Impact of localized solar resource integration on energy consumption and greenhouse gas emissions: A case study of the residential sector in the United Arab Emirates

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***Abstract*—**United Arab Emirates is a unique energy market with 98% generation using natural gas and a subsidized value chain, making it the highest pollutant contributor. In order to curb its GHG emissions, alternative routes via greener solution is a necessity. We focused on zero emission solar energy and evaluated its penetration by observing energy consumption and GHG emission behavioural response via the electrical load strategy using the residential sector in Abu Dhabi as a case study. First, we studied the current energy sector scenario in terms of its energy generation, consumption and GHG emissions. We identified gaps in renewable energy adoption, especially the on-grid solar setup and reported the failure of existing solar IPPs in the country. Second, we integrated the residential statistics, using building specifications as input in DesignBuilder and simulated in EnergyPlus, to understand the impact. We observed that using a 20 kW or higher solar solution per household would not only reduce GHG emissions but also act as micro-grid feeders for the national grid. Thus implying that the country's current energy ecosystem has failed to capture potential of solar energy and that major improvements are needed which we propose through policy recommendations to government entities.