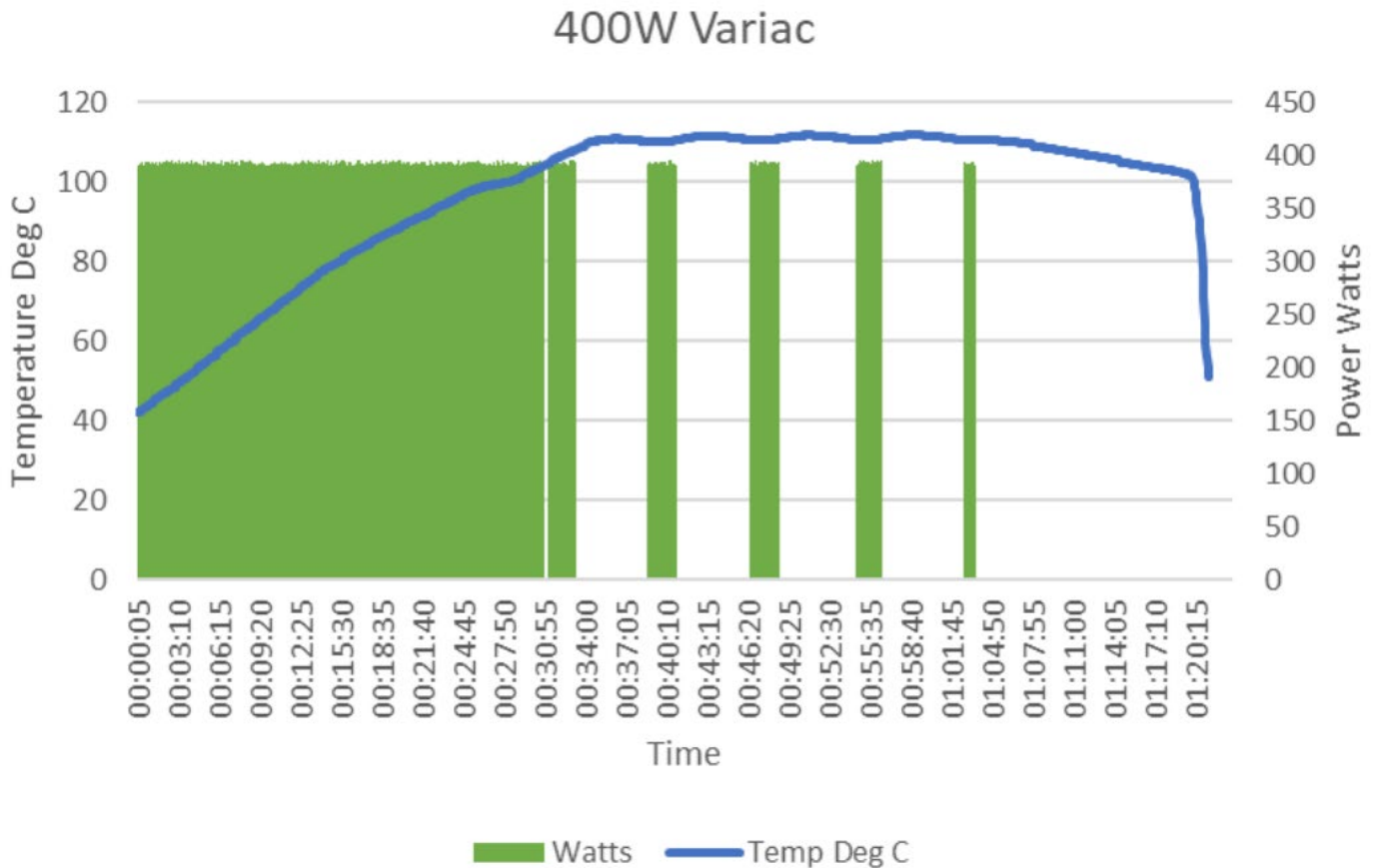


Power Spreading for Clean Cooking and Energy Access

Master thesis project



Source: Modern Energy Cooking Service

Summary:

Providing means for clean cooking is one of the most valuable undertakings within energy access. The indoor air pollution (IAP) associated with traditional cooking annually kills more people than Malaria, Tuberculosis, and HIV/AIDS combined. Children under the age of five, carried by their mother while cooking, have a six time higher chance of developing lung cancer than if their parents would have smoked and were not exposed to IAP from cooking. Electric pressure cookers are a popular solution to this problem, as it provides the means to low energy clean cooking. One of the limitations to these devices however is that they still require relatively high power, which is often not available in energy poor communities. The goals of this project will be to research how the power consumption of these pressure cookers can be reduced to make them more widely deployable.

Problem definition:

Electric pressure cookers consume large amounts of power during the first 'warming-up phase' of the cooking process. The student will research if-, and how this power consumption can be spread out over a longer period of time, to decrease the grid stress. While doing this, the new algorithm should not increase the required energy, nor add to the cooking time. In other words, the design should adhere to the following requirements:

$$\int_{t_0}^{t_1} P(t) dt = E_{total} = \text{Constant} \quad \text{and} \quad t_1 - t_0 = \text{Constant}$$

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Method:

The student will make a test setup to research the effects of power spreading for the pressure cookers, based on the results the student will propose a power spreading algorithm, and build a PCB that performs this algorithm.

The Computer Architecture for Embedded Systems (CAES) group already made similar algorithms for other devices, and studied the integration of multiple flexible devices at a larger scale. The student is expected to visit their group to understand how their system works and how the proposed algorithm could be embedded within their architecture.

Research objectives:

A successful project will include a thorough analysis of the effects of power spreading in pressure cookers and how to best implement it, the requirements of the PCB will be based on the complexity of this analysis.

Courses and supervision:

This is a straightforward project and standard courses apply, the Energy Conversion: People, Planet, and Prosperity gives insight in the context of this project. Experience with PCB design, basic thermodynamics, and/or communication protocols are conducive. The MSc candidate has completed a BSc in Electrical Engineering or equivalent. Supervision throughout the project will be discussed and agreed upon.

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