Clean Energy Convergence: One Solution Leads to another Problem

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**Abstract**

The following is a draft research proposal focused on the integration of clean energy onto the electric power grid. The purpose of the study will investigate and analyze the impact clean energy has to bulk power reliability, security, distribution, and market while recognizing the importance and necessity for clean renewable energy and grid stability. An unpredictable electric grid and a volatile bulk power market are the results of the increasing use of clean energy and the decreasing use of dirty energy. The background of the problem entails the fact that CO2 emission and global temperatures are increasing at an alarming rate. One major contributor to that affect, is burning of fossil fuels to create energy. Clean energy has zero carbon emissions and is the boon to the environment.

The rationale for the study is that little to no research has been done towards minimizing or completely mitigating the causality of clean energy. A theoretical framework is proposed to illustrate the relationship between inverter-based generation (clean energy) and synchronous based generation (both clean and dirty energy). The relationship visualization will identify clean energy convergence opportunities and solutions. The proposed theory is that there is a correlation between clean energy integration and grid instability. The null hypothesis proposed will provide statistical significance correlating clean energy and grid instability.

Key concepts, which are the independent and dependent variables are: percentage of clean energy, grid frequency, market instability, grid security, brown outs, black outs, increased grid manageability and complexity.

Limitations and delimitations include zonal differences, independents system operator managed versus non independent system managed, proprietary information, political affiliation creating a bias.

The research methodology a survey method plan. This method will cover the following topics: percentage of clean energy, grid frequency, market instability, grid security, geographical location relationship. The research study will be a quantitative inferential statistical analysis correlating clean energy and grid instability.

Instrumentation will include questionnaires and tests. The questionnaire construct will be: reviewing the literature, deciding what information should be sought, knowing respondents, constructing questionnaire items, reexamining and revising the questions, pretesting questionnaires, and lastly editing the questionnaire and specifying the procedure for use. The development of tests will be done by: reviewing the literature, defining objectives, defining target data, reviewing related measures, develop an item pool, preparing a prototype, evaluating the prototype and one last revision of the prototype.

Data analysis and interpretation of the results will include statistics on the surveyed responses. An inferential analysis of the dependent variables (outcome) will be provided.