Hendren, H., Okioga, I. T., Sireli, Y., & Wu, J. (2018). Renewable Energy Policy Formulation for Electricity Generation in the United States. *Elsevier*, 365-384.

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**“A summary and Critical Analysis: “Renewable Energy Policy Formulation for Electricity Generation in the United States”**

 Within the United States there are numerous clean energy incentives, initiatives, targets and goals inspiring a cleaner environment, economic and technical growth. For example, on January 17th, 2019 Governor Cuomo announced the “Green New Deal,” which mandates that New York State’s power will be 100 percent carbon free by 2040 (NYSERDA, 2019). The announcement from Governor Cuomo is considered a goal, not a legal requirement; the goal is “politically easy,’ but in reality, it’s easier said than done. Such a profound goal requires a realistic model and roadmap.

“Renewable Energy Policy Formulation for Electricity Generation in the United States” by Iren Teshamulwa Okioga, Jy Wu, Yesmin Sireli, and Heather Hendren is one such study that uses Analytic Hierarchy Process (AHP) to propose national targets for renewably electricity, by first reviewing electrical energy potentials based on geographic areas defined by the U.S. Census Bureau regions, and the establishing regional and national renewable electricity goals (Hendren, Okioga, Sireli, & Wu, 2018). The journal article consists of a study is a factual and statistical assessment of renewable energy possibilities, providing a plan on how to successfully integrate renewable energy onto the grid using a cost/benefit ratio computed from the AHP analysis. The said journal article uses statistical data and an analysis supporting the viability of specific targets, versus Governor Cuomo bloviating with empty promises and unobtainable goals. The goals of the article are based on a quadruple-bottom-line approach (4P), which considers: technical or “progress”, social or “people”, economical or “profits” and environmental or “planet” factors (Hendren, Okioga, Sireli, & Wu, 2018).

The assessment and the journal article were created and written by four highly credentialed women. Three out of the four professionals hold a Ph.D.: Dr. Yesim and Dr. Okioga hold degrees in Engineering, Dr. Wu has an emphasis on statistic and analytics, and Heather holds a Graduate Degree. Judging by the certificates and degrees held, the credibility of the journal writers is impeccable.

**Review of the Literature**

Firstly, in the introduction, the authors provide a historical timeline starting with the “peak oil” theory in 1960’s and ending with the Environmental Protection Agency Clean Power Plan in 2015. The authors have numerous citations supporting the enumerated historical events within the introduction. A visual observation was made on page 366, which consisted of a nomenclature of acronym definitions. Thru ought the journal article there are numerous acronyms; therefore, the authors provide a visual aid at the beginning of the article which allow the reader to look up acronyms quickly.

Secondly, after providing a historical sequence of events, the authors segway nicely into the problem statements and objectives. The problem statements identify seven current renewable energy policy gaps in the U.S. All seven of the problem statements, or gaps, are clear and concise. One concern would be, that there are too many problem statements to solve for one journal article. In addition, the problem statements are not lengthy; between one and three sentences. For example, the first problem statement reads “The U.S. does not currently have any national energy policies aimed at achieving technology-specific renewable electricity targets. Predictable and steady renewable electricity growth cannot be guaranteed for this reason” (Hendren, Okioga, Sireli, & Wu, 2018).

Lastly, after the problem statements the authors dovetail into the objectives of the study. The authors inform the reader that specific questions from the study will be answered thereby, filling the gaps in research. All problem statements, gaps and questions are relative the to the topic and title of the journal article.

The review of the literature is very short; however, a number of citations (books, articles, websites) were given, which provides a notion that the authors had done a thorough review of the literature. Unfortunately, from the readers perspective, the literature review for the assessment and analysis appears to be limited.

**Methodology**

First, the Analytic Hierarchy Process used is a Multiple Criteria Decision Making Model (MCDM) that allows multiple alternatives to be selected or ranked in order of preferences using multiple criteria, by pairwise comparison of criteria and alternatives (Hendren, Okioga, Sireli, & Wu, 2018). The four authors reviewed over 90 published papers and analyzed various MCDM methods and their applicability. The authors later determined that AHP was the best methodology for energy planning. From a reader’s perspective, the review of 90 published papers, prior to selecting a methodology, shows due diligence and is noteworthy.

 As part of the AHP methodology, Geographical Information Systems (GIS) was utilized, representing specific locations in the U.S. that were abundant with renewable energy capabilities. The data that was extrapolated from the analysis and applied in GIS to create the visual maps. In total there were three GIS maps of the U.S., that superimposed the different types of renewable energy per the geographical location. The study consisted of numerous bar, and pie charts, tables, graphs, a renewable energy potential pyramid and an AHP ranking. The visual representation was rich with data pertaining to the analysis and assessment. The criteria were divided into four main categories: (1) Technical criteria; (2) Economic; (3) Environmental; and (4) Social (Hendren, Okioga, Sireli, & Wu, 2018).

 Next, after the analysis was done using the AHP methodology, a weight was given to each category. With the results now being weighed an assessment was done to prioritize the implementation of renewable energy in specific locations within the U.S.

 Lastly, in every category, the study provides the causality if the AHP methodology was carried out. This causality and progression provide the reader with a high confidence level regarding the methodology used. The methodology section of the journal article was extensive, taking up twelve out of the twenty pages. The methodology section was extremely detailed and relevant to the topic. All of the methodological data was purely quantitative and readily available on the internet; therefore, obtaining data was not a limitation. One delimitation was that the study only related to the United States.

**Overall Critique**

One, as researcher and an engineer, I have had to opportunity to read hundreds of articles, books, and studies. “Renewable Energy Policy Formulation for Electricity Generation in the United States” by Iren Teshamulwa Okioga, Jy Wu, Yesmin Sireli, and Heather Hendren was a detailed, well written peer reviewed journal article. I would highly recommend this to my fellow colleagues and engineers. The journal article had very little redundancy, was accurate and was not in any way ambiguous. The readability of the article was slightly technically; however, as an engineer it was within my wheelhouse. The charts, graphs, tables, and maps within the article were easily interpolated. Grammatically, the 20-page article was errorless.

Two, the goals and objectives of the article were reached. The article was considered “text book written,” with an abstract, introduction, problem statement, methodology, conclusion and recommendation, subheadings and recommendations. The methodology was extremely thorough and extensive. The review of the research hypotheses concluded that from an investors point-of-view further studies had to be conducted. This showed a certain level of transparency and fairness to all readers as not being biased. In total there was a of 52 references showing due diligence and credibility. The authors were highly recognized within their field of expertise.

To conclude, there was much rigor that went into this journal article especially in the methodology section. As a fellow researcher, my recommendation would be to not consume the paper with the methodology. The paper lacked a supporting literature review, which failed to provide the reader with a culmination leading to the problem statement. The title of the journal article is very general; therefore, it could be passed up as a good read, which it was. The results for the assessment, from to the AHP analysis, was required to prioritize renewable energy recommendations, which it did. My recommendations for future research to the authors would be to compare the current convergence of renewable energy in the United States to Europe. Utilize the same methodology and see if the results are comparable, and if not, what can be gleaned from applying the same study to a different country.

# References

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