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Comparison of energy efficiency incentive programs: Rebates and white certificates

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ABSTRACT

With increased interest in energy efficiency in recent years, energy efficiency portfolio standards (EEPS) have gained popularity in state policymaking. This analysis employed New Jersey specific data to compare two incentive based approaches to EEPS implementation: rebates and white certificates. Quantitative modeling suggests that white certificate approaches that depend on market-clearing prices generate much larger upfront incentive outlays than rebate programs. They do not however increase societal burden. Both programs overcome high upfront efficiency measure costs and both recoup the expenses over the long run. Administration costs and participation rates can affect this dynamic however and require additional research to determine which approaches are most cost effective for various energy efficiency measures.

1. Introduction

Energy efficiency, when properly designed and implemented, can reduce harmful emissions, lessen consumer energy bills, decrease wholesale electricity costs, and stimulate the economy by reducing energy consumption and congestion costs and/or delaying or foregoing transmission and distribution costs. Energy efficient technologies often come at increased cost compared to their traditional counterparts however, and consumers are often either unwilling or unable to pay the premium for efficiency despite its long-term benefits. Energy efficiency programs attempt to overcome these barriers to spur efficiency installation and reap its public benefits. In addition, well designed programs transform energy efficiency markets to generate organic efficiency adoption and decrease the need for additional efficiency advancing policies. Energy efficiency portfolio standards (EEPS), also known as energy efficiency resource standards (EERS) and an analog of renewable portfolio standards (RPS), stipulate how energy efficiency must meet some portion of energy demand or how much efficiency potential must be installed. EEPS have gained increasing interest from policymakers and as of October 2008 twenty-one states had instituted some form of EEPS (US EPA, 2009).

The following paper employs quantitative models and theoretical analyses to compare two generic incentive approaches in achieving EEPS energy efficiency goals: *rebates* and *white certificates*. In both cases, we assume that each program sets a quantity level, as opposed to a price level, although the implications of setting price versus quantity under uncertainty are important (Weitzman, 1974). Rebate programs have existed for some time and generally involve a refund or discount payment to consumers of qualifying products. Used commercially to spur sales, rebates are often employed in government programs to encourage technologies or behaviors. Rebate payments typically occur as single, predetermined transactions at the time of sale (instant rebate) or as a post-sale claim (mail-in rebate). Rebates are popular incentives because they require relatively straightforward implementation, rely on simple economic principles, and when structured properly transform target markets to eliminate future rebate needs. Consider the instant rebate approach; the consumer receives the rebate immediately at the time of sale and the payment is deducted from a rebate fund account. Very few, if any, additional staff or resources would be required beyond the rebate fund itself. If the rebates are claimed via a mail-in arrangement, the program implementer can contract with a rebate clearinghouse or other private party to handle claim processing and minimize administration requirements. The rebate payments reduce a good's apparent price and, in accordance with consumer theory, stimulate product demand. In the EEPS case, rebate payments cover incremental cost differences between efficient and inefficiency measures, removing incentives to purchase traditional technologies and stimulating demand for efficient ones. Note however that rebate programs are subjected to leakage; customers from states without rebates can purchase goods

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in states with rebates, taking advantage of the incentives without providing the associated in-state energy savings.

In contrast, white certificates, also known as energy efficiency certificates or credits, energy savings credits, and white tags, represent a new approach and embody the energy efficiency analog to renewable energy credits (RECs) when traded or sold in a certificate market (Bertoldi and Rezessy, 2006). REC policies are themselves analogous to sulfur dioxide and nitrogen oxide emission cap-and-trade policies that many conclude have been extremely cost effective in achieving emission reduction objectives. Rather than government agencies choosing which technologies to support with pre-set rebates, a white certificate program establishes a marketplace to allow retail customers or their representatives to determine the most cost effective way to achieve energy efficiency enhancements. White certificates are generated through efficiency measure use and accrue to the entity owning the measures. Policymakers can design the program to either issue the white certificates upfront, accounting for a measure's lifetime energy savings or they can issue certificates representing annual savings in a multi-payment approach. Entities meeting required EEPS targets can do so either by installing energy efficiency measures or by purchasing white certificates from entities producing surplus certificates. Those implementing inexpensive measures can generate white certificates in excess of their EEPS requirements and sell to entities with higher costs and fewer efficiency opportunities. This provides a profit maximizing, cost minimizing dynamic that in conjunction with demand and supply feedback loops continuously approximates efficient incentive levels and lowers the cost of achieving the EEPS efficiency targets. Originally developed in Europe, Connecticut was the first state to implement white certificate trading with Pennsylvania and Nevada following shortly afterward (WRI, 2009).

2. Incentive program design considerations

While rebates and white certificates remain two popular approaches to incentive programs, one can isolate their fundamental characteristics into distinct design variables: payment timing and incentive level. These variables are not unique to any approach and can be recombined to form several policy variations.

2.1. Incentive timing

When an incentive payment is provided and how often form the first design variable, loosely described as incentive timing. The choice usually involves either a) single, upfront incentive payments or b) incentives provided over time through multiple payments. Single payments provide immediate benefits to entities installing energy efficiency, reduce risk and uncertainty for the consumer, and simplify the incentive transfer for program administrators. Requiring only one transaction per case, single-payment systems reduce administrative costs but generally disregard long-term energy savings tracking. This saves additional expenses but makes the program vulnerable to abuses like multiple installations and incentive claims from a single device or the improper maintenance of a device. In addition, providing a single, upfront payment requires that full funds be available to honor all incentive claims upfront upon request.

Multi-payment systems address many of single-payment design's disadvantages but generally forfeit its benefits. Multiple-payment programs' chief asset is their ability to finance incentive costs by spreading otherwise large, upfront payments over time, avoiding large early fund requirements while taking advantage of the time value of money. Note however that programs dealing mainly with short-lived and inexpensive measures like light bulbs will benefit less from financing than those involved primarily with long-lived, costly measures. In addition, while the spaced payments aid the program implementer, they increase risk for the efficiency installer and generate mixed effects concerning administrative costs and measurement and verification requirements. First, series payments require multiple financial transactions through time, necessarily increasing administrative costs. Second, policymakers can design multi-payment systems to link incentives with measured annual savings as a means to ensure energy efficiency gains. This can improve compliance and reduce fraud but requires significant tracking and measurement capabilities, driving up program costs. Policymakers can disconnect series payments from measured savings however, and instead derive the incentives through predetermined protocols, maintaining financing benefits without complicating the measurement and verification process.

In addition to choosing when incentives are paid in time, policymakers must decide whether additional rounds of incentives should be provided after the first energy efficient measure reaches the end of its useful life. For instance, if a consumer received an incentive to install an efficient room air conditioner, should that entity receive another incentive payment to replace the measure on burnout with a technology of equal or greater efficiency? If so, what level should the second incentive be, compared to the original (e.g. 50%, 25%)? This issue applies particularly to measures with lifetimes shorter than the program duration and therefore policymakers considering lengthy program applications should be sure to address it.

2.2. Incentive level mechanism

The second design variable of interest is the incentive pricing mechanism. Traditionally incentives were set at fixed levels by an institutional program administrator. Fixed incentive levels reduce uncertainty for efficiency installers but typically lack rapid adaptability, leaving program efficiency at the mercy of initial incentive level choices before periodic revisions. If the incentive is set too low, it will not induce sufficient program participation; if it is set too high, over subscription will occur and funding will used inefficiently. As a result, programs employing institutionally selected incentive levels require comprehensive, reliable efficiency potential and cost projections prior to program implementation.

In contrast, market based systems automatically adjust incentive levels based on feedback between demand and supply pressures and can adjust quickly with changing circumstances. Markets develop demand and supply relationships between product (or service) producers and consumers that when applied to policy initiatives can harness profit maximizing interests to bring about behavioral change. The net effect of many producers and consumers conducting market transactions is to establish an efficient incentive level based on market forces reflected in market-clearing prices and to lower the overall cost of achieving program goals. However, this ever-adjusting system is highly sensitive to mandated targets, introduces risk and uncertainty, and may distress consumers wondering why the incentive levels change so frequently.

2.3. Overall design

It is important to note that multiple versus single-payment systems and institutional versus market derived pricing mechanisms are not unique to either rebate or white certificate programs. Rebates can be dispensed over several years rather than in a single-payment and white certificate systems can be designed with institutionally determined prices. However, rebate programs traditionally involve single, institutionally priced incentive payments