FUTURE SOLAR HOME SYSTEMS MATCHING ENERGY SUPPLY WITH ENERGY DEMAND

ENERGY POVERTY

1.3 billion people in the world lack access to electricity. The largest share of this group is poor and lives in the developing world, and has to deal with unmet basic needs. Having the possibility to use reliable and clean energy is seen as a driver for social development and environmental sustainability. Having access to energy is also often linked to economic growth and has a positive impact on health. Improving energy access is therefore a hot topic worldwide. With a Solar Home System (SHS), energy can be generated and used on a household level at places where the electric grid does not reach. The adoption of SHSs is, unfortunately, hampered by high upfront costs and limited capacity.

MISMATCH IN CURRENT SYSTEM DESIGN

This thesis aimed to tackle the challenges of high upfront costs and limited capacity by focussing on matching energy supply with energy demand. A data analysis on energy consumption of SHS users in rural Cambodia revealed that most energy is consumed at night, when the sun does not shine. Furthermore, the limited SHSs can only power a small amount of small appliances, such as TVs, LED lighting, fans, and phones. This leaves many users with unfullfilled needs. Matching energy supply and demand in future SHS design is crucial in tackling the problems that (potential) SHSs users are facing, as it will improve user satisfaction and reduce system costs.

NEED FOR MORE

Field research in rural Cambodia revealed a need for appliances such as fridges, water kettles, irons and rice cookers. These future needs require bigger, expandable systems. This can be achieved by implementing features such as modularity and connectivity. Solely increasing the system size is not the optimal solution. The full potential of SHSs will be unleashed with an integral approach, which also facilitates mart off-grid appliances and Demand Side Management features. This will require advanced power electronics. The increased complexity and costs that come with developing such advanced power electronicsshouldbecounterbalancedbythe economical and user benefits of optimized system design.









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