for the maintenance and 6% of income for insurance.

To estimate the capital outlay prevailing market conditions have been used, for a solar PV power plant of polycrystalline silicon of 20 kW peak power.

Technological development in Europe and incorporation of China to the manufacturing of solar PV modules has contributed to the reduction of the capital outlay for an installation. At the same time that tariffs for PV electricity injected to the network and has come down. Both facts are shown in **Figure 1**. During the different RD regulations PV installation has been classified according to different criteria such as power and location of PV installations we have selected the most common PV installation in Spain, which is a PV installation of 20 kWp located over roof.

Figure 1 shows the evolution of PV tariffs for the above-mentioned PV installation. Tariffs have been extracted form the corresponding RD listed in **Table 1**. It is worth to note that prices (tariffs) plotted in **Figure 1** are for electrical energy of PV installations that start to inject energy to the network at the price given by the RD in course at the moment. Since the beginning of 2013 it is not longer possible to connect PV installation to the network. Only the PV installations previously registered in the Ministry of Industry conserved this right. Even though the decree regulating the grid connection of new PV installations, the tariff plotted for 2013 is the average of the cost of electrical energy in Spain at the time this paper was prepared.

The trend followed by the electric tariff is similar to that trailed by the electric tariff, which progressively decreases with time. The inset in **Figure 1** shows the ratio between the electric tariff and the cost for a PV plant normalized to its maximum, which was reached in 2012. This ratio displays a growing tendency till 2012 when the support to generation of electric power with PV plants was removed. After the suppression of any renewables incentives in 2013 the ratio drops to the same value attained in 2005. This ratio is a

Table 2. Payback, Irr and NPV for PV solar plants in Spain

Year	PB (years)	IRR (%)	NPV (4%)	NPV (7 %)
2004	10.73	9.48	95,908.92 €	33,736.55 €
2005	9.94	9.74	100,859.80 €	37,359.87 €
2006	11.42	9.95	103,230.68 €	39,710.25 €
2007	10.07	12.09	126,043.25 €	61,177.98 €
2008	11.67	9.65	81,519.50 €	29,679.90 €
2009	10.34	11.58	96,934.29 €	45,214.37 €
2010	9.76	12.55	94,012.36 €	46,987.89 €
2011	9.24	13.57	84,613.27 €	44,610.69 €
2012	13.63	7.37	26,043.94 €	2,270.30 €

good indicator of the potential viability of an investment project. The inflexion points in the electric tariff are always due changes in electric tariffs. The aim of this curve is to show graphically the effect of the electric tariff regulation policy on the expected benefit on a solar PV plant. One can expect that the ration tariff/cost is proportional to the profit of the inversion. The ratio tariff/cost reached its maximum in the beginning of 2012, simultaneously at the release of RD 1/2012. In our opinion this fact is related to the lack of expectative for renewable market in Spain. As a result of the mentioned RD, most companies operating in Spain decided to sell out their stock of PV modules so producing a drop in the price of PV modules. Indeed next challenge is the achievement of 'grid parity', which depends on both the average price of electricity and the cost of solar energy PV installations.

Taking into account all the scenarios described above we have calculated the main economical parameters for the PV installations as a function of the moment when the PV installation was launched. **Table 2** shows PB, IRR and NPV for investments in PV solar plants in Spain. As both PV installation costs and electric tariff have been varying along time the behavior of investment parameters such as Payback, IRR and NPV are highly dependent of the moment when the installation was launched.

The Payback remains quite constant during the period. There are not significant differences except for 2012 when previous incentives for the production of electricity with solar PV technologies were abolished. In 2012 the recovery of the investment increases more than 4 years, while from 2004 to 2011 was between 10 and 11 years.

The NPV obtained for the whole period is positive, calculated at a rate of 4% and 7%, respectively. It means that the PV installations provide positive benefits. This result should encourage investors to make investment in PV electricity production in Spain.

Figure 2 displays the IRR for photovoltaic solar installations in Spain in the last decade and it is compared with the 10 years average of Public debt.

To estimate the IRR each year, as usual in this type of calculus, we have taking in account the cash flow generate for each installation every year during 25 years of economic life of the solar PV panels (Equation 1). To obtain net return we have taken into account the cost of capital. In this study we are not look into this cost, but it should be mentioned that the IRR is, in all the studied period, above the average bank interest rate in Spain. The lowest IRR is in 2013 (7.37%) under assumption that we are in the grid parity in the electricity market in Spain.

As can be seen the results obtained for IRR in all the PV plants are positive, which means that the investment is profitable in all period with a growing trend until the suppression of special regime. To contextualize the results for IRR have been compared with return for financial investment in Spanish public debt for 10 years. According to **Figure 2** the placement funds in PV plant always exceeds the return for financial investment in Spanish public sector. As stated above, after 2012 all incentives to

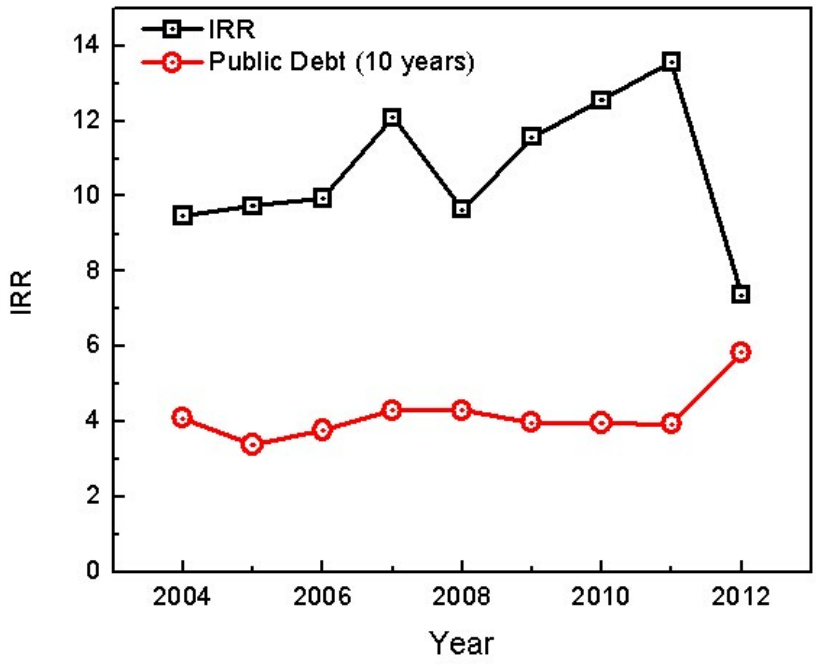

Figure 2. IRR for PV solar installations and public debt in Spain.

PV plants were abolished but nevertheless it is an encouraging indicator that PV plants maintain the profitability over 10 years public debt. That means that changing the energetic policy in Spain is closer to a political option rather than a budgetary issue, at least in photovoltaic. Furthermore, taken into account that the investment in solar PV is low risk because it is subjected to special regime with assured tariffs during 25 years and contributes to economic and environmental sustainability goals.

4. CONCLUSION

The potential for PV plants is enormous in Spain, but depends on future prevailing legislation. Several years of incentive policies for renewable energies in Spain mainly related to tariff regulations, the grid-parity for photovoltaic installations has been reached or they are very close. In spite of the apparent chaos occurred with the incentives the policies developed in Spain has succeeded. However, the legal frame concerning stable and long-term rules is still waiting its full definition. The incentives related to photovoltaic energy installations as well as the rest of renewable sources have been reduced in the last decade but the drop in the costs of photovoltaic installations has compensated the tariff reductions. Therefore, having eliminated the incentive tariffs its undesirable effects on the public budget have also vanished.

We have demonstrated in this paper that the required investment in PV solar plants has low risk because the investment is mainly released in the beginning, the reliability of related technology is guarantee for 25 years and the raw materials (Sun irradiation) are assured at zero cost. The main risk factor involves the legal frame in which this business has to survive. Tariff limits, limitations in irradiation sun time or any kind of new taxes for producing clean energy are the main risks of this activity.

To guarantee the future of renewable energies in Spain a legal frame has to be established and the suitable characteristic of new legal frame should guarantee its long-term stability. Owing to the special climate

conditions in Spain and the filter suffered recently in PV industry, the development and dissemination of renewable energies is assured if long-term regulation rules are put in place.

5. ACKNOWLEDGEMENTS

This work was supported by European Commission through grant NanoCIS (FP7-IRSES ref. 269279).

References

[1] R. Haas, C. Panzer, G. Resch, M. Ragwitz, G. Reece, and A. Held, "A historical review of promotion strategies for electricity from renewable energy sources in EU countries," *Renewable and Sustainable Energy Reviews*, vol. 15, no. 2, pp. 1003–1034, 2011.

[2] T. Couture and Y. Gagnon, "An analysis of feed-in tariff remuneration models: Implications for renewable energy investment," *Energy Policy*, vol. 38, no. 2, pp. 955–965, 2010.

[3] L. y J. A. and S. X., "Design of an economically efficient fieed-in tariff structure for renewable energy development," *Energy Policy*, vol. 36, pp. 981–990, 2008.

[4] J. I. L. Hurtado, R. de Francisco Fernández, B. Y. M. Soria, A. A. Alonso, L. M. G. Gutiérrez, and P. R. Castelló, *Energía solar: estado actual y perspectiva inmediata*. Catedra Rafael Mariño de Nuevas Tecnologías Energéticas, 2007.

[5] A. de la Industria Fotovoltaica, "ASIF," *Informe anual*, vol. 2010, 2010.

[6] K. Bennouna, G. G. Meredith, and T. Marchant, "Improved capital budgeting decision making: evidence from Canada," *Management decision*, vol. 48, no. 2, pp. 225–247, 2010.

[7] B. Fernandes, J. Cunha, and P. Ferreira, "The use of real options approach in energy sector investments," *Renewable and Sustainable Energy Reviews*, vol. 15, no. 9, pp. 4491–4497, 2011.

[8] A. SUÁREZ, "Decisiones óptimas de inversión y financiación en la empresa," *Edición. Madrid: Ediciones Pirámide*, 2005.

[9] T. Jackson and M. Oliver, "The viability of solar photovoltaics," *Energy policy*, vol. 28, no. 14, pp. 983–988, 2000.

[10] S. Awerbuch, J. Dillard, T. Mouck, and A. Preston, "Capital budgeting, technological innovation and the emerging competitive environment of the electric power industry," *Energy Policy*, vol. 24, no. 2, pp. 195–202, 1996.

[11] J. Jackson, "Promoting energy efficiency investments with risk management decision tools," *Energy Policy*, vol. 38, no. 8, pp. 3865–3873, 2010.

[12] J. Jackson, *Energy Budgets at Risk (EBaR): a risk management approach to energy purchase and efficiency choices*, vol. 422. John Wiley & Sons, 2008.

[13] M. Hossain, J. Woods, and B. Bala, "Optimisation of solar tunnel drier for drying of chilli without color loss," *Renewable Energy*, vol. 30, no. 5, pp. 729–742, 2005.

About This Journal

ER is an open access journal published by Scientific Online Publishing. This journal focus on the following scopes (but not limited to):

- Applied Economics
- Business Management
- European Economics
- Financial Economics
- History of Economics
- Macro-Economics
- Meso-Economics
- Micro-Economics
- Models for Economics
- Principle of Economics
- Regional Economics

Welcome to submit your original manuscripts to us. For more information, please visit our website: http://www.scipublish.com/journals/ER/

You can click the bellows to follow us:

- Facebook: https://www.facebook.com/scipublish
- Twitter: https://twitter.com/scionlinepub
- LinkedIn: https://www.linkedin.com/company/scientific-online-publishing-usa
- Google+: https://google.com/+ScipublishSOP

SOP welcomes authors to contribute their research outcomes under the following rules:

- Although glad to publish all original and new research achievements, SOP can't bear any misbehavior: plagiarism, forgery or manipulation of experimental data.
- As an international publisher, SOP highly values different cultures and adopts cautious attitude towards religion, politics, race, war and ethics.
- SOP helps to propagate scientific results but shares no responsibility of any legal risks or harmful effects caused by article along with the authors.
- SOP maintains the strictest peer review, but holds a neutral attitude for all the published articles.
- SOP is an open platform, waiting for senior experts serving on the editorial boards to advance the progress of research together.