Flick Power Device Pilot

DR23.02 Report

Prepared by:

Emerging Technologies
Customer Service
Southern California Edison

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Executive Summary

The Flick pilot evaluated the effectiveness of a color-coded smart device appended to a light switch designed to help residents of multifamily apartments understand and respond to time-of-use (TOU) electricity pricing. The Flick device replaces a standard plastic home light switch cover, or plate, and uses simple, easily recognizable visual cues—green indicating low-cost energy periods, blue for moderate-cost, and red for high-cost periods. Similar to previous in-home information devices tested across the industry (Brattle 2017), the device aims to address common challenges faced by customers who often find TOU pricing difficult to understand or recall, potentially leading to missed opportunities for saving energy and reducing electricity bills.

The Flick differentiates itself by requiring no set-up or action from the occupants and is affixed to the building envelope to increase the likelihood of persistent education and use, avoiding pitfalls of other devices previously tested in the industry. For example, in a TOU energy display trial conducted by SDG&E, only about 20% of devices sent to customers were plugged in or activated—highlighting challenges with voluntary engagement and device setup, particularly among low- and moderate-income customers. These devices often ended up unused, a phenomenon sometimes referred to as the "mean time to drawer." In contrast, Flick is installed as a default for all residents, requiring no customer action and overcoming key barriers to adoption and consistent use. The device does not require wiring or Wi-Fi, communicating independently on its own network, and was installed by building maintenance of multifamily communities. No devices were reported as damaged or inoperable during the pilot. While three wireless communication hubs were installed across the property to provide conservative signal coverage, occasional temporary disruptions occurred when one hub was inadvertently unplugged by maintenance staff. These instances were promptly resolved after notification. Importantly, device functionality was not impacted, as each unit is pre-programmed to follow a set schedule independently, and signal coverage was generally maintained even with one hub offline.

Conducted in the fall of 2024 at an apartment complex in Buena Park, California, this pilot involved approximately 180 apartment units randomly assigned to either receive the Flick device or serve as a control group. The apartment complex is an affordable housing community designated for families earning 60% or less of the area median income. The primary objectives were to measure the effectiveness of the Flick device in encouraging residents to shift their electricity use away from peak-demand hours, and to evaluate overall energy-saving impacts.

The evaluation found that the Flick device successfully motivated participants to shift energy use away from peak-demand hours (4 to 9 PM), achieving an average peak reduction of about 10.5%. Additionally, participants demonstrated overall daily energy savings averaging approximately 8.4%. These outcomes suggest that the Flick, with its permanent fixture and simple, intuitive visual signals integrated into daily routines can effectively prompt residents to adjust their energy use behavior, leading to lower energy bills and reduced strain on the electricity grid.

The pilot involved a sample size of 180 residences and was conducted within the multifamily residential setting over a two-month period. Additionally, high tenant turnover during the pilot introduced challenges to accurately measuring and interpreting the device's impacts.

Future pilot applications may consider larger participant groups, longer observation periods covering multiple seasons, and expansion into diverse housing settings such as low-to-moderate income housing and student housing. Despite its limitations, the pilot clearly demonstrates the potential for Flick's placement and visual-based behavioral cues to play a significant role in residential load flexibility strategies.

Abbreviations and Acronyms

AMI	Advanced Metering Infrastructure
CARE	California Alternate Rates for Energy
CPUC	California Public Utilities Commission
DiD	Difference-in-differences
ESA	Energy Savings Assistance
RCT	Randomized Controlled Trial
SCE	Southern California Edison
TOU	Time-of-Use

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Introduction

Flick is a patented demand response and time-of-use (TOU) communication device designed to increase residential energy pricing awareness and encourage load shifting within multifamily communities. It is a smart device appended to a common light switch replacing the decorative plate or cover. The Flick is battery operated and includes a screen with color-coded signals—such as green (low cost), blue (moderate cost), and red (high cost)—to convey electricity prices in real time (Figure 1). While the device is capable of displaying multiple colors, during this pilot only the red signal was used to indicate the 4 to 9 PM peak period, accompanied by a message that read “Conserve Energy Between 4 and 9 PM.” No colors were displayed during other hours. Due to the variability of building stock across affordable multifamily communities, the Flick was designed to be wireless and Wi-Fi-less, utilizing a LoRa WAN communication protocol.

Past research has shown that in-home visual cues could meaningfully influence customer behavior (Brattle 2017, Jessoe 2012), resulting in noticeable load reductions and shifts during peak demand periods. Unlike traditional stand-alone devices or smartphone apps, Flick’s integration into the building envelope, conspicuous placement, and easily visible design provide clear, persistent reminders that help residents make informed decisions about energy use. Installed by maintenance teams or outsourced installers, Flick does not require user setup or placement and ensures consistent visibility by being affixed in a fixed location within the apartment home.

Figure 1. Example of Flick device

This pilot was conducted in collaboration with Southern California Edison (SCE) and other partners. It built on previous trials from Flick’s “Generation 1,” wired light switch technology that suggested Flick effectively motivated customers to adjust usage and reduce peak demand. Under this pilot, approximately 180 residential apartment units in Buena Park, California, were randomly assigned to treatment (Flick installed) or control (no Flick) groups. Customer outreach materials provided to participating tenants are presented in the appendix. By comparing energy usage between the two groups, the study evaluated Flick’s ability to drive incremental load shifting in response to TOU rates. The results help determine the viability and scalability of Flick as a simple, low-cost way to bolster TOU awareness, reduce bills, and support grid reliability.

Background

California and many other regions have been transitioning residential customers to TOU rates in an effort to align energy consumption with grid needs, reduce peak demand, and encourage use of cleaner, off-peak generation resources. However, extensive research found that customers often remained unaware of the specifics of TOU pricing. Even when extensive educational materials were provided, a significant proportion of residents could not correctly identify differences between peak and off-peak periods. In addition, lower income customers were consistently found to have lower levels of awareness and education compared to non-low income customers (Nexant 2018). This gap in understanding led to missed opportunities for households to actively reduce or shift usage—and for utilities to achieve more substantial peak load reductions.

The Flick system was developed in response to these awareness and engagement challenges among traditionally overlooked communities, often living in older and inefficient multifamily building stock. While customers might be theoretically willing to shift their usage to save money or reduce emissions, many did not receive timely or actionable signals. Stand-alone in-home displays and smartphone apps were frequently overlooked, never installed, or abandoned over time (Res-Intel 2021). The term “mean time to drawer,” refers to the time it takes for a user to discard one of these previous stand-alone devices and forget about it (Utility Dive 2015). Flick was designed to solve for this, increasing likelihood for persistent use by integrating the price signal into a home’s electrical switch plate, ensuring visibility for everyone in the household—without relying on repeated device setup or app downloads. As the Flick system does not rely on wiring or Wi-Fi, it can be deployed and scaled across any multifamily community.

Earlier trials of Flick, including installations in multifamily complexes, indicated that even a simple visual reminder could yield load reductions during peak hours, with some customers lowering consumption significantly compared to a normal peak period. These findings underscored the potential for stronger engagement and significant peak load impacts when a simple, intuitive reminder was present in the home.

Assessment Objectives

A primary goal of this pilot was to measure Flick’s incremental impact on residential energy consumption patterns, particularly during high-cost TOU periods. Specifically, the pilot addressed the following objectives:

1. **Incremental Load Shifting Under TOU**
   Determine how much additional load shifting Flick induced beyond any shifts that customers might already undertake due to their TOU rate. By comparing usage patterns between the treatment (Flick) and control groups, the pilot isolated Flick’s effect on peak and off-peak consumption.

2. **Conservation Impacts**
   Evaluated whether Flick fostered any overall reduction in average energy usage, beyond shifting load from peak to off-peak times. If households became more mindful of their consumption—day or night—Flick could generate conservation benefits that manifested as lower total consumption over time.

Technology and Product Evaluation

This pilot study was designed as a randomized controlled trial (RCT) to evaluate the effects of Flick devices within a specific residential apartment complex. A sample of 186 units across 15 buildings, described in Table 1, were randomly assigned to either the treatment group (those who would receive a device) or a control group (those who would not). Random assignment was stratified by unit size. Following random assignment, devices were professionally installed throughout the month of August 2024.

Table 1. Description of Units Available for Pilot[1]

Description		Statistic
Unit Type	1bd & 1bath	2
	2bd & 1bath	178
	Studio & 1bath	6
Average Peak kW (4 to 9 PM on weekdays)		0.89 kW
Average Weekday kWh		15.60 kWh

Methodology

Load impacts in September and October 2024 were estimated by using a difference-in-differences (DiD) approach implemented via a fixed effect regression model. This approach works by calculating the difference between the treatment and control group during the treatment period, and then subtracting any pre-existing differences between the treatment and control group during the pre-treatment period. The second difference helps to adjust for any pre-existing differences between treatment and control that could otherwise bias the results.

An example of the fixed effects regression model is below, with a description of each term in Table 2:

$$kW_{i,t} = \alpha + \gamma post_t + \beta treatpost_{i,t} + v_i + \varepsilon_{i,t}$$

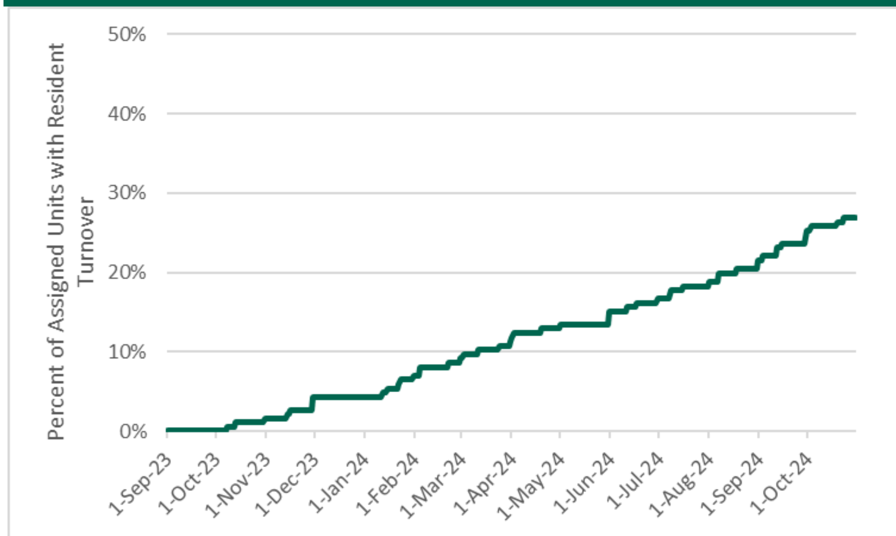
Table 2. Difference-in-Differences Regression Terms

Term	Description
$kW_{i,t}$	Electricity demand for customer *i* at hour *t*
α	Intercept term
γ	Time dummy variable coefficient
$post_t$	Time dummy variable: equals 1 if time ***t*** is in the post-treatment period, 0 otherwise
β	Difference-in-differences estimator coefficient; captures the treatment effect
$treatpost_{i,t}$	Interaction term: equals 1 if customer ***i*** is in the treatment group and time ***t*** is post-treatment, 0 otherwise
v_i	Customer fixed effect; controls for time-invariant characteristics of each customer ***i***
$\varepsilon_{i,t}$	Error term

[1] Average peak kW and weekday kWh estimates represent all customers included in the analysis during the pretreatment month of July 2024.

Initially, AMI data from September and October 2023 was to be used as the pretreatment period. However, due to a high occurrence of move-outs (or evictions), a limited number of customers (roughly 60 customers in each group) had sufficient pretreatment data for inclusion. Figure 2 illustrates the cumulative customer turnover among the group initially assigned to treatment and control conditions.

Figure 2. Cumulative Percent of Assigned Units with Resident Turnover



To maximize the sample size and ensure a more robust analysis, the pretreatment period was adjusted to July 2024.[2] This adjustment allowed for the inclusion of 78 control customers and 73 treatment customers with a full panel of data.[3] Table 3 presents the initial assignments to treatment and control conditions by unit type, as well as the final units included in the analysis. Nearly all units included in the Pilot were two-bedroom and one-bathroom apartments.

Table 3. Initial and Final Assignments for Load Impact Evaluation

Unit Description	Initial Assignments		Final Assignments	
	Control	Treatment	Control	Treatment
1bd & 1bath	1	1	1	1
2bd & 1bath	89	89	77	72
Studio & 1bath	3	3	-	-
Total	**93**	**93**	**78**	**73**

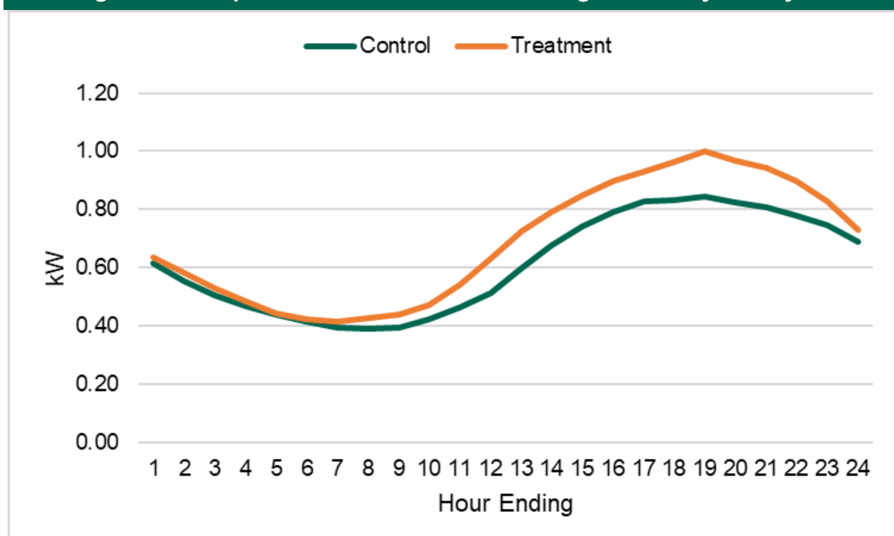
[2] In order to be included in the analysis, residents must have moved into their unit prior to July 1, 2024, and remained in that unit through at least October 31, 2024. Move-in and move-out data was provided by the managers of the apartment complex.

[3] In addition to accounting for customer churn, AMI data provided by SCE was reviewed for gaps, outliers, duplicates, or otherwise erroneous reads.

A comparison of average weekday hourly demand during the pretreatment period is presented in Figure 3. Unfortunately, there were significant differences in pretreatment hourly electricity demand between the treatment and control groups. Ideally, pretreatment differences between treatment and control groups are minimal, which allows for simpler comparisons of post-treatment outcomes. However, when substantial differences exist, as was the case here, additional analytic techniques such as DiD are necessary to isolate treatment effects and account for baseline imbalances. Although treatment was randomly assigned, imbalances such as these can occur with small sample sizes. Load data was not available at the time when assignments were made and could not be used to test equivalency between groups. That said, even with prior validation, the high-turnover rate among Pilot customers may have resulted in a similar outcome.

The imbalance between treatment and control customer load underscores the importance of using a DiD approach, which adjusts for pre-existing differences by comparing changes in usage over time between the two groups, rather than relying solely on absolute consumption levels in the post-treatment period. With that in mind, it should be noted that sample sizes were very small and represent customers residing in a specific apartment complex. Load impacts in this evaluation are meant to be directional, and not necessarily precise estimates of the effectiveness of Flick devices.

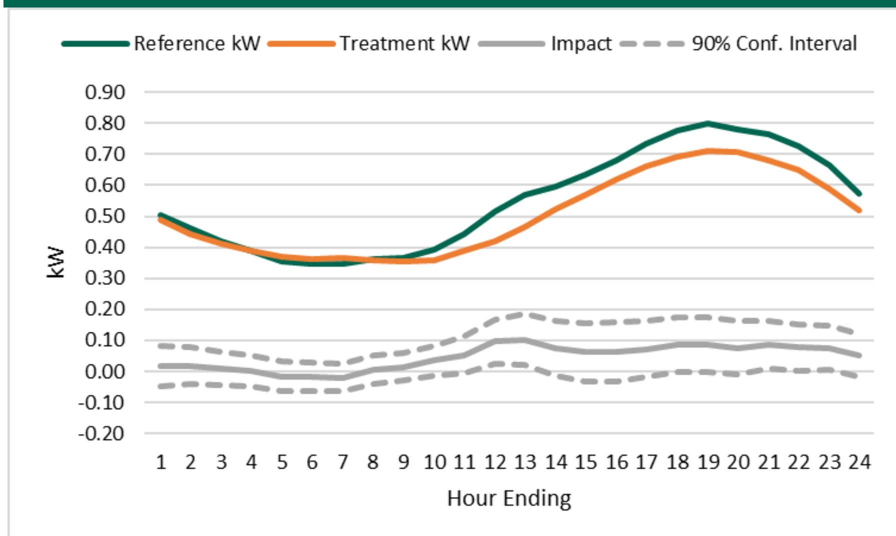
Figure 3. Comparison of Pretreatment Average Weekday Hourly Demand (July 2024)



Results

Figure 4 illustrates average hourly kW demand and kW impacts for the analysis period from September through October 2024 after the DiD estimation. In the figure, the orange line represents treatment group hourly demand. The green line represents the reference load (control group load) – or what the treatment group demand would be in the absence of a Flick device. Finally, the solid gray line represents load impacts (positive values indicate a reduction in demand) and the dashed lines indicate the 90% confidence interval. Interestingly, the observed load reductions occurred from mid-day through the evening, and not just the TOU peak period. It is possible the Flick device increased overall energy behavior awareness including outside of the TOU price signals. If this similar pattern occurs in future pilots, customer survey questions may be able to better understand how Flick is influencing customer behavior.

Figure 4. Average Weekday Hourly Demand and Impacts (September and October 2024)



The values presented in Figure 3 are detailed below in Table 4. On-peak hours are highlighted in orange. Hourly impacts were generally not statistically significant at the 90% confidence level. Notably, only one individual hour of the on-peak period showed a statistically significant demand reduction (8 to 9 PM, or hour-ending 21). Reductions were also statistically significant at the individual hourly level from 11 AM to 1 PM. It should be noted that the confidence bands on hourly estimates were quite wide, and the true effect likely falls somewhere within these ranges.

Table 4. Average Weekday Hourly Load Impacts

Hour Ending	Reference kW	Treatment kW	Impact kW	90% Conf. Interval		% Impact
1	0.51	0.49	0.02	-0.05	0.08	3.1%
2	0.46	0.44	0.02	-0.04	0.08	4.1%
3	0.42	0.41	0.01	-0.04	0.06	2.2%
4	0.39	0.39	0.00	-0.05	0.05	0.3%
5	0.36	0.37	-0.02	-0.06	0.03	-4.5%
6	0.35	0.36	-0.02	-0.06	0.03	-5.2%
7	0.35	0.37	-0.02	-0.07	0.03	-5.6%
8	0.36	0.36	0.01	-0.04	0.05	1.8%
9	0.37	0.35	0.01	-0.03	0.06	4.0%
10	0.39	0.36	0.03	-0.01	0.08	8.9%
11	0.44	0.39	0.05	-0.01	0.11	12.0%
12	0.52	0.42	0.10	0.03	0.17	18.8%
13	0.57	0.47	0.10	0.02	0.19	18.1%
14	0.60	0.52	0.08	-0.01	0.16	12.6%
15	0.63	0.57	0.06	-0.03	0.16	9.9%
16	0.68	0.62	0.06	-0.03	0.16	9.2%
17	0.73	0.66	0.07	-0.02	0.16	9.8%
18	0.78	0.69	0.09	0.00	0.17	11.0%
19	0.80	0.71	0.09	0.00	0.17	10.8%
20	0.78	0.71	0.08	-0.01	0.16	9.7%
21	0.77	0.68	0.09	0.01	0.16	11.2%
22	0.73	0.65	0.08	0.00	0.15	10.7%
23	0.66	0.59	0.08	0.00	0.15	11.5%
24	0.57	0.52	0.05	-0.02	0.12	9.1%

Aggregating across hours provides more precise estimates. The average hourly load impact during the peak period (4 to 9 PM) was equal to 0.08 kW, as seen in Table 5. This represents a demand reduction of 10.5% and is statistically significant at the 90% confidence level. Installation of the Flick device also resulted in statistically significant conservation effects on the average weekday, equal to 0.77 kWh across all 24-hours (or 8.4%).

Table 5. Average Weekday On-Peak Load Impact and Daily Conservation Effect

Period	Reference	Treatment	Impact	90% Conf. Interval		% Impact
Peak (4-9 PM)	0.77 kW	0.69 kW	0.08 kW	0.04 kW	0.12 kW	10.5%
Daily	13.21 kWh	12.10 kWh	1.11 kWh	0.77 kWh	1.46 kWh	8.4%

Limitations and Robustness

This evaluation of the Flick pilot encountered several important limitations that should be taken into consideration when interpreting the results. First, the pilot's relatively small sample size (approximately 180 apartment units) restricts the statistical power of the analyses, particularly when evaluating hourly and daily variations in energy use. With fewer participants, estimates of energy impacts have greater uncertainty, meaning that results should be viewed cautiously.

Second, the evaluation period was very brief, covering only two months (September and October 2024). Such a short timeframe limits the ability to capture potential seasonal variations in energy consumption and occupant behavior. Energy use patterns might significantly differ during other seasons, meaning the observed results may not fully represent annual behavior or longer-term trends.

The Flick system was designed to serve multifamily communities, and the pilot did not include any single-family homes. Multifamily residences often have distinct energy use patterns influenced by building design, tenant occupancy, and appliance ownership. Therefore, the pilot findings may not directly apply to single-family homes or the broader general residential population.

Despite these limitations, the results provide valuable initial insights into how visual cues from Flick can influence energy-saving behaviors in apartment settings. The findings highlight important considerations regarding how such technologies might be utilized to encourage energy behavioral changes within a multifamily housing environment.

Conclusions

The Flick pilot has provided promising initial evidence of the potential effectiveness of using simple visual cues to influence residential energy consumption behaviors. During the pilot period, the Flick device successfully encouraged noticeable load shifting and modest overall energy savings among participating apartment residents and among lower-income customers that previously have demonstrated significantly lower levels of awareness and response compared to non-low-income customers. These results indicate that clear, persistent visual signals integrated into everyday household fixtures can effectively prompt occupants to change their energy use behaviors.

However, the conclusions drawn from this pilot are constrained by several important limitations. The relatively small sample size and brief evaluation period limit the generalizability and robustness of the findings. The pilot's focus exclusively on multifamily apartments further restricts the applicability of the results to broader residential settings. Additionally, high tenant turnover in a multifamily setting presents an ongoing challenge in reliably measuring and interpreting the impacts, however the persistent signal in a multifamily home that experiences turnover has the potential to educate more residents that may encounter the pre-installed device.

Despite these constraints, the Flick pilot underscores the potential value of behavioral-based load flexibility tools in residential settings, particularly multifamily housing. The insights gained from this pilot highlight critical considerations for future research and deployment, including the need for expanded testing across diverse residential contexts, larger participant samples, and extended monitoring periods. With continued research and refinement, Flick and similar technologies could play a significant role in supporting utility and residential goals for load flexibility and energy conservation.

Recommendations

Considering the findings and limitations identified in this pilot evaluation, several recommendations can be proposed for future research and implementation. Future pilots should consider increasing the sample size to enhance statistical robustness and allow for high levels of participant turnover. Additionally, extending the observation period would provide a more comprehensive understanding of how occupant behavior and energy usage change across different seasons, capturing important seasonal variations.

Given the positive initial results observed in multifamily housing contexts, further studies targeting multifamily units are recommended. These settings appear particularly suited to leveraging the visual energy-saving signals offered by the Flick device. Moreover, there are additional housing contexts worth exploring, including low-to-moderate income housing and student housing environments (explored previously on a smaller scale), as these populations may uniquely benefit from and respond differently to behavioral cues for load shifting. Expanding research into these specific contexts will further clarify Flick’s broader potential as a scalable and effective tool for promoting load flexibility and energy conservation.

This pilot may help inform the development or refinement of several existing and emerging programs. Notably, it offers insights for improving the Energy Savings Assistance (ESA) program, particularly by expanding in-unit measures in multifamily housing, an area with persistent underspending and limited tenant-facing solutions. It also presents an opportunity to support low-income customers enrolled in the California Alternate Rates for Energy (CARE) program by promoting behavior-driven bill reductions, potentially helping to mitigate the growing financial burden of CARE subsidies. Beyond these, Flick could serve as an enabling technology for behavioral demand response initiatives, offering an accessible entry point for customers who lack smart thermostats or Wi-Fi connectivity. As such, the findings may support the design of new dynamic pricing outreach strategies and load flexibility programs that are inclusive of multifamily and underserved households.

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Appendix

FAIRFIELD. SOUTHERN CALIFORNIA EDISON Energy for What's Ahead Flick

Announcement / Anuncio

You have been selected for a study on energy savings by Southern California Edison. As part of this study, you will receive a free device called a Flick. The device is attached to a light switch and helps you remember when energy costs the most and reminds you to save energy.

Using less energy when the switch glows red from 4pm – 9pm will help lower your energy bill.

The device will be installed within the next week by building maintenance.

Has sido seleccionado para un estudio sobre ahorro de energía por Southern California Edison. Como parte de este estudio, recibirá un dispositivo gratuito llamado Flick. El dispositivo está conectado a un interruptor de luz y le ayuda a recordar cuándo la energía cuesta más y le recuerda que debe ahorrar energía.

Usar menos energía cuando el interruptor se ilumina en rojo entre las 4 p.m. y las 9 p.m. ayudará a reducir su factura de energía.

El dispositivo será instalado durante la próxima semana por el mantenimiento del edificio.

FAIRFIELD. SOUTHERN CALIFORNIA EDISON Energy for What's Ahead Flick

Today is the Day! / ¡Hoy es el Día!

Your new Flick device has been installed!

It will glow red between 4pm and 9pm to remind you to save energy.

No action is needed by you and you can continue to use power as you choose.

Using less energy when it glows red will help lower your Edison bill.

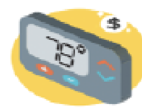
¡Tu nuevo dispositivo Flick ha sido instalado!

Se iluminará en rojo entre las 4pm y las 9pm para recordarle que ahorre energía.

No es necesario que usted realice ninguna acción y puede continuar usando el poder como desee.

Usar menos energía cuando se ilumina en rojo ayudará a reducir su factura de Edison.

Energy Saving Tips
Consejos para ahorrar energía
When your Flick glows red
Cuando tu Flick se ilumina en rojo



Adjust your air conditioning up 2 to 3 degrees
Ajusta tu aire acondicionado hasta 2 o 3 grados

Don't use appliances like your dishwasher
No utilices electrodomesticos como tu lavavajills

Turn off lights, TVs or other electronics you are not using
Apague las luces, televisores u otros aparatos electronicos que no este utilizando

For more information on Flick, or report if your Flick is not working correctly visit:
Para obtener más información sobre Flick o informar si su Flick no funciona correctamente, visite:
www.FlickPower.com/SCEPilot