Energy resilience in buildings for hot tropical climate conditions: A review
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INTRODUCTION
- According to the International Energy Agency, buildings account for approximately 36% of global energy consumption and 24% of greenhouse gas emissions.
- Buildings should aim to control the usability conditions of the interior spaces (e.g., temperature, illumination, and humidity). These comfort conditions are affected by external events. The BAS/BMS are orientated to ensure the comfort of users and the safety of people and facilities (7,9).
- Therefore, the main variables monitored are micro-climatic conditions in the surrounding area.
- The versatility of building management and automation favours the resilience or responsiveness of a building to changes in expected or normal operating conditions.
- This paper presents the methodology used for the literature review concerning the measurement and analysis of energy resilience associated with buildings.

DEFINITIONS
Resilience: characterize certain behaviors of physical systems with respect to actions that may disturb the correct operation of the system. The four characteristic components of resilience are robustness, redundancy, resourcefulness, and speed.

Energy Resilience: (stage of self-definition) allows studying the ability of a system to predict, prevent and resist all possible disas-ters, such as loss of supply, and recover quickly and efficiently.

Resilience in buildings: ability to recover critical infrastructure already control systems as these have a direct impact on the health, safety and communities of the building.

Resilience in control systems: is considered to be a computer and cybersecurity along with robust control, tolerant to faults and fluctuation, thanks to its design, parameters or system operating under a given range of disturbances.

RESILIENCE ANALYSIS PROCESSES

Resilience analysis process
Resilience Assessment Framework
Resilience Assessment Process

Define resilience goals
Define system and resilience metrics
Characterize Threats
Determine the level of disruption
Define and apply system models
Calculate the consequence
Evaluate resilience improvements

Define a resilience metric
Vulnerability analysis
Establishment of resilience objectives
Stakeholder engagement
Resilience capacities
Recover the system affected by events
Evaluate the level of resilience

System identification
Characterizes the threat
Define and apply damage scenarios
Carry out proactive management
Find System Degradation

BUILDING OPERATION IN TROPICAL
In the tropical context, the resilience of buildings is subject to a greater extent to the increase in global temperature. Therefore, the prompt adoption of:
- An updated or new building code that considers indoor thermal comfort requirements
- The use of more resilient envelopes as a strategy to mitigate climate change.
- The union of resilience in design and systems.

CONCLUSIONS
- Resilience is easily extrapolated from natural events to other types of events, mainly those that may have high repercussions and uncertainty of occurrence.
- Resilience in buildings has been studied from a seismic-resistant and structural approach. However, since the acceptance of the definition of resilience for dynamic systems, it is evident that the analysis of energy resilience in buildings should be expanded to the definition and consensus of methods of analysis, calculation and evaluation of all the systemic actors of a building.
- Using resilience as an evaluative element of the systems is possibly the next step in the analysis of their management and efficiency.