Chapter 4
Review of Energy Efficiency Adoption Literature from a Demand Side Management Perspective: Taxonomy of Research Approaches

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ABSTRACT

It has been observed that some of the energy efficiency terms may cause misinterpretation if one does not grasp research perspectives in the energy efficiency literature. The importance of understanding these terms and perspectives emerges from the fact that varying perspectives propose different levels of energy efficiency potential, which have significant implications on determination of market barriers and the extent of market interventions. This study places a special focus on taxonomy studies in the literature, and articulates the terms and perspectives along with their implications on energy efficiency program design. Furthermore, this study also approaches the energy efficiency literature from an academic perspective, providing further research suggestions and taxonomy of earlier studies with respect to data collection and research methods, technologies, and end users studied. It is expected that the outcome of this research is going to help practitioners establish clear links between energy efficiency program design specifications and market diffusion related issues, as well as guide the next wave of academic research initiatives.

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CONSIDERATIONS IN THE CONTEXT OF ENERGY EFFICIENCY FROM A UTILITY PERSPECTIVE

Energy Efficiency Gap/Paradox and Market Barriers

Energy efficiency gap or energy efficiency paradox is a widely used term in energy efficiency literature. In simple terms, energy efficiency gap refers to slow adoption of cost effective energy efficient technologies (Shama, 1983) and related to that, market barriers are those factors that cause this particular situation to happen (Jaffe & Stavins, 1994). As suggested by Weber (1997), in order to define a particular energy efficiency barrier series of questions need to be answered. These questions are:

- What is the barrier to adoption of a specific technology?
- Who or what is that barrier an obstacle to?
- What does that barrier prevent the actors reaching from?

As can be seen, in order to define an energy efficiency barrier clearly, any given energy efficiency barrier needs to be linked with entities it is an obstacle to and goals that it prevents each entity from reaching. Energy efficiency barriers and their characteristics have been observed to be linked to definition of energy efficiency gap. Accordingly, literature review shows that optimal energy efficiency gap has been defined differently depending on the perspective of the actors due to their different perceptions of barriers. A well-known energy efficiency study conducted by Jaffe and Stavins (1994) gathers different perspectives' definitions of energy efficiency potential with respect to market/non-market failures, environmental externalities and discount rates. Accordingly, Jaffe and Stavins (1994) have identified five optimality points, which are named as the economists' economic potential, the technologists' economic potential, hypothetical potential, the narrow social optimum and the true social optimum. Please refer to Figure 1 for the graphical representation of each optimality point.

According to Figure 1, the economists' economic energy efficiency potential is stated to be achieved by eliminating only the market failures associated with an energy efficiency measure where as the technologists' economic energy efficiency potential is achieved by eliminating both market and non-market failures associated with low adoption. Hypothetical energy efficiency potential, which is the maximum potential of all perspectives, is stated to be achieved by eliminating all market and non-market failures not only related to slow adoption of energy efficient technologies but also related to whole energy market such as energy pricing. By considering market externalities in defining energy efficiency potential, Jaffe and Stavins (1994) have also drawn the connection between efficiency gap and public policy. Accordingly, it has been claimed that narrow social optimum is achieved by eliminating only the market failures whose elimination can pass cost/benefit ratio test however; due to existence of external costs associated with energy markets, a more comprehensive optimality point which is true social optimum is also proposed. True social optimum is stated to be achieved by eliminating both cost/benefit justified market failures and environmental externalities such as green house gas emissions and its negative effects on the environment. An implication that can be drawn from the true social optimum perspective is the newly developing policies, which are based on inclusion of environmental externalities by making use of trading of greenhouse gas emissions. White certificates in EU and carbon trade in the US, which are both recently becoming politically and socially more and more supported, can be given as an example.