

Customer perceived value of electricity in the province of New Brunswick in Canada: A sustainable development approach

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Overview

Since 1881, when the first electric utilities were formed, their business model has been barely altered. However, recently liberalization of energy markets, technological innovations, adaptation of renewable energy resources and an increasing environmental awareness have dramatically transformed electricity markets. As a result, the role of customers' preferences increased significantly. To address these problems, this study attempts to revise the existing business model for electric utilities by introducing the concept of customer perceived value (CPV). CPV is then used to quantify the value of products and services in electricity markets from perspective of a supplier to better incorporate customers' needs in the development of new electricity products and services. Two major research tasks were undertaken in the study in this regard: (i) development of interdisciplinary conceptual framework for CPV, and (ii) identification and evaluation of fundamental determinants of CPV for electricity products and services. Addressing the first task, discussions around CPV across various academic disciplines were reviewed. The review served as basis to construct a clear, structured and systematic definition of CPV for both general market products and services as well as industry-specific products and services for electric utilities. The second task was addressed on basis of the sustainable development philosophy and hedonic price approach. Eventually the latter was used to evaluate the impacts of key determinants on CPV of electricity products in the province of New Brunswick in Canada. Rigorous statistical work was performed regarding the following two assessment groups: (i) urban versus rural customers, and (ii) residential versus industrial customers. Our findings show that economic determinants, in particular average electricity price and household income, were the most crucial determinants of CPV for electricity followed by social, environmental and technological factors. Based on these results, it was suggested that electric utilities in the province should incorporate some specific factors into their design of new electricity products and services for different consumer groups to provide higher CPV and consequently enhance business performance.

Methods

In order to incorporate the concept of CPV in the existing business model of electric utilities, this study carried out two major research tasks: (i) development of interdisciplinary conceptual framework for CPV, and (ii) identification and evaluation of CPV determinants for electricity products and services. The first task was based on extensive review of existing CPV-related studies. Two conceptual frameworks - one for general market and one for specifically designed electric utilities - were developed. They will serve as a common language for scholars, government, business managers and other relevant stakeholders in the field.

The second task was addressed on the basis of sustainable development framework coupled with the hedonic price approach. In particular, the key determinants of the CPV of electricity in the province of New Brunswick in Atlantic Canada were identified within the following four groups: (i) economic, (ii) technical, (iii) social, and (iv) environmental. Rigorous statistical framework based on panel data analysis was performed within two assessment groups: (i) urban versus rural customers, and (ii) residential versus industrial customers.

Results

One of the major findings of this study is the fact that significance of determinants for different assessment groups varies. For example, social determinants play a much more important role in determining the CPV for electricity within urban versus rural customers assessment group than within residential versus industrial customers assessment group, although economic determinants were found to be the most crucial determinants for both. First, for urban and rural customers, economic determinants were the most important determinants of the CPV of electricity followed by environmental, social and technological factors. For residential versus industrial consumer assessment group, the

order of importance was as follows: economic, social, environmental and technical. Also macroeconomic indicator was among statistically significant determinants.

Among all determinants analyzed, average electricity price was found to be the most statistically significant determinant: an increase in average electricity price by 1% would result in an increase in the CPV of electricity for urban and rural customers by 0.904%; for residential and industrial customers, a 1% increase in average price of electricity would increase CPV by 1.001% which means for this assessment group this impact is stronger. However, in addition to highly significant economic factors, the number of customers also played an important role: an increase in the number of customers in New Brunswick by 1% would lead to a decrease in the CPV by 0.219%. Another interesting results is negative impact of outside air temperature for both assessment groups: a decrease in temperature by 1% would increase the CPV by 0.0437% and 0.059% respectively. It reflects the fact that in New Brunswick the highest demand for electricity is during long and cold winters because electricity is used for heating. Thus, the lower outside temperature would result in a higher CPV of electricity for all customer groups and vice versa.

Conclusions

This study explores the potential of using the concept of customer perceived value (CPV) of electricity in coping with new reality due to liberalization of electricity markets, technological innovations, adaptation of renewable energy resources and an increasing environmental awareness. In order to meet this objective, two major research tasks were performed. The first task established a common ground for the CPV of electricity by introducing a conceptual multi-disciplinary framework based on a comprehensive literature review. Within the second task, we quantified the impacts of relevant determinants organized in four groups - economic, social, environmental, and technical - on the CPV of electricity in the province of New Brunswick in Atlantic Canada. Variation of impacts from these determinants for different customer groups is the major finding of this study. Hence, based on our findings, we suggest that electric utilities should revise their existing business models and diversify their products and services using a multi-dimensional approach to achieve the highest CPV on the one hand and to increase their business performance on the other.

References

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