World Academy of Science, Engineering and Technology
International Journal of Energy and Power Engineering
Vol:16, No:09, 2022

Scenarios of Digitalization and Energy Efficiency in the Building Sector in Brazil: 2050 Horizon

Authors : Maria Fatima Almeida, Rodrigo Calili, George Soares, João Krause, Myrthes Marcele Dos Santos, Anna Carolina Suzano E. Silva, Marcos Alexandre Da

Abstract : In Brazil, the building sector accounts for 1/6 of energy consumption and 50% of electricity consumption. A complex sector with several driving actors plays an essential role in the country's economy. Currently, the digitalization readiness in this sector is still low, mainly due to the high investment costs and the difficulty of estimating the benefits of digital technologies in buildings. Nevertheless, the potential contribution of digitalization for increasing energy efficiency in the building sector in Brazil has been pointed out as relevant in the political and sectoral contexts, both in the medium and long-term horizons. To contribute to the debate on the possible evolving trajectories of digitalization in the building sector in Brazil and to subsidize the formulation or revision of current public policies and managerial decisions, three future scenarios were created to anticipate the potential energy efficiency in the building sector in Brazil due to digitalization by 2050. This work aims to present these scenarios as a basis to foresight the potential energy efficiency in this sector, according to different digitalization paces - slow, moderate, or fast in the 2050 horizon. A methodological approach was proposed to create alternative prospective scenarios, combining the Global Business Network (GBN) and the Laboratory for Investigation in Prospective Strategy and Organisation (LIPSOR) methods. This approach consists of seven steps: (i) definition of the question to be foresighted and time horizon to be considered (2050); (ii) definition and classification of a set of key variables, using the prospective structural analysis; (iii) identification of the main actors with an active role in the digital and energy spheres; (iv) characterization of the current situation (2021) and identification of main uncertainties that were considered critical in the development of alternative future scenarios; (v) scanning possible futures using morphological analysis; (vi) selection and description of the most likely scenarios; (vii) foresighting the potential energy efficiency in each of the three scenarios, namely slow digitalization; moderate digitalization, and fast digitalization. Each scenario begins with a core logic and then encompasses potentially related elements, including potential energy efficiency. Then, the first scenario refers to digitalization at a slow pace, with induction by the government limited to public buildings. In the second scenario, digitalization is implemented at a moderate pace, induced by the government in public, commercial, and service buildings, through regulation integrating digitalization and energy efficiency mechanisms. Finally, in the third scenario, digitalization in the building sector is implemented at a fast pace in the country and is strongly induced by the government, but with broad participation of private investments and accelerated adoption of digital technologies. As a result of the slow pace of digitalization in the sector, the potential for energy efficiency stands at levels below 10% of the total of 161TWh by 2050. In the moderate digitalization scenario, the potential reaches 20 to 30% of the total 161TWh by 2050. Furthermore, in the rapid digitalization scenario, it will reach 30 to 40% of the total 161TWh by 2050.

Keywords : building digitalization, energy efficiency, scenario building, prospective structural analysis, morphological analysis
Conference Title : ICEP 2022 : International Conference on Energy Planning
Conference Location : San Francisco, United States
Conference Dates : September 27-28, 2022