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helps prevent cooking fires before they start

Safe-T-element™ Energy Efficiency
Testing & Research Findings

Updated January 2007

This presentation is based on energy efficiency testing and analysis conducted by Pioneering Technology Inc. ("Pioneering") and other recognized third party organizations on behalf of Pioneering. It is important to note that the energy efficiency of the Safe-T-element™ cooking system and the related cost savings depends on many different variables and as such the results will differ under various circumstances. The results are affected by cooking usage and behaviour, demographics, size of household, volume/type of food cooked; age/model type of stove; flatness of cooking vessels and; the cost of electricity. The information contained herein is Pioneering's best effort to come up with means/averages based on significant in-house, third party and in-field testing which is conducted and documented on an ongoing basis.

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Executive Summary

Pioneering Technology's Safe-T-element™ cooking system is an innovative, patented product upgrade for electric coiled stove elements, designed and engineered to help prevent cooking fires before they start ***and*** reduce the amount of electricity required to cook.

For the purpose of this document the focus is on the impact of the Safe-T-element™ cooking system on energy efficiency. Some highlights to consider:

Facts to consider:

- Actual savings are difficult to quantify because cooking behavior, usage habits and demographics vary considerably
- Unlike other appliances energy usage for a stove actually increased by 17% between 1990 - 2000 ***- NRCan***
- 94% use the stovetop once a day, 65% two times and 29% three times per day ***– OEE***
- Unattended cooking is the number one cause of residential fires in North America - ***NFPA***
- STE has a maximum temperature control of 350°C / 662°F; most stoves reach temperatures of 650°-760°C / 1200°-1400°F on high

What does this mean?

It is clear that the stovetop is a frequently used and often *misused* product, making it both dangerous and inefficient. Safe-T-element™ by design will help to prevent fires and reduce the amount of energy required to cook. This second fact is magnified given the popularity of this appliance and that its use typically occurs at peak hydro usage times.

With Safe-T-element™ – (Top line conclusions based on minimum efficiency testing methodology):

- Maximum efficiency increase of approximately 75% is achieved when the stove is left on high and unattended
- Depending on behavior, on average under normal conditions, Safe-T-element™ cooking system will deliver 25 -50% efficiency
- Depending on usage, on average, the Safe-T-element™ cooking system will deliver annual savings of between $20 and $64
- Meaning Safe-T-element™ offers a payback of between 3 to 10 years on the energy savings alone
- Safe-T-element's primary benefit of fire prevention and many other intangible benefits means the time to payback can be greatly reduced (reduction in fires, sprinkler damage and injury; reduced insurance premiums; longer element life; etc)
- With Safe-T-element™ not only will you get reduced electricity costs, you get peace of mind and so much more

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Background:

Pioneering Technology's Safe-T-element™ cooking system is an innovative patented product upgrade for electric coiled stove elements, engineered to help prevent cooking fires before they start *and* reduce the amount of electricity required to cook.

Each Safe-T-element™ is an electronically controlled solid cover plate that is installed on top of the existing stovetop burners monitored by a thermocouple. A patented control unit installed inside the stove controls the high end temperature of the plate allowing it to reach a maximum temperature of 662°F/350°C. When the plate reaches 662°F/350°C the stove automatically shuts off and then as the plate cools to just below 662°F/350°C the stovetop is turned on again. In this way the burner plate maintains a maximum temperature of 662°F/350°C, more than enough for efficient and effective cooking, while not allowing most household materials to ignite.

With this technology the stovetop is turned off at certain times during the cooking process and this contributes to making the cooking process more energy efficient. The kitchen stove is one of the only major household appliances that has not increased in energy efficiency over the past 20 years. Given that the stovetop is used during peak usage times (dinner/breakfast), demand is high and so too are the related utility costs.

It is difficult to assess the average cost of operating a stove and the potential savings because the cooking process is an individually managed activity and usage habits differ considerably. Consider the following Usage Chart from Mississauga Hydro. It is evident from the disparity in monthly kWh usage and the approximate monthly costs that actual usage is difficult to put a handle on. As such the potential cost savings and time to payback will vary considerably depending on usage and actual utility costs.

Appliance Usage Chart – Mississauga Hydro

Appliance	Consumption (kWh)	Monthly Hours of Use	Monthly kWh	Approximate Monthly Cost $
Built-in Range/Cooktop	12.5	10 – 50	125 - 625	$12.50 - $62.50*

- *Based on $0.10 per kWh*

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The Challenge of Quantifying Energy Savings

The energy savings associated with the Safe-T-element™ cooking system is difficult to pinpoint because it depends on several key factors:

- Usage – the number of times per day the stove top is used and for how long
- Behavior – the way in which the cooking process is managed (whether cooking on high, medium or low; whether the user starts on high and then turns the stove down during the cooking process; whether the vessel is left unattended and boiling for long periods of time before the food is introduced; and in some instances whether the elements are being used for the very dangerous purpose of heating the premises; etc.)
- The model type and/or age of the stove
- The volume which is being cooked at any given time (i.e. size of household)
- The cost of electricity in the specific area
- And in some cases, the time of day the stove top is being used

Historically, the energy efficiency of a stove has been driven by Energuide's methodology of demonstrating energy efficiency. This methodology compares the energy usage of one stove to another for the purposes of making a quality or pricing decision at retail and does not reflect the cooking process or the true usage habits of the actual people operating the stove.

As a result the only way to understand the impact of the Safe-T-element™ cooking system is to either: a) conduct cooking tests in a controlled environment under every possible cooking permutation and then apply that data to existing third party standards; or b) to conduct in-field testing with and without the system to better understand its impact.

The first scenario offers a credible base-line and the latter is difficult to draw conclusions from because it depends so heavily on the demographic being tested and their cooking behaviors.

Here's what we do know and can quantify.

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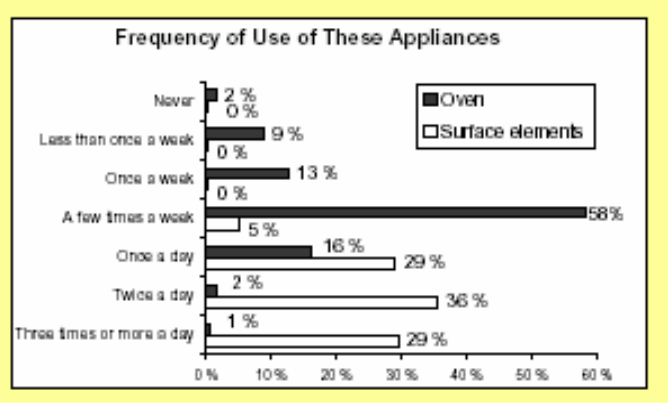
Some Facts on Behavior and Usage

Behavior

Although data on behavior is limited, the following statistics related to fires support some interesting behavioral habits:

- 118,700 home fires involved cooking equipment in 2005 (NFPA)
- 2 out of 3 reported home cooking fires start with the stove when food, grease, rags, bags, cabinets, curtains, or other common household items ignite
- Unattended cooking is the number one cause; the cook was out of the kitchen for 6 of the 7 fires studied
- Fire ignitions occur 2 to 1 in the first 15 minutes of cooking
- According to a Lowe's Home Safety Study over 53% of all Americans admit they walk away from the kitchen while cooking
- In most cases, for a fire to ignite the stovetop must heat up to in excess of 700°F/370°C

Usage



Two thirds of all households in Canada use the surface elements of their stoves at least twice a day; conversely, four out of five use their oven less than once a day.

- 94% use the stovetop at least once a day
- 65% use their stove top twice per day
- 29% use their stovetops three times or more a day
- Less than 19% use the oven once a day

There does not appear to be similar data from the U.S. but we are assuming that usage habits are quite similar.

According to the National Energy Use database's study of "Energy Consumption of Major Appliances" there has been no noticeable improvement in the energy efficiency of ranges between 1990 and 1997 and Natural Resources Canada's Residential End-use Model (Feb 2002) suggests that energy use of the stove has actually increased by 17% from 1990 to 2000 while penetration has only increased 1%.

As a company we have conducted ongoing in-house and third-party testing to better understand the energy efficiency performance of the Safe-T-element™ cooking system. What follows are the results of that testing:

Research Study/Findings to Date

Study 1: ACTS Testing Labs (Veritas), New York – Oct 2002

CONSUMER PRODUCTS DIVISION
OF BUREAU VERITAS

Category: Energy Efficiency Testing
Project Number: (5102)282-0132
Date: 09 October 2002
Devices Tested: Safe-T-element™ technology in a portable unit.

Test Parameters: Safe-T-element™ technology was tested against cooking performance of a regular electric coiled stovetop. Energy efficiency was calculated based on the cycling time of the Safe-T-element™ technology.

Results Overview: Testing found that Safe-T-element™ provided a 75% savings in energy consumption.

Study 2: Pioneering In-House Testing and Kinetrics (Old Ontario Hydro) – Aug 2003

Methodology:

1. Conducted testing in-house for potential efficiency of the Safe-T-element™ cooking system under different operating conditions. Testing was based on different utensil sizes, amounts of water at different settings for each of the burner sizes. (It is important to note that we were more diligent than the average cook might be in terms of controlling the usage behaviour – i.e. addressing settings immediately at boiling point and then running the stove at various levels for a set period of time).

2. Kinectrics conducted back of the envelope calculations based on in-house results to quantify potential savings/payback.

Study 2: Pioneering In-House Testing and Kinetrics (previously known as Ontario Hydro) cont'd

Calculations of Annual Savings (completed by Kinectrics)

Assumptions:
- Electric stovetops use approx 260 kWh/year (DOE)
- Useful energy estimated at 209 kWh/year (DOE)
- Small burner about 1.3 kW
- Large burner about 2.3 kW
- Electricity cost is $0.9 per kWh (Ontario all in)

Burner switched to low at boil

Small burner operates 9 minutes at high (boil) and 15 minutes (cook) at ¼ power	Power use: 0.27625 kWh per use
Large burner operates 6 minutes at high (boil) and 15 minutes (cook) at ¼ power	Power use: 0.37375 kWh per use
Assume one time per day, 350 days per year	Total: 227.5 kWh
Assume two times per day, 350 days per year	Total: 455 kWh

Burner left on high

Small burner operates 9 minutes at high (boil) and 15 minutes (cook) at full power	Power use: 0.52 kWh per use
Large burner operates 6 minutes at high (boil) and 15 minutes (cook) at full power	Power use: 0.805 kWh per use
Assume one time per day, 350 days per year	Total: 463.75 kWh
Assume two times per day, 350 days per year	Total: 927.5 kWh

Potential Savings

Once per day	0.675 kWh/day of use	236.5 kWh annually	$21.26 annually
Twice per day	1.35 kWh/day of use	472.5 kWh annually	$42.53 annually
Three per day	2.70 kWh/day of use	709.0 kWh annually	$63.79 annually

(Source: Kinectrics - calculations based on data from Pioneering in-house testing)

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Study 3 – CSA International Testing (Applied to HUD Historical data – analysis conducted by U.S. ESCO) - Oct 2004

CSA INTERNATIONAL

Category: Energy Efficiency Testing
File Number: 191012-1487735
Date: 15 October 2003
Devices Tested: Time versus cumulative wattage, temperature; model(s) Safe-T-element™, electric coiled & ceramic stovetops.

Methodology:

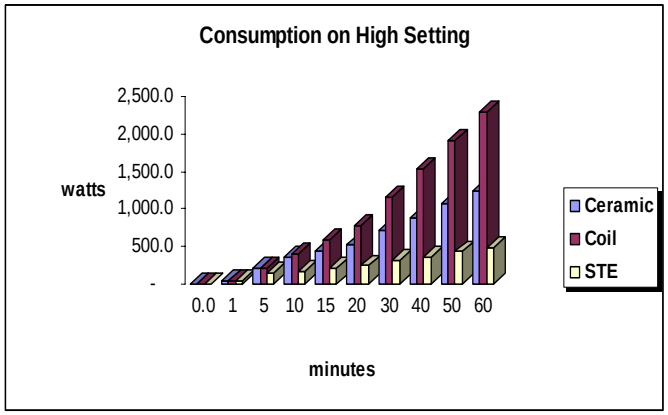
1. CSA International conducted testing using the Safe-T-element™ cooking system under different usage conditions comparing a normal electric coiled stovetop, a ceramic stovetop and an electric coiled stovetop with the Safe-T-element™ installed while cooking on high, medium and low. CSA also conducted ignition testing to better understand cooking fire prevention.

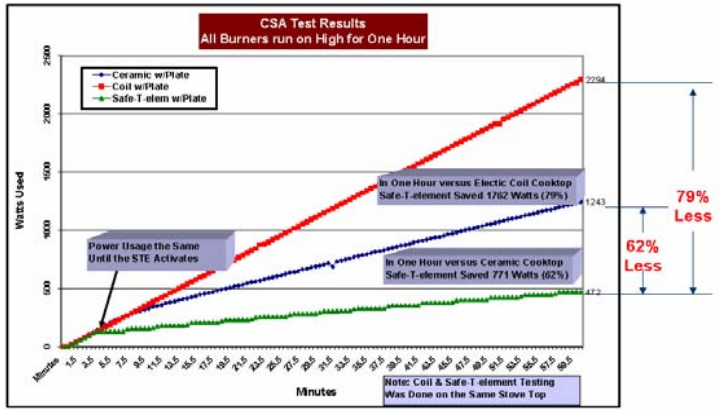
2. A major U.S. ESCO as part of their proforma analysis then applied CSA's findings to HUD's historical database for assessing cost savings and payback.

Results

Cooking on High

← HIGH SETTING →			
	Ceramic	Coil	STE
Minutes	Watts	Watts	Watts
1.0	42.2	39.4	38.0
5.0	209.0	192.8	132.6
10.0	343.4	383.0	161.8
15.0	435.6	575.2	208.4
20.0	526.2	765.8	234.0
30.0	705.6	1,148.4	306.8
40.0	883.8	1,530.0	354.8
50.0	1,062.0	1,911.6	423.8
60.0	1,242.6	2,294.2	472.2





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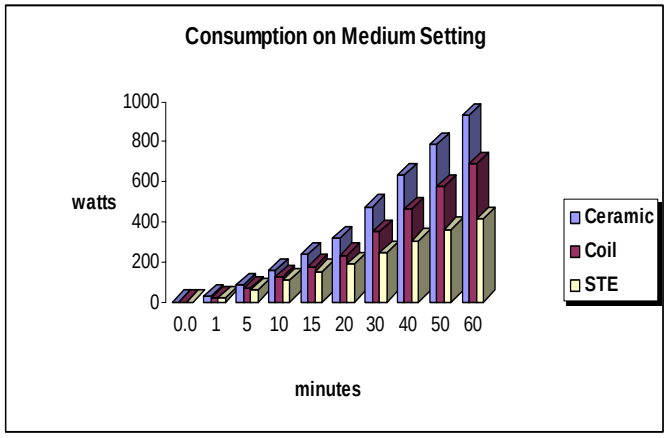
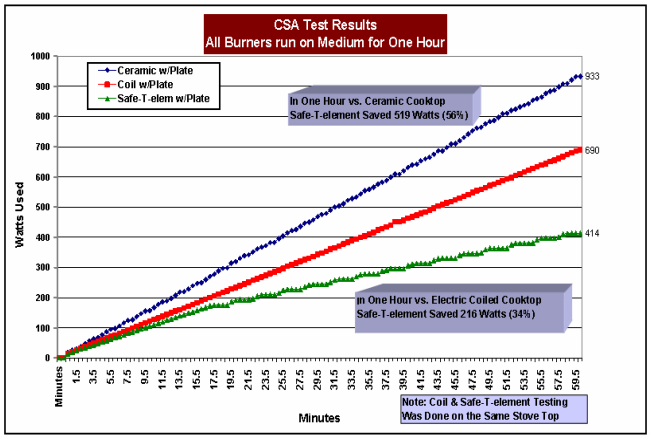
Cooking on Medium

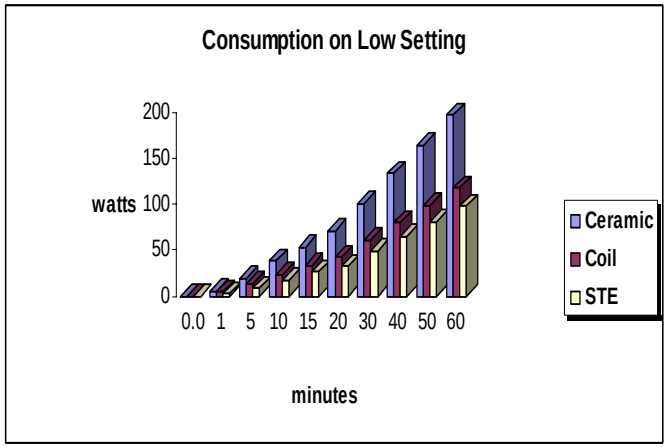
← MEDIUM SETTING →			
	Ceramic	Coil	STE
Minutes	Watts	Watts	Watts
1.0	26.8	20.6	18.6
5.0	86.6	65.2	57.4
10.0	157	122.4	105.4
15.0	238.8	176.8	153.0
20.0	319.8	233.8	191.6
30.0	475.6	347.4	244.4
40.0	631.2	462.8	306.0
50.0	786.6	576.6	363.2
60.0	933.2	690.0	413.6

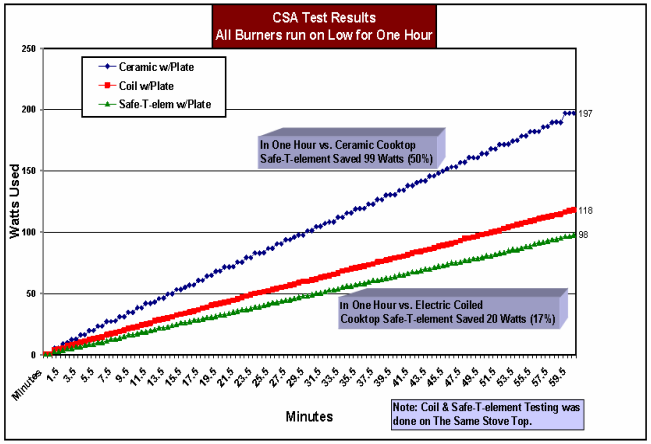




Cooking on Low

← LOW SETTING →			
	Ceramic	Coil	STE
Minutes	Watts	Watts	Watts
1.0	5.4	4.6	2.8
5.0	19.8	13.0	8.6
10.0	38.2	22.8	17.2
15.0	53.2	33.0	26.0
20.0	71.6	42.6	32.6
30.0	101.2	61.0	49.0
40.0	134.2	79.8	65.0
50.0	164.2	98.6	80.8
60.0	197.2	118.2	97.8





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Estimated savings based on CSA testing and HUD energy efficiency data

Energy Efficiency – Annual Savings & GHG Reductions

Apt. size (# of rooms)	Stove kWh per unit/ month	% Range use of total stove	Range kWh per unit/ Month	Total annual range kWh	% STE savings (CSA)	Annual savings kWh	Electric costs $/kWh	Annual $ savings	Annual Lbs. CO_2 decrease per apt. unit	Annual CO_2 tons decrease per 1,000 apt. units
0	47	0.8	37.6	451.2	50.0%	225.6	$ 0.10	$22.56	273	136.5
1	52	0.8	41.6	499.2	50.0%	249.6	$ 0.10	$24.96	302	151.0
2	62	0.8	53.76	645.1	50.0%	322.6	$ 0.10	$32.26	390	195.0
3	71	0.8	56.8	681.6	50.0%	340.8	$ 0.10	$34.08	412	206.0
4	77	0.8	61.6	739.2	50.0%	369.6	$ 0.10	$36.96	447	223.5
5	84	0.8	67.2	806.4	50.0%	403.2	$ 0.10	$40.32	488	244.0
0	47	0.8	37.6	451.2	79.0%	356.4	$ 0.10	$33.39	431	215.5
1	52	0.8	41.6	499.2	79.0%	394.4	$ 0.10	$36.94	477	238.5
2	62	0.8	49.6	595.2	79.0%	470.2	$ 0.10	$44.04	569	284.5
3	71	0.8	56.8	681.6	79.0%	538.5	$ 0.10	$50.44	652	326.0
4	77	0.8	61.6	739.2	79.0%	584.0	$ 0.10	$54.70	707	353.5
5	84	0.8	67.2	806.4	79.0%	637.1	$ 0.10	$59.67	771	385.5

The above noted calculations were completed by a large US based Energy Performance Contractor using The US Department of Housing and Urban Development's (HUD) energy efficiency formula for their proforma financial analysis of Safe-T-element™. All Safe-T-element™ data was supplied by CSA International. Actual savings depends entirely on cooking usage and behavior.

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Study 4: Safe-T-element™ Performance Testing – a simple calculation

The following is a test conducted in-house by Pioneering Technology Inc., in a controlled environment to clearly and simply demonstrate the potential of this product to save energy under normal everyday cooking conditions:

Purpose: To test the cooking performance of an average electric coil stove and the same electric coil stove with the Safe-T-element™ product retrofit.

Conditions: 500 grams of spaghetti
standing water temperature: 23°C / 73.4°F
7 cups of water per pot
large pot on large burner with control knob turned to high

Results: **Without Safe-T-element™ installed**: (temperature at high setting and then later reduced once spaghetti came to a boil)

Time to boil vigorously =	8.00 minutes & 0 seconds
Time for spaghetti to cook =	9 minutes and 30 seconds
Total time =	17 minutes and 30 seconds

With Safe-T-element™ installed: (*maximum temperature = 350°C / 662°F)*

Time to boil vigorously =	8 minutes & 45 seconds
Time for spaghetti to cook =	10 minutes & 0 seconds
Total time =	18 minutes & 45 seconds

Conclusion:

Difference in cooking time:	75 seconds
Coil Burner used:	440 watts
Safe-T-element™ used:	250 watts
Difference in energy usage	190 watts (or a 43% savings)

** Tests were conducted in-house at Pioneering Research and Development Lab*

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Study 5 – In-field Testing - Ongoing

While for the past few years we have focused on selling Safe-T-element™ based primarily on its fire prevention benefits we have begun conducting in-field energy efficiency testing with various Housing Authorities to assess the products impact under real life circumstances. While this initiative is in its infancy, to date we have conducted testing with the Toronto Community Housing Corporation, the Tampa Bay Housing Corporation, Peel Regional Housing and Waterloo Regional Housing. Some recent test results/findings include:

Toronto Community Housing - Test realized a savings of 23.5%. The results of this test were inconclusive given the time of year of the testing (May – July) when many appeared to go on holidays after the Safe-T-elements had been installed.

Peel Regional Housing – Test was completed by Peel Region Energy on Nov 21, 2006 – their conclusion, *"This product's claim has been validated with this test. Energy savings will still be a calculated number based on the type of tenants in the building and cooking habits. Pioneering Technology has created a spreadsheet to enter assumptions for the building which will calculate anticipated energy savings. Overall this product should be promoted as a safety feature with the by-product being energy savings."*

Waterloo Regional Housing – Test was completed by Waterloo Hydro who concluded a savings of 32% under normal controlled cooking conditions.

Tampa Bay Housing – Testing was completed on Oct 21, 2006 and while we have not received the test data Tampa has continued to purchase product and fund the costs out of their energy management budgets.

Ontario's Social Housing Services Corporation (SHSC - representing over 200K apartment units) has recognized Safe-T-element™ as one of their pre-qualified products for their "Green Light Initiative". The SHSC Green Light Initiative provides financial and technical assistance to housing providers in Ontario to implement responsible energy management initiatives. The product is also a recognized energy management solution by the Ontario Non-Profit Housing Association's "Best Deals" Program and the BC Non-Profit Housing Association's (BCNPHA) "Buyers" program.

In Conclusion

Safe-T-element™ is currently being purchased and installed throughout North America in seniors' facilities, housing authorities, universities, hotels/motels/timeshares, military facilities and in institutions for the mentally and physically challenged. The majority of these groups have bought the product based on its fire safety benefits and the many cost savings associated with this benefit. However in many instances these organizations are funding the project out of their energy efficiency budgets. While the exact savings may not be evident, it is clear that the Safe-T-element™ cooking system, by virtue of the way it works, does save energy.

Pioneering's Safe-T-element™ cooking system is currently recognized as an energy efficiency product vendor with many multi-residential housing organizations throughout North America.

More information and data is available upon request

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