

## *Defense of a Master's Thesis*

*Managing Off-Grid Power Use for Solar-Fueled Residences with Smart Appliances,  
Prices-to-Devices, and IoT*

by  
*Donnelle January*

*For the MSCP degree in Computer Engineering*

Availability of electricity has significant impact on improving the quality of life. In developing countries, remote villages are often not connected to the utility grid. Solar power can be used for local generation of electricity. In this thesis, the matching of supply and demand of locally generated electricity for a typical residence in a remote village is studied. A new method is developed and evaluated whereby electricity use is managed using local price as a scarcity index communicated using IoT. Electricity consuming devices independently use this price value to determine how much electricity they will consume. A simulation model of a solar-powered residence in Cameroon is used to study the effectiveness of the new method for improving quality of experience for residents. A key measure is the number of blackout (loss of power) incidents. The control methods significantly reduce blackouts enabling critical devices, such as freezers for food and medicine, to operate reliably.

*Monday, June 22, 2020*

*2:00pm*

*Online (Blackboard Collaborate)*

*Please email for more information*

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**THE PUBLIC IS INVITED**

*Examining Committee*

**Ken Christensen, Ph.D., Major Professor**

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**Yao Liu, Ph.D.**

***Robert Bishop, Ph.D.***  
***Dean, College of Engineering***

***Dwayne Smith, Ph.D.***  
***Dean, Office of Graduate Studies***

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