

Assessment of the process of generation and final use of electric energy in Colombia based on energy efficiency indicators

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Abstract

The recovery of the global economic activity following the Covid-19 pandemic, caused emissions associated to energy consumption to be 2% higher in December 2020 than the same month in 2019. The migration to a low carbon energy system is essential, achieving the reduction of greenhouse gas emissions (GHG). Energy efficiency is a key point in clean energy transitions and energy efficiency policies the development path, which in 2019 covered only 35% of the final energy use.

Colombia committed to reduce 51% of its GHG emissions by 2030 compared to the projections made for that year. The country electric generation is relatively clean, 69% corresponds to renewable energies (RE) and the remaining 31% to fossil resources, with associated emissions of 11,82 GtCO₂eq for the year 2019. However, Colombian electric system is unstable, due to the water resource dependence, which can be affected by variable weather conditions, and to the high energy losses that reached 60% in 2012, with a cost of 5200 million dollars per year.

Therefore, it is necessary to generate energy efficiency strategies and policies in the Colombian electric system, due to its relationship with the economic competitiveness, energy security and environmental benefits. The impact of these strategies and policies implementation can be monitored through an energy efficiency indicators analysis that allow taking timely actions to meet energy goals. Thus, the main purpose of this study is to determine energy efficiency indicators to evaluate the current state of the Colombian electric system, analyzing the trends and historical dispersion of the data. It was made a compilation of the historical variables selected for the calculation of the following energy efficiency indicators: generation efficiency, energy intensity, emission intensity, CO₂eq emissions and per capita consumption. Based on the preliminary results it is concluded that, although Colombian energetic matrix is mainly composed by RE, it is susceptible to the world oil market variations, due to the crisis occurred during 2014 and 2016 years, where the international oil prices dropped, causing a 1% negative increase in the electric generation during 2015 and 2016 years, which had a relative annual growth rate of 3%.

On the other hand, this study is a macro project preliminary step, which seeks the construction of a platform that allows to variate different key parameters, to generate and project energy efficiency strategies which can adapt to the needs of the different entities associated in the generation, distribution, and end use processes of the country electric energy.

Keywords

Energy efficiency, Electric energy, Indicator, Generation and End use.

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