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.

Recent Publications

1. Kiani A (2017) "Electric vehicle market penetration impact on transport-energy-greenhouse gas emissions nexus: a case study of United Arab Emirates". Journal of Cleaner Production 168:386-398.
2. Kiani A (2017) "Coupling effects of demand-side improvements ensemble on energy performance to monetary implications for UAE economy". Journal of Cleaner Production 167:44-54.
3. Kiani A (2017) "Methane hydrate upstream cost modelling using single well analysis for NEA region". American Scientific Research Journal for Engineering, Technology, and Sciences 34: 174-189. 365: 519-530.
4. Kiani A (2017) "Electric vehicle impact on greenhouse gas emissions in United Arab Emirates", (Invited) Asian Journal of Science and Technology 8: 5003-5011.
5. Kiani A (2017) "A conceptual cost minimization model for estimating methane hydrate upstream activity in NEA for policy-making". Transactions on Business and Economics, World Scientific and Engineering Academy and Society 14:110-119.
6. Kiani A, Bayer BC, Hasko DG, Milne WI, Flewitt AJ (2017) "Analysis of amorphous indium-gallium-zinc-oxide thin-film transistors with bi-layer gate dielectric stacks using Maxwell-Wagner instability model". ECS Transactions, USA.

Biography



Ahmed Kiani is the Director of Engineering and Research (ESR), Core Technologies Pvt. Ltd., a Core Group subsidiary, where he works on a wide variety of research topics including nanotechnology, cyber security, transport, energy-water-food nexus, gas hydrates, to name a few. The research encompasses technical feasibility, data analytics, solutions and governmental policy recommendations and regulation alterations. Previously, Dr. Kiani was a Postdoctoral Associate in Department of Engineering and a Postdoctoral Council Member at New York University, UAE, and as a Postdoctoral Research Fellow in Engineering System & Management at Masdar Institute of Science and Technology, UAE. In the past, Dr. Kiani served as head of renewable energy consulting at EA Consulting in United Arab Emirates/Pakistan and co-founded an energy practice (EP) consultancy under Core Technologies Pvt. Ltd. with prime focus on upstream oil & gas technologies and renewable energy with projects across Pakistan, Brazil, Russian Federation and UAE.

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