FRONTIER energy

Reducing Energy Consumption in Commercial Food Service Equipment

October 23, 2019

Edward Ruan

California Energy Commission
Gavin Newsom, Governor

1

Thank You to the Plug Load Project Sponsors

Silicon Valley Power
City of Santa Clara

DEED Public Power Research & Development
American Public Power Association

California Energy Commission

2

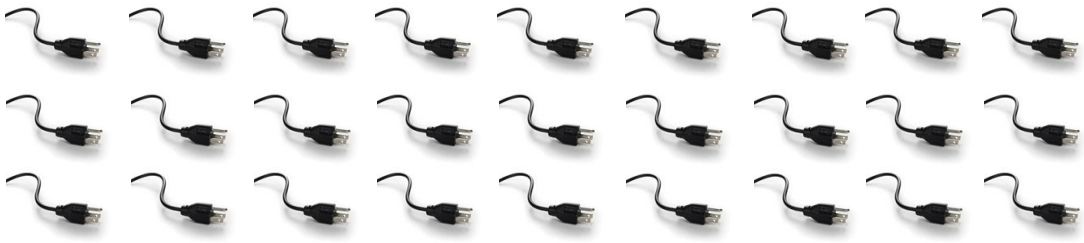
Project Objectives

- Gather energy data about plug loads, an underexplored category
- Identify plug load appliances with greatest energy savings potential
- Demonstrate potential to reduce appliance energy consumption without hindering overall kitchen production

3

Potential For Big Savings From Small Loads?

Appliance Plug Loads can be substantial - there are approximately 100,000 commercial food service (CFS) facilities operating in California and over 1 million facilities nationwide.



4

Plug Loads: More Common Than You Think

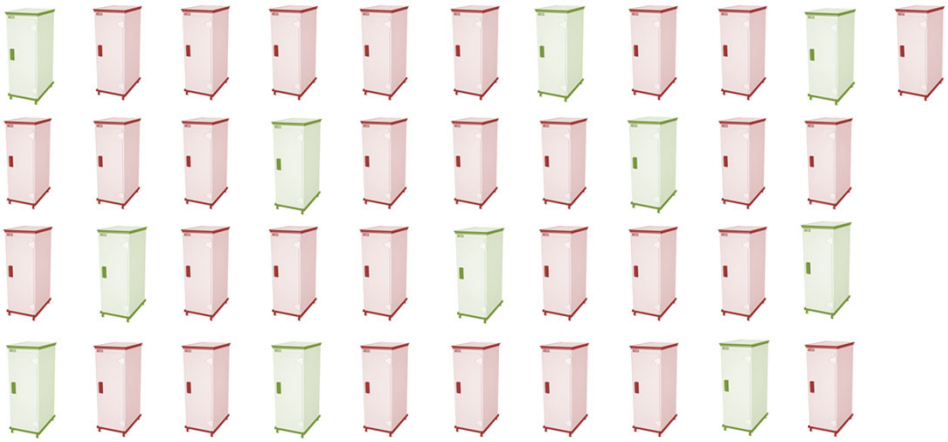
5

Energy Data Collection

6

Project Scope: 10 Sites

10 Appliances Replaced



7

- Energy Use Data Collected and Analyzed for ***19*** Appliance Types

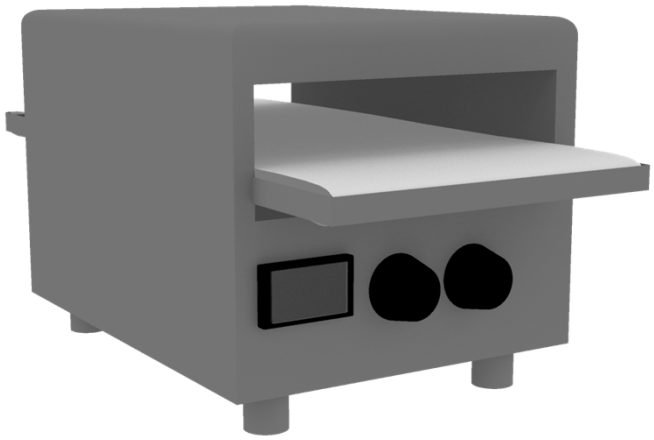
8

Of These 19, Which Can Save You $$?

9

	Number Monitored	Total Average Daily Energy Usage (kWh/day)	Average Percent Difference (%)	Direct Replacement Savings (%)	Average Annual Savings ($/unit)
Baseline	3	12.4	15	15	106
Efficient	3	12.4			

Conveyor Toasters

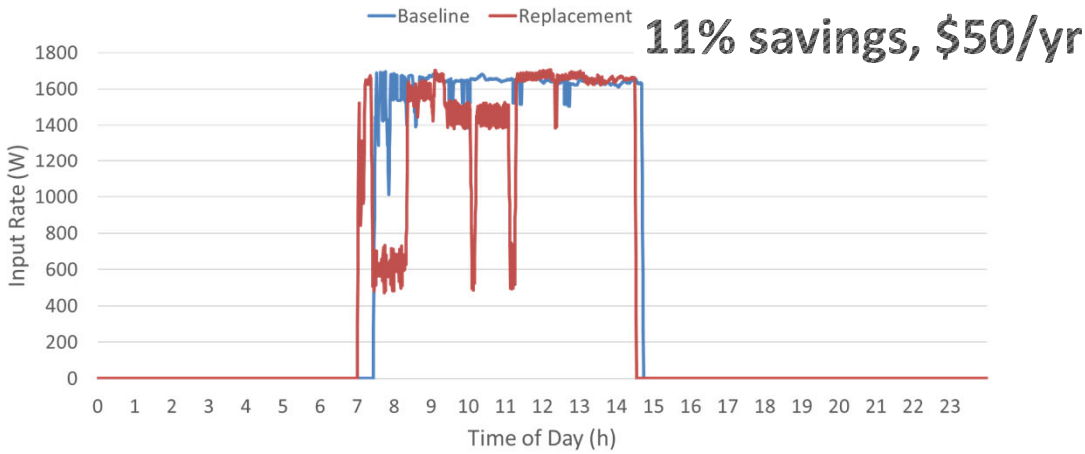


@ $0.15/kwh

10

Sandwich Store – Before, After, and Modified

Input Rate Modulation

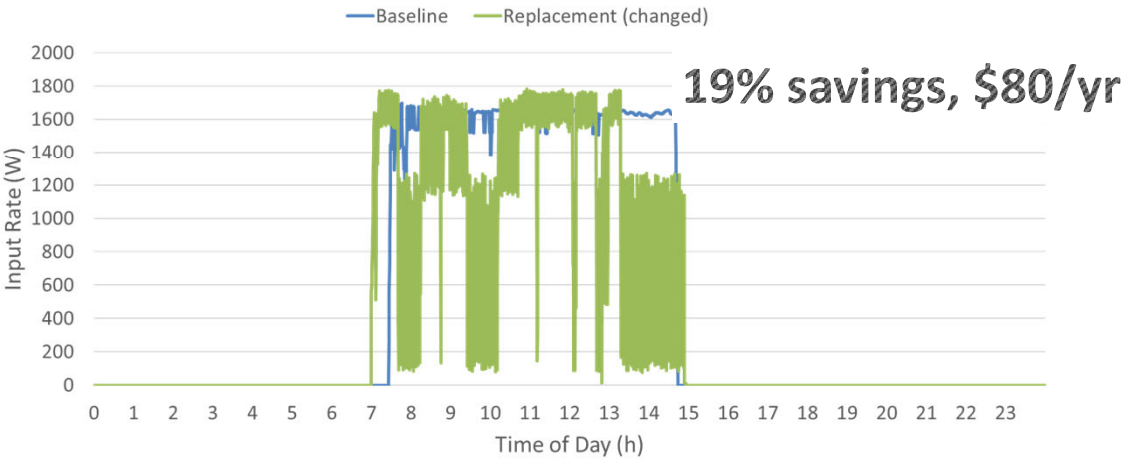


@ $0.15/kwh

11

Sandwich Store – Before, After, and Modified

Input Rate Modulation



@ $0.15/kwh

12

	Number Monitored	Total Average Daily Energy Usage (kWh/day)	Average Percent Difference (%)	Direct Replacement Savings (%)	Average Annual Savings ($/unit)
Baseline	5	8.7	61	58	287
Efficient	3	3.4			

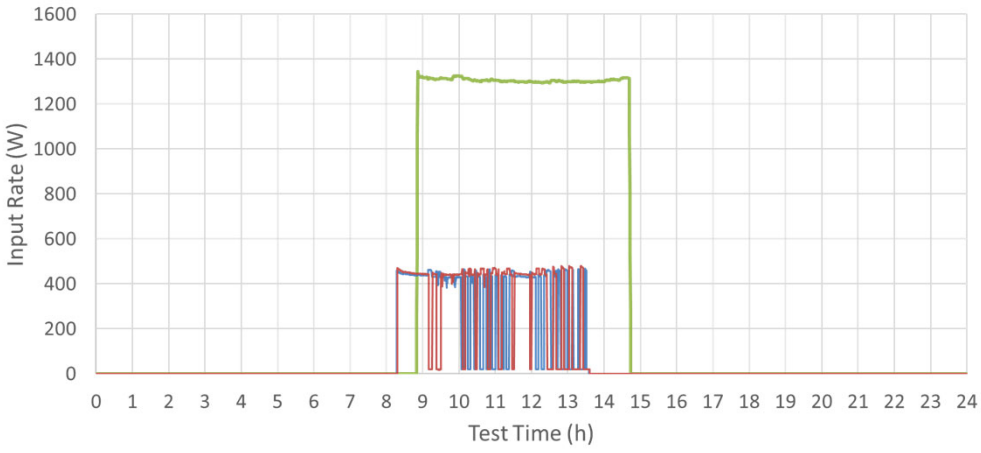
Holding Cabinets

@ $0.15/kwh

13

Tech Company

44% savings, $115/yr

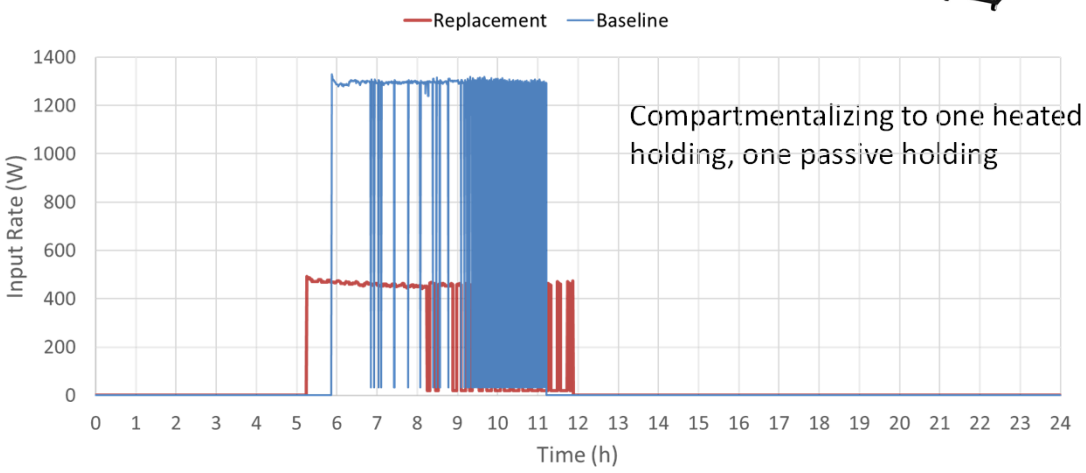


@ $0.15/kwh

14

Hotel

70% savings, $145/yr



@ $0.15/kwh

15

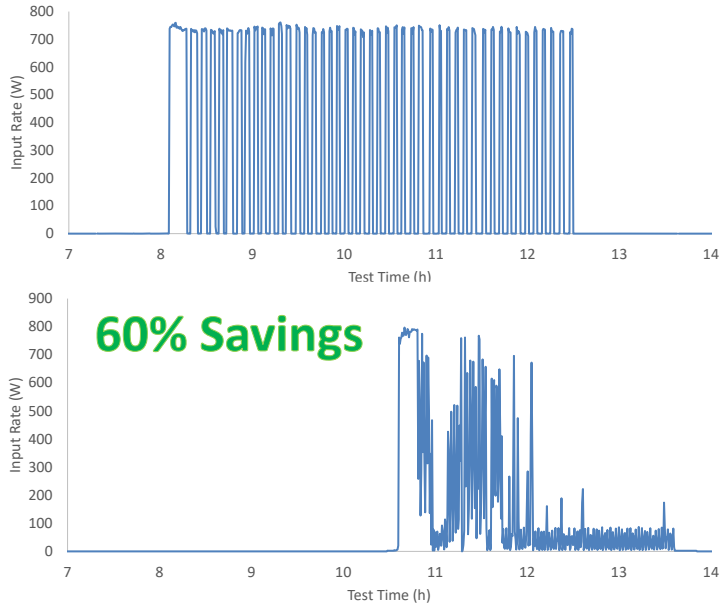
	Number Monitored	Total Average Daily Energy Usage (kWh/day)	Average Percent Difference (%)	Direct Replacement Savings (%)	Average Annual Savings ($/unit)
Baseline	3	0.8	39	42	17
Efficient	2	0.5			

Soup Wells

@ $0.15/kwh

16

Direct Replacement Savings



	Baseline	Induction
Average Daily Energy Use	1.04 kWh	0.41 kWh
Annual Energy Cost	$40.46	$23.96

- Client pleased with performance and noted ease of use

@ $0.15/kwh

17

Other Equipment With Potential

18

Hotplates

@ $0.15/kwh

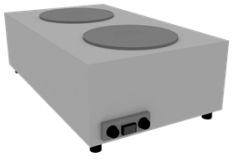
19

Induction Hotplates

Baseline electric hotplate to induction hotplate

- Energy use was reduced by 59%
- Estimated annual energy savings of about $600

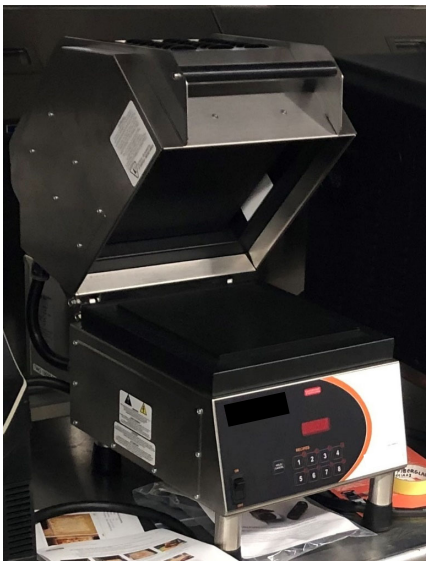
	Baseline	Induction
Average Daily Energy Use	18.2 kWh	7.4 kWh
Annual Energy Cost	$1000	$400



@ $0.15/kwh

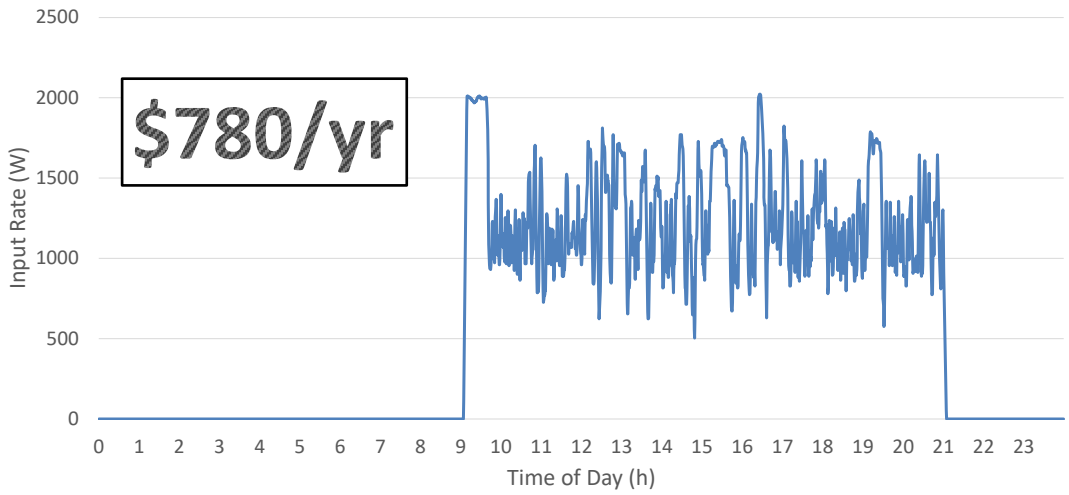
20

Panini Presses



21

Sandwich Shop

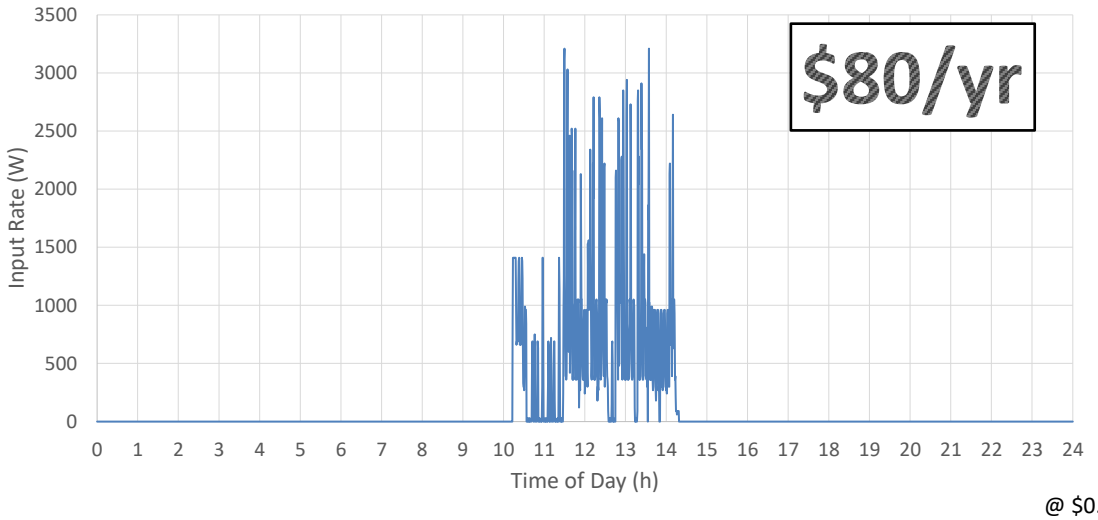


@ $0.15/kwh

22

Tech Company

High Speed Microwave Panini Press



@ $0.15/kwh

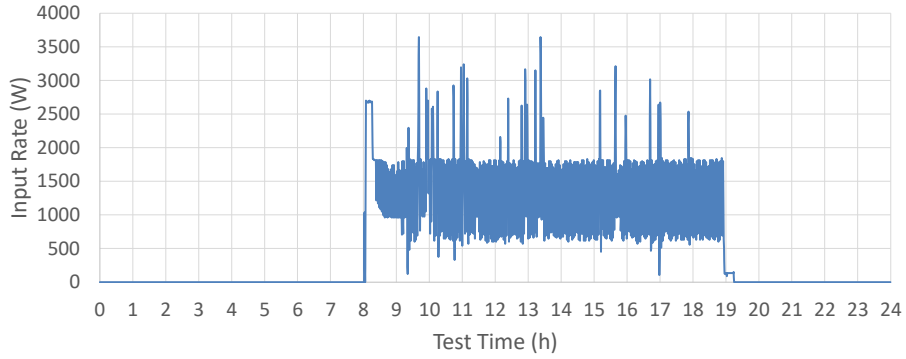
23

Rapid Cook Ovens

24

Sandwich Store

- Savings possible when replacing multiple pieces
- Replaced panini press and one steam table well



@ $0.15/kwh

25

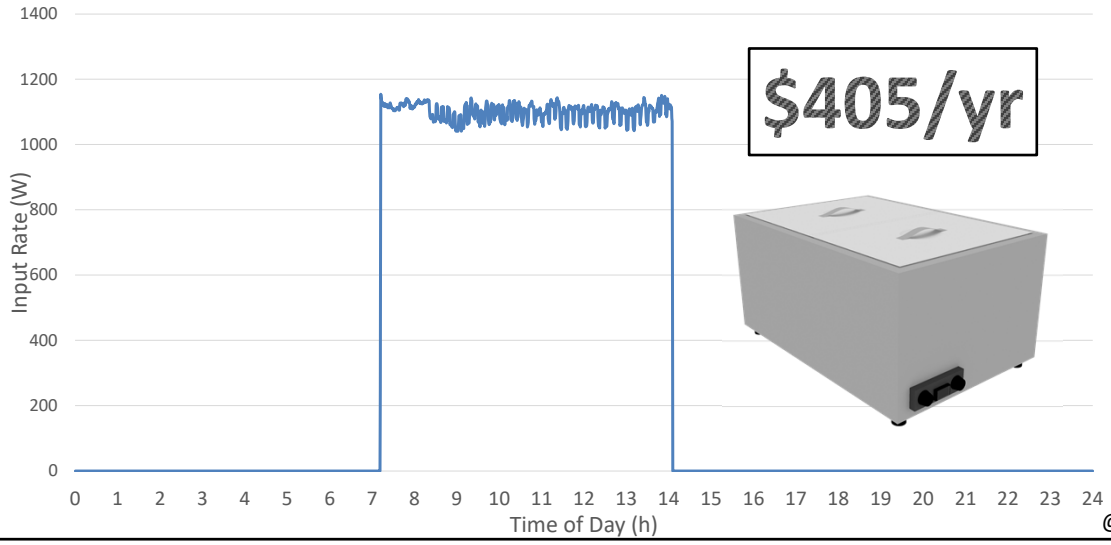
Heated Wells

@ $0.15/kwh

26

Wet Well at Sandwich Shop

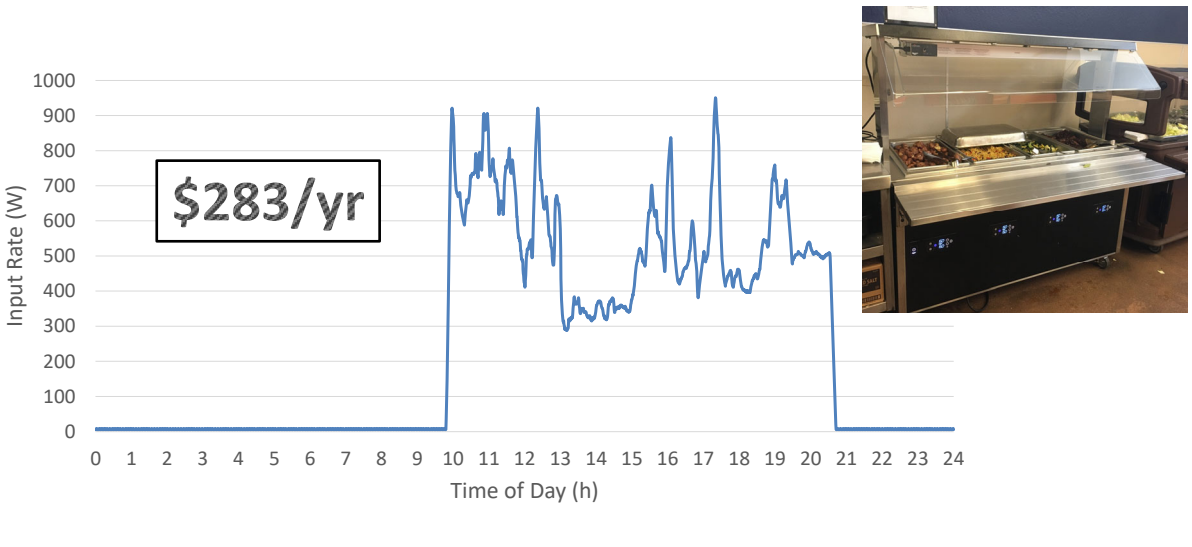
- One of two 12” x 20” Warmers used every day



@ $0.15/kwh

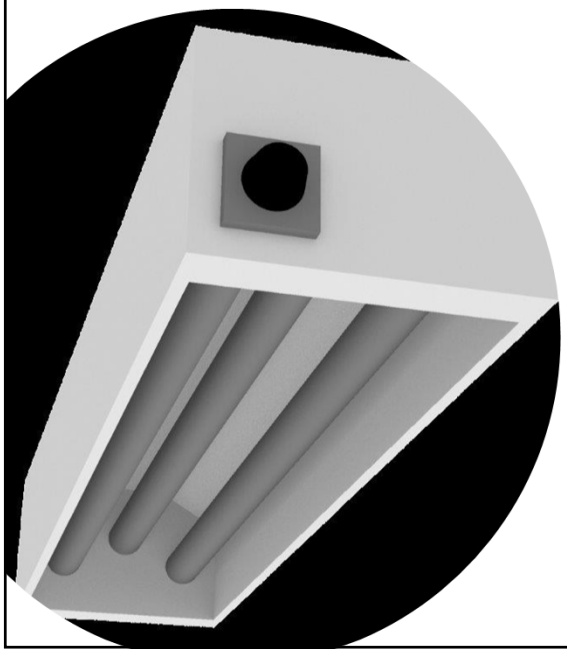
27

Induction Well at Hotel



@ $0.15/kwh

28



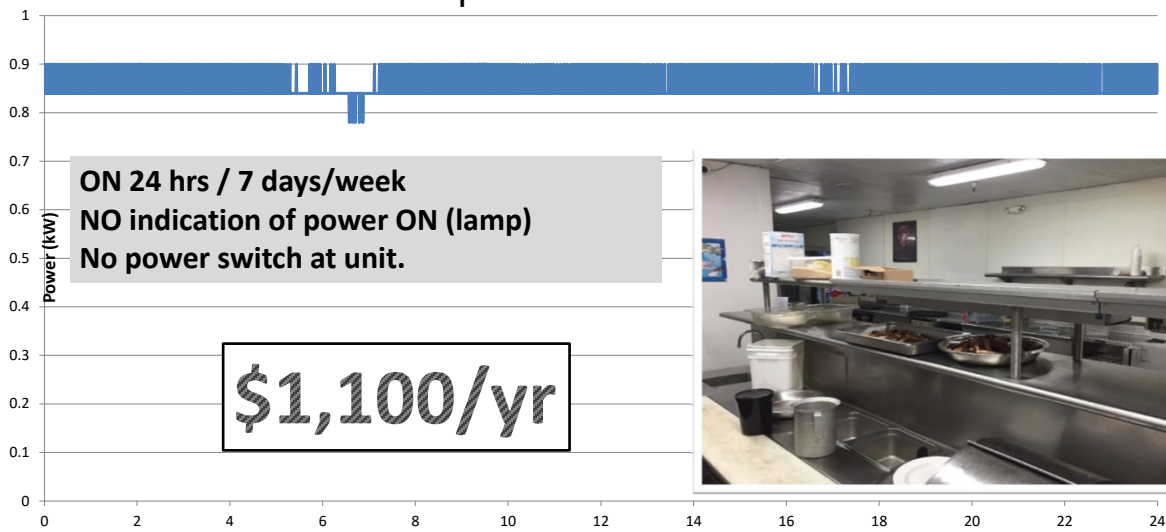
Heat Strips

@ $0.15/kwh

29

Hotel

4ft Heat Strip



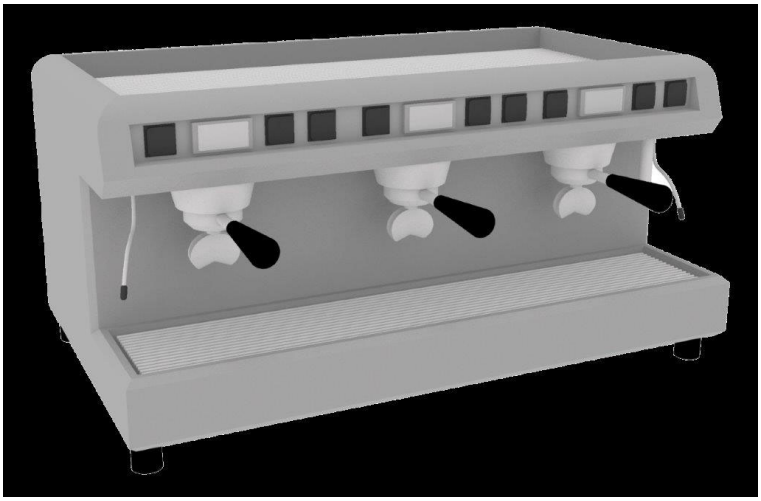
ON 24 hrs / 7 days/week
NO indication of power ON (lamp)
No power switch at unit.

$1,100/yr

@ $0.15/kwh

30

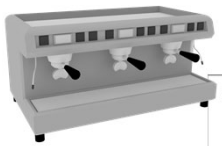
Espresso Machines

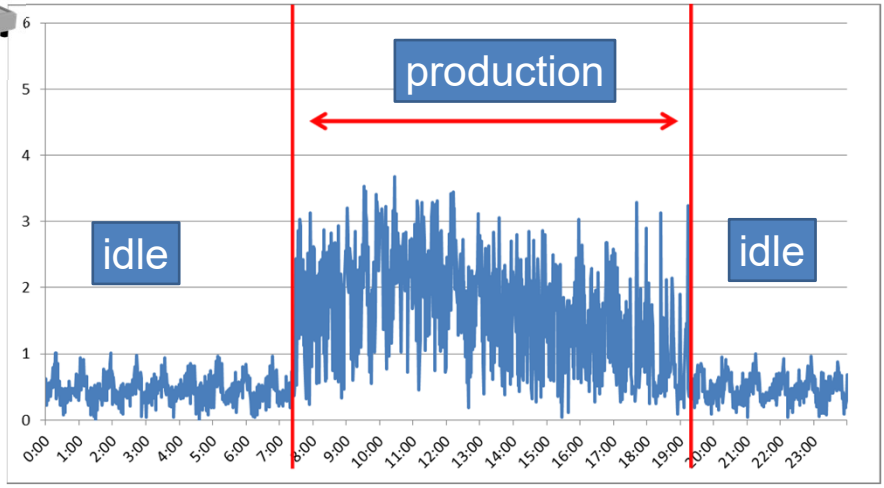


@ $0.15/kwh

31

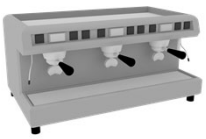
Espresso Machine Challenge – Always ON

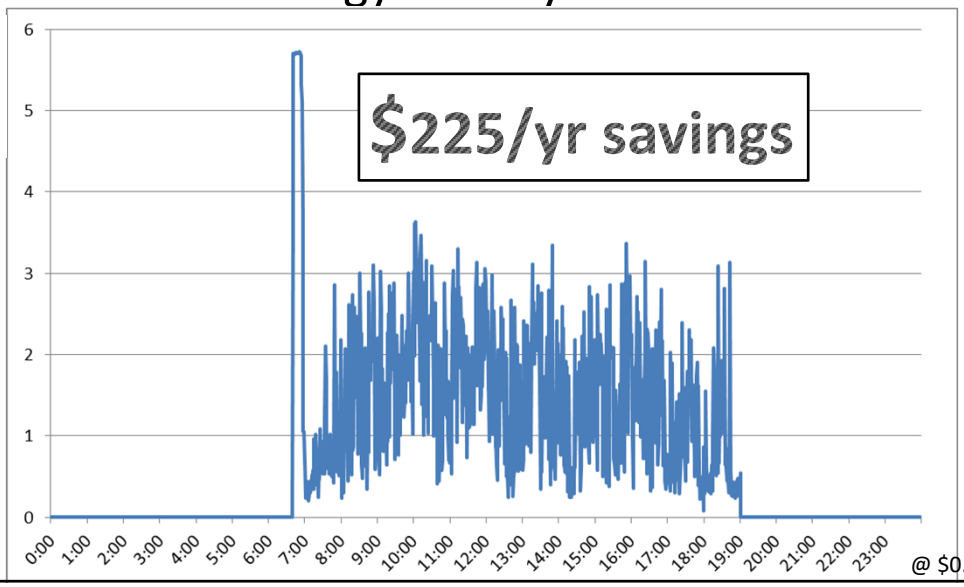




32

Espresso Machine Controlled with Internal Timer
Cut Energy Cost by 33%

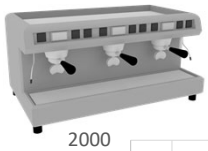


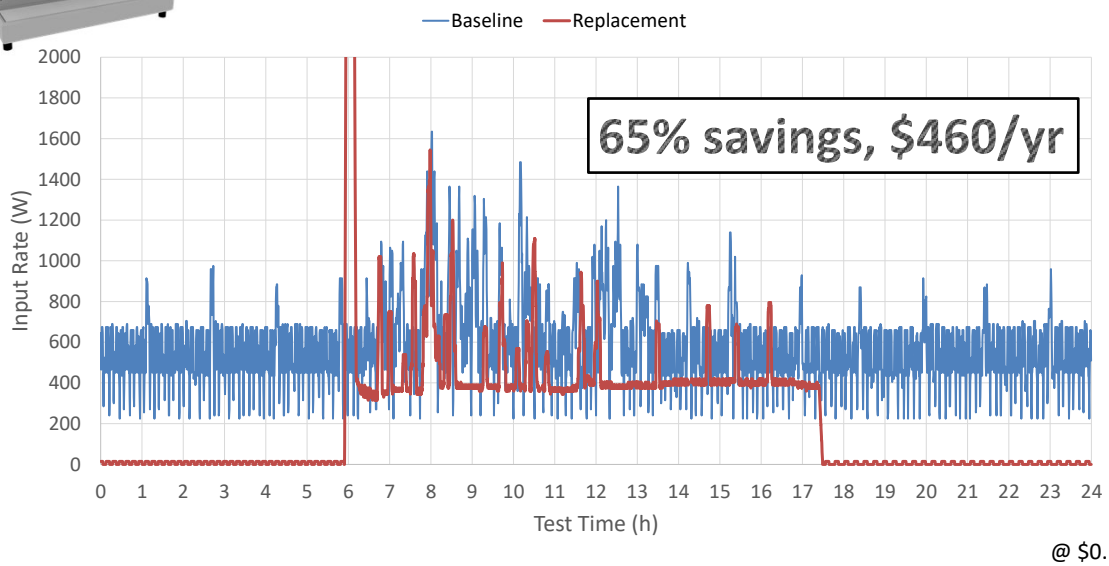


@ $0.15/kwh

33

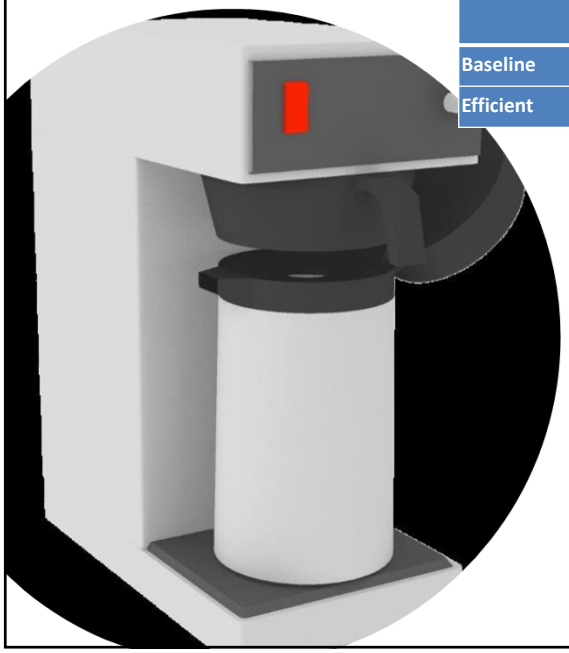
Café





@ $0.15/kwh

34



	Number Monitored	Total Average Daily Energy Usage (kWh/day)	Normalized Input Rate (kW)	Average Percent Difference (%)	Direct Replacement Savings (%)	Average Annual Savings ($/unit)
Baseline	7	9.1	0.71	75.0	55.3	163
Efficient	2	1.0	0.18			

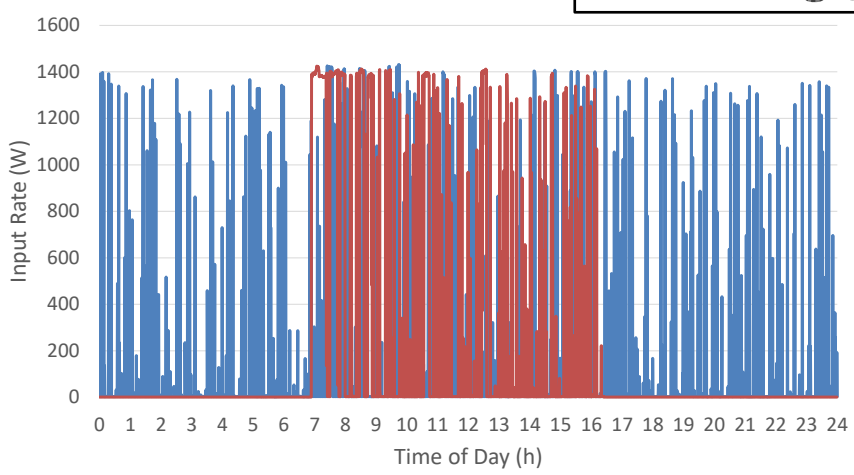
Coffee Brewers

@ $0.15/kwh

35

Replacement

Same model, controlled with on/off timer



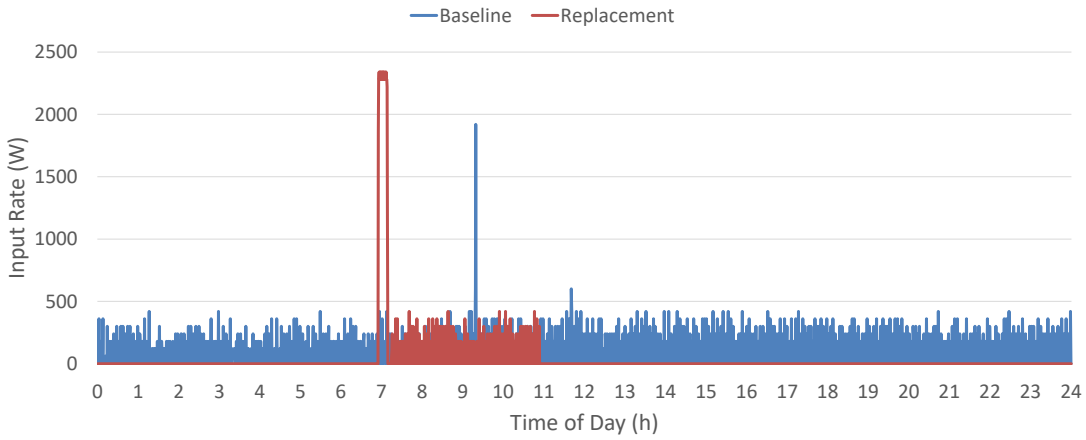
@ $0.15/kwh

36

Replacement at Small Sandwich Shop

Activating Setback Mode

69% savings, $55/yr



@ $0.15/kwh

37

Energy Savings Recognition

- Opportunities
  - Equipment with constant input rates
  - Long hours of operation and varying levels of demand
  - Low visibility and operator neglect
- Solutions
  - Better heat retention (insulation)
  - Improved energy conversion (induction)
  - Demand controlled operation (sensors/timers)

38

Barriers to Adoption

- Cost
- Staff Behavior Changes
- Education

39

Creating a Market

- Helping consumers find energy efficient options
- Encouraging manufacturers to invest in creating energy efficient equipment
- Help the food service industry push towards higher energy efficiency standards

40

CEC Plug Load Project
Web Page

http://www.fishnick.com/cecplug/

41