

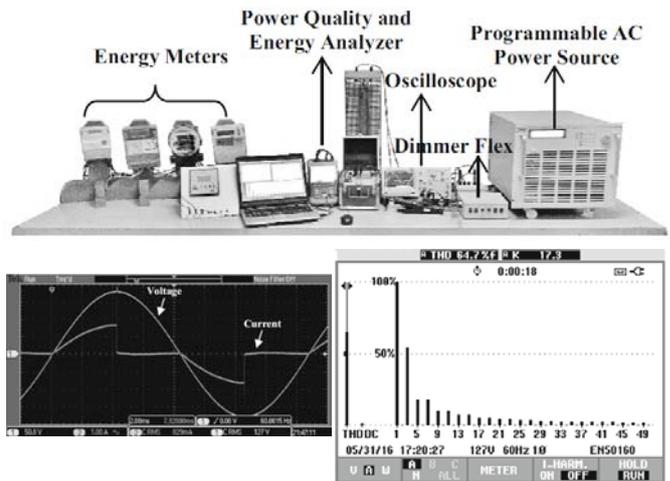
Prof. Hamid Reza Shaker
CFEI, SDU (Supervisor)

Prof. Luiz C. Pereira da Silva
University of Campinas, Brazil (Co-supervisor)

INTRODUCTION

The electronic loads has, in general, nonlinear characteristics. The impact of nonlinear loads on electrical systems has been a concern for several decades. In addition, billing concern also became part of this analysis and it was evident that there are problems in the measurement of electrical energy in systems with non-sinusoidal signals. Furthermore, the problems tend to intensify with the increase of nonlinear loads on the electric system.

The main question that arise is: *How to calculate the electric energy billing on non-sinusoidal system?* This is the main research question for this PhD project.



Project Period
February 2019 - January 2022

OBJECTIVES

The objectives for this project are: **contribute to the state-of-art** the influence of nonlinear loads on the electric system, with emphasis on issues related to measurement, power quality and billing. **Propose changes in the form of electric energy billing**, performing analyses of at least two case studies (Brazilian and Danish systems).

METHODOLOGY

- **To analyze** the rules of the Brazilian and Danish electric energy billing systems.
- **To model and simulate** in PSIM and/or ATP software the nonlinear loads representative of residential, commercial and industrial consumption and the algorithms of the power theories with the intention of emulating electric energy meters and evaluating the measurement results of the nonlinear loads before such protocols measurement.
- **To do measurements in the laboratory and in the field**, in order to validate the simulated models, as well as to verify in practice the analyzes and discussions proposed.
- **To analyze the influence of nonlinear loads on electric energy metering and billing systems**, as well as power quality optics, focusing on harmonic distortion and power factor, as well as on electrical parameters (ie, reactive and non-active power)
- **To propose changes in the form of electric energy billing**, performing analyzes of at least two case studies (Brazilian and Danish systems).

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