

EMISSIONS IMPACT ASSESSMENT FOR THE IMPLEMENTATION OF A FEED-IN-TARIFF SYSTEM IN COLOMBIA.

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The present work evaluates the emissions impact of a hypothetical implementation of a FEED-IN TARIFF (FIT) as an energy regulation policy to encourage the installation of Renewable Energy Sources (RES) projects for electricity generation in Colombia. Energy consumption is highly important in the economic and social development of the communities. However, it is well demonstrated that this development needs to involve sustainability and reduce the negative impacts such as harmful gasses emissions. In this case, FIT has been proven to be one of the most effective regulation policies to encourage the installation of RES. Through a methodology of scenarios forecasts, the installation of new generation capacity from different sources is evaluated in a time period of 10 years, the objective is to determine the possible avoided emissions if a FIT is implemented. First, the Colombian electricity market is studied, as well as the FIT state of the art, the simulation is performed with a different combination of scenarios including renewable and conventional sources to determine the different possible results in terms of emissions. Finally, the conclusions of the study are given.

Index Terms— Feed-in Tariff, renewable energies, greenhouse gasses emissions, integration of renewable energies, Colombian electricity system, subsidies, wind energy, solar energy,

I. OVERVIEW

Energy consumption is directly related with the development of societies and fulfilling of basic needs. Several reports from different agencies (IEA, DOE, World Bank, IRENA) forecast that the energy demand will growth constantly worldwide, mostly in the developing countries as Colombia. This demand should be covered with the basic criteria of the “energy triangle”: security of supply, protection of the environment and low cost.

Despite the fact that electricity generation in Colombia is considered clean due to the high share of large hydropower electricity plants (65%) [1], these three targets of the energy triangle mentioned above are not being fulfilled due to the cyclic weather phenomenon called “El Niño”; where the rainfall is not enough and therefore there is not available water to generate with hydropower stations [2]. When this happens, the security of supply is endangered; expensive back-up fossil fuel plants start operation to cover the demand, then, the electricity prices and the pollution increases.

In order to overcome this problematic, one of the alternatives is the implementation of national policies to encourage new installed capacity of electric generation from renewable resources. In this way, feed-in tariff has been one of the most successful policies to the energy and climate change mitigation objectives. In 2011, more than 50 countries had implemented this policy and half of them are developing countries [3].

The present proposal focuses on the emissions impact assessment of a possible feed-in tariff implementation, the benefits or drawbacks given by the policy and its comparison with the current reliability charge that consumers are paying in

the electricity bill which clearly favors the generation with conventional sources [4].

II. METHODOLOGY

The methodology used in this work is based in the **SCENARIOS METHODOLOGY**. The initial approach to solve the research question is to gather the information available for the Colombian electricity system: load curve characteristics, electricity generation capacity, current energy matrix, demand, current emissions, fuel consumption, national policies in electricity and renewable energy generation targets.

After that, a literature review about the state of the art in FIT is performed, in order to determine which model is the most suitable to apply in the Colombian energy market.

In the third step the forecasts of the Colombian Energy Planning Unit (UPME) released in the last *Generation Expansion plan 2015 – 2029* are used. In this document there are eight long-term scenarios with different options for the installation of new generation capacity: coal, larger hydro, small hydro, wind, biomass and geothermal are included with different shares are included. Two out of the eight scenarios proposed by the UPME are simulated. Also, historical meteorological data of wind and solar are used to determine the quantity of electricity produced by the new renewable plants in the time period.

In this simulation, the merit order effect is evaluated and with the possible implementation of the FIT system, which renewable or conventional power plants are dispatched.

After the simulation is performed, a comparison is made between the business as usual without FIT (BAU) scenario and the scenarios with FIT to calculate the avoided emissions.

III. EXPECTED RESULTS

After the simulation is performed, the expected results are the different emissions given by the different energy mixes and the share installed capacity from renewable sources. It is expected to obtain a lower emissions factor in the scenario of high share of renewables. Anyway, the security of supply should be also ensured and this means that conventional sources should be part of the scenarios to complement the system and reduce the risk of shortages. In this case, coal generation is also considered and should be act as back up in case of lower generation from renewable sources.

IV. CONCLUSIONS

It can be concluded than the implementation of a FIT system can be positive for the reduction of emissions from the electricity generation. However, some other factors should be studied carefully as the impact in prices and security of supply of the system in general.

The government should release clear and stable conditions of regulation for the investors to ensure the installation of new capacity from different sources focusing on RES. In this way the support system could be a good option to achieve this goal

V. REFERENCES

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