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Presentation Title: Integrated Energy Decision-Making: How, When, And Why Adoption And Co-Adoption Happen

Abstract: Improving building energy efficiency has substantial potential to mitigate emissions associated with climate change, given that buildings account for approximately 40% of the global energy consumption and 30% of the associated green-house gas emissions. The decision-making processes for choosing which upgrade (e.g., air source heat pump, solar PV) and when is a complex process, including economic, behavioral, social, and policy considerations. Additionally, the mix of building types and ages and owners, as well as the life-cycle of the innovations (e.g., 15-20 years for HVAC, 20-25 years for solar) create a complex diffusion pattern that can be challenging to understand. This talk will review the results of a survey targeting key technologies for reducing building emissions, e.g., solar PV, smart thermostats, and air source heat pumps. We will explore the behavioral, economic, social, and informational contexts that lead to adoption of each innovation and co-adoption of subsequent innovations. We will answer questions such as: What are the key decision-making factors (e.g., attitude, economic, social) for each innovation and how do they differ? Which innovations are most influenced by social interaction? What knowledge barriers exist for each innovation? How does the adoption of one innovation influence the next? The survey results drive towards an improved understanding of how policy can use the concept of co-adoption to create integrated and coherent policy that views related building upgrades as a suite of innovations, rather than as individual innovations. Ultimately, the outcomes of this survey will be integrated with Envision Tomorrow, an urban planning package, and City Learn, a building energy demand simulation tool, to account for realistic neighborhood development scenarios and technology diffusion scenarios for modeling building emissions over time. The integrated tool set will allow for a model that can aggregate realistic behavioral responses to a dynamic urban environment and provide a testbed for the impact of small policy intervention over time at scale.