SELECTING GREEN STRATEGIES FOR NEW STADIUMS: A CASE STUDY OF AUSTIN FC

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ABSTRACT

Stadiums acting on climate change mitigation must develop strategies that contribute to reduce greenhouse gas emissions from the commercial building sector. Energy-related measures have a prominent weight on the rating system for green building certification programs that determine the level of sustainability for new construction. Project location and energy end-use requirements of the design are important to determine alternatives to minimize their carbon footprint.

A baseline carbon footprint was established due to emissions associated with future end-use consumption of electricity and natural gas to compare reduction alternatives for the case study. Building energy modeling simulation of lighting and heating, ventilation and air conditioning (HVAC) systems was performed using eQUEST based on geometry observations of enclosed spaces and the canopy roof to generate hourly demand data for Austin FC's new outdoor stadium.

Reduction alternatives were identified and analyzed for different system configurations. The alternatives that were considered for the analysis are: (1) installing low wattage floodlighting, (2) a proposed solar photovoltaic (PV) carport system, and (3) replacing furnace heating fueled by natural gas with an electric heat pump. The evaluation of alternatives was carried out in terms of abatement cost estimates (ACE) normalized by the amount of emissions that can be reduced from the baseline, considering periods of 20, 30, and 50 years starting in 2021.

The stadium's floodlighting system can avoid costly demand charges and reduce a relatively small fraction of the carbon footprint. Emissions reduction budget allocation between PV and HVAC systems favors PV. Heat pumps have a higher operational expenditure relative to natural gas charges although they can continue to reduce emissions after Austin Energy's electricity generation system becomes carbon neutral as expected by 2035.

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