



# Can a daily electricity bill unlock energy efficiency? Evidence from Texas

Derya Eryilmaz<sup>a,\*</sup>, Sam Gafford<sup>b</sup>

<sup>a</sup> NERA Economic Consulting, Washington, DC, United States

<sup>b</sup> Direct Energy, Houston, United States

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## ABSTRACT

This study examines the energy efficiency implications of a daily billed energy service, commonly known as 'prepaid' electricity, which is used by a growing percentage of residential customers in the competitive Texas electricity market. Our empirical analysis results suggest that this service could save 9.6% of average daily energy consumption, net of the effect of any disconnections. This quantitative study demonstrates that energy efficiency from prepaid energy products can extend to competitive marketplaces.

## 1. Introduction

### 1.1. The study

Electricity expenses for residential customers can be a substantial portion of their disposable income, particularly in areas of the country where lifestyle and comfort demand significant electricity usage. In Texas, with long hot summers and high humidity in the big population centers of Houston and Dallas, the annual electricity usage tends to be higher than other parts of the country, averaging about 15,000 kW-h for a residential home. Further, according to the most recent residential household survey by the EIA, the annual electricity cost for an average U.S. household is about \$1801/year (EIA, 2009), or approximately 5% of annual per capita income.<sup>1</sup> Given the significant expense, electricity customers prefer to be able to manage their electricity usage to save energy and money (Alcott and Greenstone, 2012). But, it can be difficult for customers to understand their usage and make effective decisions.

One challenge is that customers do not have timely access to information on their usage and spending. In fact, most electric utilities bill customers far after their usage, and any irregular usage due to changes in weather, appliance demand, and other factors are long-forgotten. This system, where customers use electricity in one month and receive a bill sometime in the following month (often followed by another lengthy period before the payment is due) provides infrequent usage information and no payment and usage linkage. This is especially true historically, as the analog meter infrastructure provided only a

single data point for around 30 days of consumption. For the purpose of this study, we call this traditional structure a monthly billed energy service (MBES). Under an MBES, customers have little insight into their usage and cannot easily associate the costs of that usage with the ultimate benefits they receive. This lack of transparency unsurprisingly causes customers to not understand or control their energy usage to eliminate inefficiency.

Over the past few years, three key technological and market changes have provided the opportunity for a new product to be offered to electricity consumers. The first change is the wide-scale proliferation of digital meters, which can measure consumption on intervals smaller than a month (often as frequently as 15 minutes), relay the usage information daily (or more often) to a central metering and billing system, and allow local distribution utilities to remotely and quickly disconnect and reconnect service. The second change is the ongoing trend of consumers deriving benefits from prepaid offerings in other areas of their lives, such as prepaid debit cards and prepaid cellular service. The third change is the ability to communicate important information with customers through robust and secure digital channels, like email and text messaging. These changes together allow energy suppliers to offer a daily billed energy service (DBES), commonly known as "prepaid electricity."

DBES addresses some of the problems of transparency that currently plague MBES. DBES gives consumers many more touchpoints on their electricity usage, which can empower them to make more-informed decisions.<sup>2</sup> Customers using DBES don't only get more frequent insight into usage but undertake a complete transaction every day by having a

\* Corresponding author.

E-mail addresses: [derya.eryilmaz@nera.com](mailto:derya.eryilmaz@nera.com) (D. Eryilmaz), [sam.gafford@directenergy.com](mailto:sam.gafford@directenergy.com) (S. Gafford).

<sup>1</sup> Annual per capita disposable personal income in Texas from 1990 to 2016 (in US dollars) listed in here.

<sup>2</sup> MBES customers can also see their detailed consumption data through their supplier's website or [smartmetertexas.com](http://smartmetertexas.com). Because these are pull channels, however, recurring participation by customers is very low.

complete bill presented, including their usage, and making a payment to continue service. Providing information is important, but a daily transaction is an effect beyond information presentation. As such, many believe that DBES could become widely used by consumers (Wimberly, 2015; Navigant Research, 2016).

In this study, we analyzed energy efficiency impacts of a DBES offered by Direct Energy in Texas using 15-minute interval customer usage data from the three years 2014, 2015, and 2016.<sup>3</sup> Because various DBES products can operate differently, we will discuss the Direct Energy product in particular.

Previous studies have also quantified the effectiveness of prepaid products for energy efficiency. A study of the Salt River Project's prepay product M-Power found efficiency of about 12% (Qiu et al., 2016; Navigant Research, 2016). A 2014 study of prepay customers in two Pacific Northwest cooperatives found 5.5% and 14% efficiency (Integral Analytics for NEEA and DEFG, January 2014). And a study of Oklahoma Electric Cooperative revealed 11% efficiency (Ozog and Integral Analytics, 2013). These studies have cited as reasons for the energy efficiency benefit to be (1) better information through more frequent communications, (2) more engagement with energy consumption choices, (3) reduction in hyperbolic discounting of energy costs, and (4) the desire to avoid cost and inconvenience of disconnection.

No known studies have examined the Texas markets. Texas is a particularly important region to examine for energy efficiency because residential electricity consumption per household is approximately 26% higher than in an average household in the U.S. (EIA, 2009). Texas has very hot summer seasons, which make the use of air conditioning substantial in the region. Aside from consumption, Texas is also different from these other areas studied because it does not have vertically integrated utilities to supply customers; instead, it uses a fully competitive market model<sup>4</sup> with over 100 suppliers from which customers can choose. Also unique about this study is that it considers specifically how being low-income and receiving state subsidies for electricity may impact a customer's ability to derive efficiency benefits.

## 1.2. DBES and MBES

First, it is important to note that Direct Energy's DBES is just one of many products available in the competitive market for customers to choose. DBES is available to all customers in Texas' competitive areas, including customers receiving energy financial assistance but excluding those on medical critical care qualification. The only other customer requirement is access to email or text messages to receive their bill and account updates. Direct Energy was an early mover in launching a DBES product, which it marketed in Texas under the name "Power-to-Go." Power-to-Go is now in the product suite of Direct Energy's First Choice Power brand.

Compared to MBES, DBES has fewer requirements of customers. For example, customers are required to pay a deposit or undergo a credit check to get a monthly billed service but not daily billed service. DBES customers also avoid fees MBES customers might face when they have trouble paying their bills. Table 1 summarizes some differences.

To initiate service, a DBES customer deposits money into an account. Customers do not buy a defined number of kilowatt-hours at that time; the price of the kilowatt-hour is determined according to the day it is used, though both fixed- and variable-priced DBES products are available. The customer must maintain a positive account balance as calculated each business day. Transactions and updates are executed on a batch basis on business days, not in real time, though customer-initiated actions like payments are processed in real time. Direct Energy does not implement any activity during the weekend and is restricted

**Table 1**  
Comparison of features for Monthly and Daily.

Features	MONTHLY	DAILY
Requires a Credit Check	Yes	No
Requires a Deposit	Based on credit score	No
Monthly Invoice	Yes	No
Late Fee	Yes	No
Debt Collection Fees	Yes	No

by state law from taking any customer actions during severe weather events, such as extreme heat or extreme cold. Every business day, Direct Energy uses energy consumption data from the prior metered day to compute a bill and charge the customer's preloaded account (for example, on Wednesday morning, Direct Energy computes Monday's bill and debits that amount from the customer's account). Direct Energy communicates with the DBES customer at 8:00 a.m. each business day, informing the customer of the daily total usage, the price per unit, the total daily bill, and the dollar amount remaining in the account. If the amount remaining in the account is below zero, Direct Energy informs the customer to add money by 10:00 a.m. or be disconnected. There are numerous vehicles to add cash to the customer's account, including web service, an inbound customer care center, and thousands of in-person payments centers at locations like grocery stores. Customers can make payments as often as they like and for any amount, with no fees incurred. The average Direct Energy DBES customer makes over five payments per month (Direct Energy). If the customer fails to add money to the account by the deadline, Direct Energy uses the smart meter network in Texas to issue a remote disconnect through the local distribution utility.

There are no fees for late payment, debt collection, disconnections, or reconnections. A customer who is disconnected may add cash to his account at any time and Direct Energy is then obligated to restore his service through a remote reconnection process within two hours.

## 1.3. Lite-Up Texas

Lite-Up Texas was a subsidy program designed to provide assistance for low-income and energy-challenged Texans in paying their electricity bills. According to the provisions of the program, households in the Supplemental Nutrition Assistance Program (SNAP) or Medicaid qualified for Lite-Up Texas.<sup>5</sup> An alternative application method involved proving that the household's total income did not exceed 150% of the poverty level, as defined by the U.S. federal government. For example, a household with five people that has an annual income lower than \$42,000 is considered as not exceeding 150% of the poverty level.<sup>6</sup> Electric bills were reduced by the amount of the subsidy, which took the form of a subsidy per kilowatt-hour of usage. The subsidy appeared to customers as a line item on their electricity bills.

One area of our research focused specifically on whether the efficiency benefits of the product are applicable to both low-income and non-low-income customers. Some critics have alleged that efficiency from prepayment is, in effect, "forced savings" because those customers would be disconnected so promptly for nonpayment. We split our customer datasets between low-income and not low-income (LIHEAP Clearinghouse, 2014).

In 2013, the Texas legislature decided to discontinue Lite-Up Texas and to increase subsidies during our study window in order to deplete the fund. As a result, substantial subsidies were offered between 2014 and 2016, as shown in Fig. 1 below. The fund was depleted by the end of 2016.

<sup>3</sup> For more information on Direct Energy, please visit [www.directenergy.com](http://www.directenergy.com).

<sup>4</sup> There are some pockets in Texas where the old utility structure remains that were carved out when the restructuring of the market was legislated. The most significant areas are San Antonio, Austin, and those areas inside Texas but outside of ERCOT. Direct Energy customers are only in the competitive areas of Texas.

<sup>5</sup> Public Utilities Commission of Texas <https://www.puc.texas.gov/consumer/low-income/Assistance.aspx>.

<sup>6</sup> Ibid.

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