DEVELOPMENT OF AN OPTIMIZED INTEGRATED RAINWATER HARVESTING MODEL FOR MULTISTOREY HOUSES

THESIS SUBMITTED TO
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Abstract

Rain Water Harvesting (RWH) is an ancient civil practice of more than 4000 years, drawing attention among scientists in recent decades, in the light of potable water shortages and water based natural disasters such as draughts and flash floods. It is noted that much focus has been on optimizing the sizes and operation of individual components, in relation to increased Water Saving Efficiency (WSE), in order to minimize he overall capital investment. However, if RWH is to proliferate, it should function on par with centralized service water supply, particularly in delivering water to service points reliably. This is most relevant in urban, multi story scenarios, where not only service reliability but optimized utilization of space and aesthetic aspects is also important. Taking in to consideration that pumping of collected rain water is energy consuming and therefore against the principles of sustainability, a Cascading Multi Tank Rain Water Harvesting (CMTRWH) system is introduced for multi story situations, where the energy requirement on pumping is much less compared to the conventional models.

Even though the CMTRWH model is energy efficient, unless an alternative, renewable power source is introduced to operate an efficient pump with total reliability, the system will have to depend on costly grid power, not only negating the positive impact of using RWH on sustainable development, but also depriving water security to vast communities of people without access to grid power. Sri Lanka being a tropical country, solar power option is pursued as the most desirable alternative energy source. Acknowledging the importance of a storage battery for the reliable operation of the power supply system, sizing curves are developed to select optimally matching pair of PV generator and battery for a given load, at a given location. In order to overcome the difficulty of obtaining measured incident solar radiation at remote locations, a methodology is developed to calculate solar radiation using easily obtainable rainfall data.

Key Words*: Cascading, Rainwater, Multi-Tank, Harvesting, Stand-Alone, Photo-Voltaic*

Declaration

I, Sisuru Sendanayake, hereby declare that the work contained in this thesis has not been previously submitted for a degree or diploma at any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

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Sisuru Sendanayake Date

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Sisuru Sendanayake

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