THE ROLE OF REGULATORY INSTRUMENTS FOR RENEWABLE ENERGY PROJECTS SUCCESS: THE CASE OF COLOMBIA

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Overview

In this paper significance of regulatory instruments role for renewable energy projects in Colombia is analyzed. Impact on creating low carbon-index scenarios is viewed in the context of a stable energy portfolio mix. Energy policy is investigated with respect to macroclimatic circumstances in Colombia and the overall dominance of hydroenergetic capacity in the power market. The focus is on the contribution of the regulative policy for existing economic conditions and possibility to improve noncompetitive traders actions in a long run. The legal framework is compared to the current status and perspectives of renewable energy deployment, as well as several contribution funds. It is noted that fiscal incentives have a major part in the promotion of renewables, which could be potentially harmful for the system, if other instruments are not implemented. Varieties of new policies are suggested, pointing out their advantages for costs options flexibility. Influence of tax exemptions on renewable energy projects show reliability level for non-pollution technologies. Rural electrification is seen as an important chance for renewable energy and grid progress, including a positive impact on social welfare. Practical examples of new renewable energy targets provide an insight into the most valuable sources of sustainable energy supply. In the paper most prevalent mechanisms of diversified energy mix are identified for specific requirements of renewable energy projects success in Colombia.

Keywords – Renewable energy, regulatory instruments, Colombia, energy policy

1. Introduction

As the new "Intergovernmental Panel on Climate Change" fifth Assessment and Synthesis report are ready for implementation in contemporary business scenarios of sustainable energy systems, the quest for global warming mitigation is already well established. The need for decisive actions and review of effective CO_2 and green house gas reduction strategies will have a major impact on generations to come. The energy mix scenarios should conserve key resources in accordance with demand of the retail energy sector, but should also include intangible assets which provide disruptive innovations for alternative energy sources. Within fourth item of article 2 of Kyoto Protocol it is stated that each country should elaborate policies and measures for research, promotion, development and increased use of new and renewable forms of energy with respect to its national circumstances (United Nations, 1998). The focus is on government policies to foster promotion of RES (renewable energy sources) that will shed light on the future energy mix. The diffusion of new technologies should not be allowed without the comparative element, as their influence could potentially conflict with national objectives. The evolution of market structure in developing economies often seeks for deregulation of the energy sector. Deregulation process needs to be monitored and fine tuned after the initial phase is finished, in order for private companies not to lose faith in policies stability (Larsen et. al, 2004). The Colombian regulatory instruments model shows us how alternative scenarios evolve efficiently in a transitional environment, how some market problems are solved and what further perspectives are ahead for the regulator/government agenda.

After the Colombian Congress signed the *Ley 697 de 2001* Law that promotes efficient use of energy, in 2002 Colombia joined other 81 countries to establish the "Johannesburg Renewable Energy Coalition" to support RES initiatives on a regular national basis (European Commission, 2005). This period could be considered as the development phase of RES incentives, even though many policies were still not effective in the deployment. It was in a way expected outcome for the first couple of years, having in mind that the Colombian power system was restructured from government monopoly to a market-oriented system during the 1990s. Incentive schemes for new installed capacity came as a result of state-owned companies' privatization, which was one step more in path of resolving intermittence problem for RES. The barriers for implementing liberalization policies still exist, considering that during the 1990s goal was to create a high competitiveness through the sale of public assets, aiming to serve the public debt of the country, as well as to fulfill other social needs (Zuluaga and Dyner, 2007). Further development and grid integration is examined in this paper

with regards to regulative instruments, since there is an urge to hedge the existing system. Even though the improvements are noticeable, there are some concerns about public statements for RES, for example study published by UPME (Mining and Energy Planning Unit) where it says "at least during this decade, it is clear that reducing carbon emissions is not a priority that determines (at least significantly) investment goals" (Batlle and Barroso, 2011). If we bear in mind that RES capacity costs are falling rapidly and could affect positively electricity pool-price, it is important to investigate the current status of RES support schemes both for rural and large scale electrification.

It is necessary for regulators and governmental agencies to understand more than just initial conditions of supporting options in terms of its content. A combination of several economic policies is favorable for the penetration of non-conventional energy sources. Development of indigenous renewable industry in Colombia is mainly consisted out of tax incentives, exemptions and refunds. Basic types of these instruments are:

- Law 788 of 2002: Article 18 states that energy produced by power generating companies from wind, agricultural waste and biomass is exempted from income tax if: a) they participate in emission certificate market according to the Kyoto protocol, b) 50% of obtained sales income are invested in social projects of the region.
- Law 383 of 1997 Article 126-3 Investors in form of legal entities or income taxpayers which invest research and development projects approved by the National Science and Technology Council shall have right to deduct 125% from their income in the taxable period.
- Decree 2532 of 2001 Environment Ministry will issue one year period qualifications certificates for the value added tax exclusion purposes.
- Tax Statute Article 6 "Equipment, items and machinery used for energy consumption reduction and/or energy efficiency projects, programs or activities" are VAT exempted.
- Law 697 of 2001 and Decree 3683 of 2003, which incorporate research funding for energy efficiency and include renewable options for non-interconnected regions.
- Law 1715 of 2014 is issued to integrate new legal framework to promote tax incentives to develop RES beyond the reliability framework of the OEF (*Obligaciones de Energía Firme*).

2. Current system of renewable energy deployment in Colombia

The key driving force for energy resources in the case of Colombia is diversification of energy supply and efficient selection criteria for policy instruments. Modest target of 6.5% of renewables in total energy for year 2020, excluding large hydro (above 20 MW) is covered by a sustainable policy portfolio, including a variety of social provisions. Furthermore, RES developers under 20 MW are exempted from a reliability fee to remunerate for reserve power (IRENA, 2015). Impressive hydrological capacity of more than 3,500 GWh generated per month and share of 63% in the Colombian power system could also be a weakness due to frequent weather changes caused by the macroclimatic phenomena "El Niño South Oscillation" (ENSO). On the other hand, studies show only about 643 MW installed of around 25,000 MW sources for small hydro potential (MinMinas, 2012). Strong financial position of power energy companies and capacity payments mechanism to increase the revenues of generators suggest that small hydro plants have big potential to influence capacity margins. Constructive effort was made from 2001 to 2010, where more than 50% (new 387 MW) came on small hydro central stream. Since these plants have low operating costs and high profit margins, they are always scheduled for dispatch at the spot price (Olaya et. al, 2016). Capital investments in hydro sources reached their peak level, with highest growth in South America for the last decade. Between 2014-2018 hydroelectric power will increase by 5,443 GWh per month as projects Ituango and Porvenir II launch. With the second stage of Ituango between 2022-2028 hydroelectric generation is expected to reach a 6,200 GWh per month of (UPME, 2014). Although this discrepancy between hydro and other RES growth looks troublesome, it made an impact on creating a relatively low carbon index of 22.54 tCO_2/TJ in 2006, making Colombia the only South American country that reduced its carbon index from 1990 (Ruiz-Mendoza and Sheinbaum-Pardo, 2010). Some analysis even show that, under 50 US$/ tCO_2 tax policy, there will be a full decarbonization of the electricity sector by 2050 with higher hydro energy deployment and a 45% higher wind energy than in the baseline scenario (Calderon et. al, 2016). The advantage is also noticeable in estimating the contribution of hydro power company, which is based on optimization model for critical hydrology.

However, this is not the case with thermal power plants, whereas they are typically backed up by a long-term fuel contract. Concerns about gas supply security and noncompetitive actions from sellers made long terms, take-or-pay gas contracts undesirable in Colombia. Low capacity utilization factor of thermal plants, mostly capable running in the dry season is not matched with steady power demand growth of 2% per year. Nevertheless, large scale projects tend to be successful, as feasibility studies show for *Ruiz Massif* and *ISAGEN* – Ecuadorian Borderline (MinMinas, 2012). Even though the *Energy and Gas Regulatory Commission* approved extra capacity payment for this technology, unstable weather condition made it inefficient to use. Figure 1 shows the level of thermal and hydro installed capacity in Colombia from year 1960 to 2016.

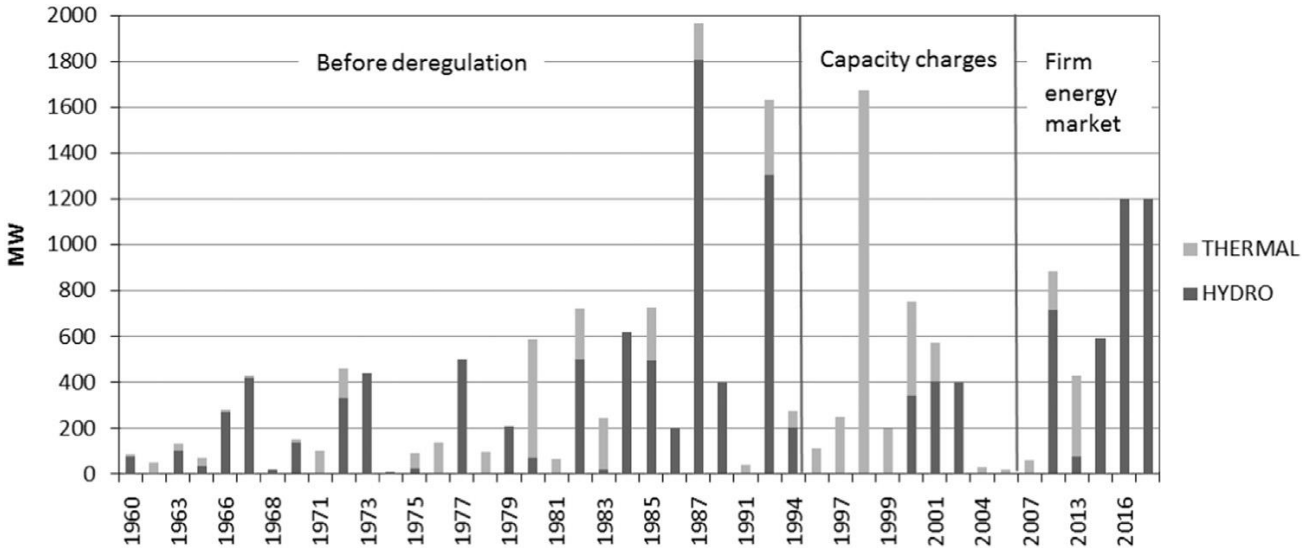

Figure 1 – Annual thermal and hydro additions in Colombia, Source: Olaya et. al (2014), data from ISA and UPME

Biomass-cogeneration projects include more than 206 MW as of the year 2014, while total estimated biomass energy potential is approximately 450 PJ/year and power potential is 2.584 MW (UPME, 2014). The cost of electricity production of modern biomass plants is remarkable and expected to represent competitive source in Colombia in 15 to 20 years, especially in case of non-connected grid systems under low cost improvement scenario (Caspary, 2009). Thus, biomass could have a 3% share by 2020 in national electricity generation and 15% for primary energy needs. Co-generation projects are very well established, particularly for sugar mills, while additional efforts for coffee farms, rice mills and palm oil plantations are required. Biomass co-firing in industrial combustion processes could replace usage of mineral carbon and substantially reduce GHG emissions. In the rice husk of regions Santaderes, the Eastern Plains and the Atlantic Coast more than 457,000 tons are produced annually (Procolombia, 2015). The main geographical areas for biomass are the Magdalena Valley, the eastern slopes and the western mountain range in the vicinity of Bogotá and the Department of Antioquia. Export opportunities are up to this date limited, since there is an absence of drying and palletization techniques in the short term, as well as torrefaction and carbonization in the medium term for energy densification (Metasus, 2011). Following opportunities are foreseen: investment projects in cogeneration of oil palm, rice and coffee husks (around 1,500 USD per kW); biomass pilot projects in rural electrification areas (project power of approx 100 kW); processing of unused oil from ships; organic waste digesters at farms for the production of biogas (Metasus, 2011).

A fifteen-year tax-exemption schemes and social benefit programs are also policies used to trigger wind energy development in Colombia. Still, between 2004 and 2010 this enabling mechanism promoted only one wind farm with a capacity of 19.5 MW (0.015% of total 13,440 MW) supplied by 15 wind generators, which suggests that more research is required to assess potential of generating commercial wind power (Dyner et. al, 2010). The problem for investments occurs because Colombian incentives are not targeted at lowering entry barriers for renewables and that is making difficulties for high capital costs of wind farms. Reduction in income tax and exemptions from system charges to the Fund for the Electrification of Off-grid Regions (FAZNI) is needed. Other special regimes for wind energy could be the key for sustainable energy growth, considering that Colombia is rated with class seven winds (9 m/s at 50 meters height) with an estimated wind

power potential of outstanding 18 GW in La Guajira region, enough to meet twice as much of power energy demand (Vergara et. al, 2010). The only similar region for wind energy potential in South America is Patagonia of Chile and Argentina. The wind industry has moved a long learning curve since 2010, decreasing capital costs in becoming a reliable source in periods of extreme weather conditions. Likewise, the output and performance data for the Jepírachi plant in the Guajira region confirm year-around availability and high plant factor (38%-98% turbine availability and 1,750 kWh/m^2 - year per turbine) (Dyner et. al, 2010). *The Prototype Carbon Fund* supported by the World Bank represents how significant this project is for Colombia and to entire wind option, adding the fact that soon after the initial phase Jepírachi tapped into the international carbon trade (Vergara et. al, 2010). By this fund park obtains 3.2 million US$ from the sale of 800,000 tonnes of carbon dioxide (Ruiz-Mendoza and Sheinbaum-Pardo, 2010). It is also relevant to point out that during extreme drought from El Niño four major rivers for hydro developments: Guavio, Nare, Cauca and Magdalena showed negative results, while at the same time the Jepírachi generation had positive values above average (IDEAM, 2010). This becomes more evident if innovation and learning level from RET (renewable energy technology) are observed. The main challenge is to design a comprehensive policy framework for energy supply diversification, in order to motivate new individual investors. Projects like Jouktai (20 MW, company Wayuu S.A./ISAGEN) and Ipapure (under construction, total 200 MW) are determined as valuable wind power capacity expansions. According to UPME data, cost effectiveness is also calculated and shows that wind energy is only between 15-30% more expensive per MWh than large hydropower (UPME, 2014). After all, this fuel-free technology offers long term power-purchase contracts and fix-price contracts as they mostly consist out of capital costs. Yet, there is a shortage of suitable instruments to promote wind source in Colombia, as it contributes approx. 0.15% to total national generating capacity. In 2014 70.2 GWh were generated, 21.9% more than in 2013. This is far less than average wind projects distribution of 15% to total CDM (Clean Development Mechanism) projects in Latin America.

Solar energy expansion in Colombia is limited due to the inherent problems of intermittent supply and storage associated with this source. Seen as a good opportunity for isolated systems for water heating, solar was replaced during the 1990's after the entry of natural gas. Stability of source utilization is viewed via solar radiation, much of which is uniform across the country throughout the year, with daily average multiannual insolation of approx. 4.5 kW/m^2 (MinMinas, 2012). Highest insolation of 6 kW/m^2/day is on Guajira Peninsula. The steady decline of PV (Photovoltaic) system costs is making PV competitive for countries with high solar insolation and high energy prices. Unlike Ecuador or Argentina where PV support schemes are in place, there are no indications that Colombia will use effectively solar energy in the near future, mainly because of high percentage of other alternative energy source at carbon index market. Central logic against solar park development in Colombia is their obvious cost inefficiency in comparison to small hydro plants. Implementation of net metering facilities and revision of self-generator definition in Colombian regulation could give upper hand for solar energy. Budgetary resources are vital for short term deployments, where the key motive for solar growth is its stable, all-year around yield in an uncertain environment.

Scenario 9				
Resource	2015-2020	2020-2025	2025-2030	Total
Solar	53.6	89.9	95.7	239.2
Wind	576.0	320.0	0.0	896.0
Geothermal	100.0	275.0	0.0	375.0
Biomass palm	191.0	0.0	0.0	191.0
Biomass sugar cane	57.0	0.0	0.0	57.0
Scenarios 10 and 11				
Resource	2015-2020	2020-2025	2025-2030	Total
Solar	53.6	89.9	95.7	239.2
Wind	0	62.0	0	62.0
Geothermal	100.0	275.0	0.0	375.0
Biomass palm	191.0	0.0	0.0	191.0
Biomass sugar cane	57.0	0.0	0.0	57.0

Table 1 – Scenarios 9, 10 and 11 for RES in Colombia, Source: UPME, 2014

The Colombian Energy and Planning Unit (UPME) published in 2015 a non-mandatory generation and expansion plan. Thus, it only provides an indication about possible future scenarios of RES mix. As reported by plan, RES might be between 6% and 15% in the 2028 Colombian energy market. Wind energy could substitute between 24% and 86% of the 1,050 MW coal capacity required in high demand scenario.

From a reliability point of view, developing RET other than hydro energy could be very helpful during the dry seasons. It should be expected for spot prices to decrease with a higher share of renewables. The smart grid technologies roadmap is essential for isolated areas and to connect new renewables to wholesale market. Since market might not always respond in a foreseen way, desirable effects are manageable if a sustainable portfolio of RES is approved. In 2006, a new scheme is introduced as a guarantee that there is enough capacity at peak level of demand during El Niño periods. Firm energy obligations (OEFs) are set to determine new prices in competitive auctions. OEFs are option contracts that commit power companies to supply a given amounts of energy at a predetermined Scarcity Price whenever the spot price in the electricity market rises above the Scarcity Price (Robinson et. al, 2012). Of special importance is to define and research ENFICC (*Energía Firme para el Cargo por Confiabilidad*), which is the maximum amount of firm energy that firm can offer in a competitive auction. It refers to the amount of energy that company can reliably produce when hydro generating capacity is at its minimum. Table 2 shows maximum ENFICC for different energy generation technologies as a percentage of plant's effective net capacity.

Technology	Maximum ENFICC (%)
Hydro with storage	55
Hydro without storage	30
Coal	97
Natural Gas	93
Fuel Oil	88
Wind	6

Table 2 – ENFICC % for different energy technologies, Source: Robinson et. al, 2012

If a wind park, for example, has an ENFICC of 8%, the maximum annual OEF for a 100 MW is park would be 100MW*0,08*8,760 hours = 70,080 MWh. The aim of the competitive auctions and option fees is to help finance plants that are significant for system reliability. This is relevant for the regulatory instruments framework in Colombia, since it marks the strategic path for uncertainty avoidance. In July 2011 CREG (Colombian Regulatory Commission for Electricity and Gas) proposed measuring ENFICCs for wind plants based upon the historical experience of Jepírachi plant.

3. Regulatory Instruments to foster renewable energy in Colombia

Due to constant climate changes and shortages in energy supply, there is an urgent need to form a comprehensive policy framework for RET target on a national level. Obligation mechanisms and mandatory policies are government orders that should be guidelines for agent decision making process. Preferential investments (low interest loans, accelerate depreciation, low interest loans), preferential taxes (tax exemptions, rebates), preferential pricing policies (price subsidies, feed-in tariffsnet metering, green price system) are some of the economic incentives for RES deployment. The necessity of balanced framework is a must for Colombian power system, given the fact that, for example, between 1997 and 2006 capacity and reliability charges contributed 49% to generator's income for for hydro and thermo electricity, while in the meantime wind energy firms did not have access to this kind of support (Dyner, 2010). Capacity payments were proportional to the fixed costs of a thermal generation plant, charges were collected from the energy pool and were a lower cap for the electricity price (Olaya et. al, 2016).

With a special approach to solving rural electrification issue, it is noticeable that energy diversification will be a key driving force for Colombia. Complementarities with rain cycles seek for contemporary technologies and direct power exchange based on long term contracts. In that sense, for the Colombian case combination of renewable portfolio standards and feed-in tariffs is proposed. Major advancements are seen in the area of fiscal incentives, as Colombia enforces VAT exemption, fuel tax exemption, income tax exemption, import/export fiscal benefit, accelerated depreciation and other benefits (IRENA, 2015). A recent analysis of

market regulation identifies three main instruments on lowering entry barriers for RES in Colombia: 1) strengthening access to and increasing participation in the CDM projects, 2) target subsidies as an income tax exemption and system charges, 3) introduce reliability charges and taxes on polluting technologies (Vergara et. al, 2010). In that way the offset the higher cost traders could incur paying for modern technologies, a fund could be created from accumulated taxes from using fossil fuels in order to charge additional costs to end users. There are not available precise empirical results how the scenario of income tax reduction is linked to generation productivity. However, even though the assumption of direct causality cannot be confirmed, a relationship between investments by agents and income tax is shown through gross profit, as seen in Figure 2.

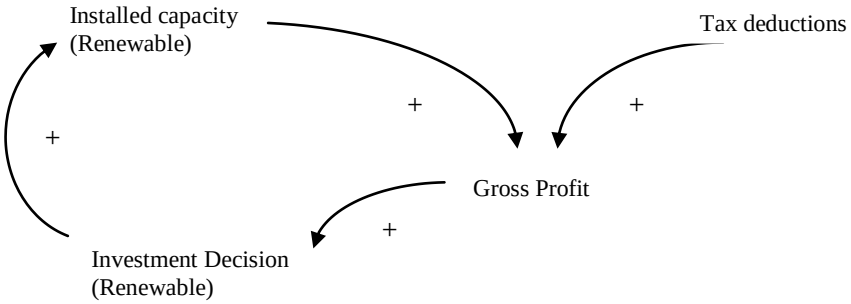

Figure 2 – Influence of income tax on renewable energy project deployment

The carbon market is the baseline for policy scenario, where Colombian Low Carbon Development Strategy (CLCDS) implemented 80 abatement strategies for sectoral and total emissions. The CLCDS aims at decoupling GHG emissions from GDP and economic growth. International standards for energy efficiency are prioritized with highest abatement potential, but they do not include reductions form land use and land use change, which account for 20% Colombia's emissions (Clarke et. al, 2016). Studies analyze that proposed set of policies would restrict the growth in emissions roughly 17% above 2010 levels by 2030, in comparison to almost 40% in the same period without the policies (Clarke et. al, 2016). To quantify the economic impact of promotion policies, it is necessary to examine rural capitalization, as landlords tend to have more benefits of it than the energy producers. Large spars of land have very low population density, especially in the Amazon. Territory with more than 31 million ha (one third of the country) have 1.4 million inhabitants (3%) living there (GEF, 2014). If country's institutional characteristics are taken into account, it is noticed that due to rural electrification process serious net losses of social welfare are generated by a combination of tax credits and blend mandates. Likewise, a major part of advantages from subsidies are distributed to landowners and this could be pointed out as a threat for production efficiency. Some analysis suggest that eliminating tax credits and maintaining blend mandates allow reducing fossil fuel consumption in consideration of the fact that Colombia has one of the highest land concetration index in the world (0.86). The equilibrium model results indicate that effect of the policy is influential when mandatory blending levels and subsidy are combined (Castiblanco et. al, 2015). Regarding this matter, IPSE (Institution of Planning and Promotion of Energy Solutions) created the *Non Interconnected Areas Fund* (FAZNI) being the case that national market mechanism should be specifically designed for isolated areas requirements. The effort is on identifying all actors in remuneration scheme and to increase quality of provided goods and services.

Specific renewable energy target by legislation or decree can be achieved by numerous different mechanisms. The most prevalent of these mechanisms, as far as their ability to produce renewable electricity at the lowest possible cost, are feed-in tariffs (FITs). Although at the moment Colombian regulative do not promote FIT, their components could be highly beneficial for new value-based approach. Especially important part of FITs is how they manage to incorporate new technologies into the national grid. Some parts of design consist out of (Jacobs et. al, 2013):

- *Guaranteed interconnection*- Independent power producers are guaranteed the right to connect to the transmission if the project is feasible;
- *Priority interconnection* – Renewable energy capacity has a priority when connecting to grid in case of long waiting process for new generation sources;
- *Guaranteed purchase* – The utility is required to purchase 100% of the generator's output, even in cases of curtailed production;

- *Priority dispatch* – Generators must obtain dispatch and transmission service , while priority means generators are dispatched ahead of conventional generation.

Spot market gap model and premium based model encourage FIT-based generators to participate in the competitive wholesale electricity market. From a risk management perspective, a fixed price payment schedule could be more appropriate for Colombian market because its simplicity and transparency makes it easy for investors to evaluate and assess. In addition, FIT is a flexible instrument that can easily be adjusted to changing market and transitional economy. Moreover, policies like FIT seek to accelerate new technology adoption, like in the Brazilian PROINFA program, and are adequate for countries with a large hydroelectric such as Colombia (Dyner et. al, 2010). FIT options, rather than a best practice perspective, could gradually be refined to serve purposes of Colombian electricity market and to drive investments in new alternative energy capacity.

Renewable portfolio standard (RPS) or quota system can be applied both for liberalized or non-liberalized markets and it requires a certain percentage of power to be generated by RES. It allows minimum costs installation inside the renewables, but also has lower administration and implementation costs. RPS are established by the regulator, so their flexibility is low, that is targets are set for a given period of time. Besides that, volatility can affect portfolio political support and increase the financial risk. Complexity of design could also be an advantage for shared cost with customers, as the precise cost depend from technology type and total market transactions. To enable a possibility of structuring sustainable RPS, the initial proposal is made by the CREG Regulatory Commission (*Comisión Reguladora de Energy y Gas*), and even though Commission could not force traders to buy a share of total renewable energy, its Resolution CREG 20/96 left open the option to "use other qualification criteria for electricity tenders the objective conditions to weight it". It should be mentioned that now Social Fund for Energy, FOES, operates in Colombia and is financed by income from energy exports for an eight year period, to subsidize the generation cost to 44.25 $ (Colombian pesos) per kWh of energy purchases value, such as an additional subsidy for special, rural area users under the same law. Considering unpredicted energy demand and low level of RES diversification, RPS in Colombia should use a special mechanism that creates an inter connected RES market. Renewable Energy Certificates (REC) are effective and perceived as economic, non-tax incentives. In order for the REC to function, a renewable generation quota on a national level should be used for various energy operators so they can minimize their marginal costs. International experience shows that RECs have wide success for renewable energy projects and could be followed by an aggressive program to exclude negative externalities.

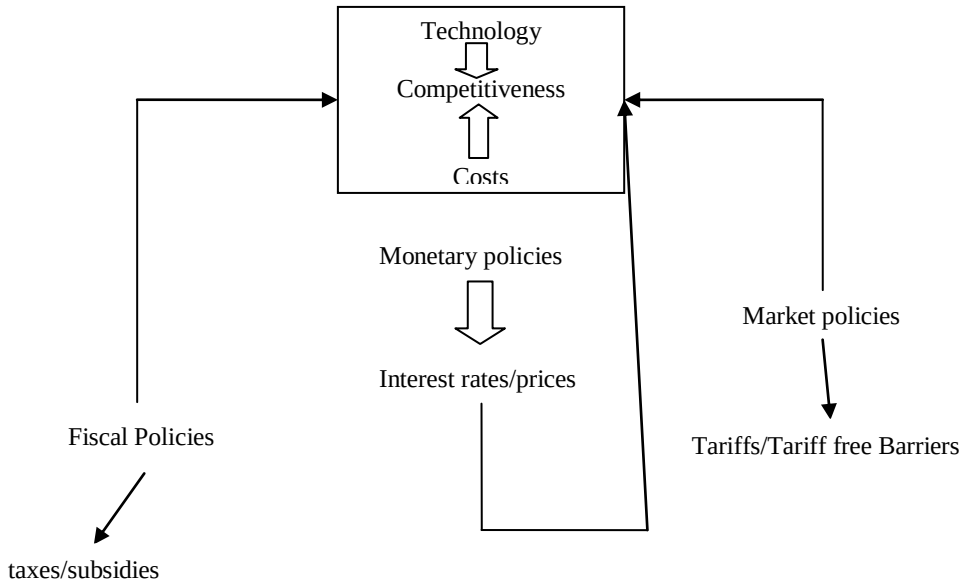

Figure 3 – Influence on the competitiveness of a renewable energy technology, Source: Zuluaga, Dyner, 2007

In Figure 3 aspects that influence on technology competitiveness are presented. It can be observed that investment in RET is influenced by interest rates/prices, taxes and market, with interest rates being the most

important variables. They also represent pivotal role for calculating the Net Present Value for renewable energy projects. It should be noted that if interest rates are above 10%, investors are no more interested in expanding their RES capacity. Therefore, it is essential that government focus on cheap loans for producers so they can determine the real effects of choosing new technology diffusion. Constituting a right path for stimulating new renewable energy capacity in Colombia can be done with an assistance of direct subsidies scenario. From the simulation analysis, there are some evidence that these direct incentives could even double the installed capacity, if 15 US$ per MWh peak level is achieved. In order to facilitate the consolidation of the RES sector in Colombia, new methodology backed upon a private sector should be revised, like the application of *Clean Development Mechanism* methodology and many other.

4. Conclusion

There is a significant environmental interest associated with the use of alternative energy in Colombia. The numerous funds, developed to support renewable projects initiative, are justified and mostly feasible for the energy system. Vast technical potential of RES, backed up with the advance fiscal incentives program, indicate there are immense opportunities to exploit renewable energy efficiently. Process of deregulation and market liberalization were in accordance with international standards, with special attention to reduce environmental impacts caused by fossil fuels. Various income tax scenarios confirm thesis of incremental increase of sustainable technology diffusion. On the other hand, Colombian energy market still needs more effective regulative legislation, as empirical research demonstrates only a minor influence of majority of tax deductions on capacity investments. Thus, feed in tariffs and renewable energy certificated are proposed for accelerating renewable energy deployment. Studies show that if hydroelectricity dominates the energy market, such as in Colombia, diversified instruments mechanism is needed to encourage other RET and to integrate these technologies with the grid. Their effectiveness in lifting market barriers is identified through ease of monitoring, enforcing and flexibility within market conditions.

Affordable modular generation units of RET are now a good opportunity for Colombia to diversify energy portfolio plan. Regulatory instruments should emphasize other RES than hydro capacity, particularly because of often dry seasons and threat of *El Niño*. It is evident that renewable energy will play a more certain role in the energy market, given the fact that the Colombian government is dedicated to expand its deployment and to take advantage of impressive technical capabilities in the country. The focal point of development should be in rural areas, so correspondingly energy poverty could be reduced and new grid connections could be installed. It is expected that Colombian renewable energy projects will have outstanding success in meeting the increasing demand for energy in the process of market development. The performance of regulative policies contributed exceedingly to promote renewable energy sources and new targets will be achieved in accordance with contemporary approach of well balanced and highly diversified instruments.

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