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Appendix for ECM 15: Energy Efficient Transformers, FunPlex, Police HQ

I. Energy Savings Calculations

POWERSMITHS

ESCO / RETROFIT PROJECT DESCRIPTION	FunPlex
DATE	24-Aug-11
ENERGY COST(s)	
kWh rate	$0.0400
Demand rate ($/kW/mo) ex. $10.00	$18.36
Energy Cost Escalation (above inflation)	0.0%

								ADJUSTMENTS									Status Quo Transformer Losses										Powersmiths Transformer Losses										Compare Transformer Performance							
TRANSFORMER COUNT	Audit Reference # (Tag #)	Building Name	Associated Panel	Transformer Designation	Existing kVA	Replacement kVA	REPLACE	% Load during normal operating hours	% Load outside operating hours	equipment operating hrs/ day	equipment operating days/yr	Status quo Efficiency (Normal Operation)	Status quo Efficiency (Outside op. hrs)	Powersmiths Efficiency (Normal Operation)	Powersmiths Efficiency (Outside op. hrs)	AAC System Performance (kW/ton)	Status Quo kW Losses (Normal Operation)	Status Quo kW Losses (Outside op. hrs)	Status Quo Annual additional kWh from transformers	Total KW Loses	Demand KW Dollars	Status Quo Annual Cost of Transformer Losses	Status Quo Additional Tons of Cooling (on peak)	Status Quo Annual additional kWh from AAC	Status Quo Annual Cost of Associated AAC	Powersmiths kW Losses (Normal Operation)	Powersmiths Transformer kW Losses (Outside op. hrs)	Powersmiths Annual additional kWh from transformers	Total KW Loses	Demand KW Dollars	Annual Cost of Powersmiths Losses	Powersmiths Additional Tons of Cooling (on peak)	Powersmiths Annual additional kWh from AAC	Powersmiths Annual Cost of Associated AAC	STATUS QUO Annual Operating Cost Total	POWERSMITHS Annual Operating Cost Total	Annual Dollar Savings with Powersmiths	Annual kWh Savings With Powersmiths	Annual Peak Ton Cooling Reduction	kW SAVINGS	kWh SAVINGS
2	T1	FunPlex	SDB-A		112.5	112.5	1	25.0%	10.0%	14.0	350	95.9%	91.3%	98.7%	97.9%	0	1.14	1.02	9,528	2.16	$251.81	$ 633	-	-	$ -	0.34	0.23	2,569	0.57	$75.89	$ 179	-	-	$ -	$ 633	$ 179	$ 454	6959	-	1.59	6,959
3	T2	FunPlex	AG		112.5	112.5	1	25.0%	10.0%	14.0	350	95.9%	91.3%	98.7%	97.9%	0	1.14	1.02	9,528	2.16	$251.81	$ 633	-	-	$ -	0.34	0.23	2,569	0.57	$75.89	$ 179	-	-	$ -	$ 633	$ 179	$ 454	6959	-	1.59	6,959
4	T6	FunPlex	N/A		112.5	112.5	1	25.0%	10.0%	14.0	350	95.9%	91.3%	98.7%	97.9%	0	1.14	1.02	9,528	2.16	$251.81	$ 633	-	-	$ -	0.34	0.23	2,569	0.57	$75.89	$ 179	-	-	$ -	$ 633	$ 179	$ 454	6959	-	1.59	6,959
5	T3	FunPlex	RP1		150	150	1	25.0%	10.0%	14.0	350	96.1%	91.7%	98.7%	97.9%	0	1.46	1.29	12,122	2.75	$320.82	$ 806	-	-	$ -	0.47	0.31	3,492	0.78	$102.79	$ 242	-	-	$ -	$ 806	$ 242	$ 563	8630	-	1.97	8,630
6	TC1	FunPlex	C1		45	45	1	25.0%	10.0%	14.0	350	93.7%	86.7%	98.2%	97.2%	0	0.71	0.66	6,037	1.37	$157.44	$ 399	-	-	$ -	0.20	0.12	1,436	0.32	$43.06	$ 100	-	-	$ -	$ 399	$ 100	$ 298	4602	-	1.05	4,602
7	TC2	FunPlex	C2		45	45	1	25.0%	10.0%	14.0	350	93.7%	86.7%	98.2%	97.2%	0	0.71	0.66	6,037	1.37	$157.44	$ 399	-	-	$ -	0.20	0.12	1,436	0.32	$43.06	$ 100	-	-	$ -	$ 399	$ 100	$ 298	4602	-	1.05	4,602
8	T4	FunPlex	LD		30	30	0	25.0%	10.0%	14.0	350	93.3%	85.8%	97.8%	96.7%	0	0.00	0.00	-	-	$0.00	$ -	-	-	$ -	0.00	0.00	-	-	$0.00	$ -	-	-	$ -	$ -	$ -	$ -	0	-	-	0
9	T5	FunPlex	LE1		15	15	0	25.0%	10.0%	14.0	350	91.1%	81.9%	97.3%	96.0%	0	0.00	0.00	-	-	$0.00	$ -	-	-	$ -	0.00	0.00	-	-	$0.00	$ -	-	-	$ -	$ -	$ -	$ -	0	-	-	0
							6												52,781	11.97	$1,391.11	$3,502		0	$0	1.89		14,070	3.14	$416.58	$979		0	$0	$ 3,502	$ 979	$ 2,523	38,711	0.00	8.84	38,711

ECM 15 Energy Efficient Transformers Savings Calculation Police HQ

POWERSMITHS

ESCO / RETROFIT PROJECT DESCRIPTION	Police HQ
DATE	24-Aug-11
ENERGY COST(s)	
kWh rate	$0.0400
Demand rate ($/kW/mo) ex. $10.00	$18.33
Energy Cost Escalation (above inflation)	

TRANSFORMER COUNT	Powersmiths Audit Reference # (Tag #)	Building Name	Location ID or Room #	Transformer Designation	Existing kVA	Replacement kVA	REPLACE	ADJUSTMENTS								
								% Load during normal operating hours	% Load outside operating hours	equipment operating hrs/ day	equipment operating days/yr	Status quo Efficiency (Normal Operation)	Status quo Efficiency (Outside op. hrs)	Powersmiths Efficiency (Normal Operation)	Powersmiths Efficiency (Outside op. hrs)	A/C System Performance (kW/ton)
2		Police HQ	UPS		15	15	0	25.0%	10.0%	24.0	365	91.1%	81.9%	97.3%	96.0%	0
3		Police HQ	RA1		112.5	112.5	1	25.0%	10.0%	24.0	365	95.9%	91.3%	98.7%	97.9%	0
4		Police HQ	L1		112.5	112.5	1	25.0%	10.0%	24.0	365	95.9%	91.3%	98.7%	97.9%	0
5		Police HQ	EMF		75	75	1	25.0%	10.0%	24.0	365	95.0%	89.5%	98.5%	97.7%	0
6		Police HQ	EME		75	75	1	25.0%	10.0%	24.0	365	95.0%	89.5%	98.5%	97.7%	0
7		Police HQ	RC1		75	75	1	25.0%	10.0%	24.0	365	95.0%	89.5%	98.5%	97.7%	0
8		Police HQ	EMC		45	45	1	25.0%	10.0%	24.0	365	93.7%	86.7%	98.2%	97.2%	0
9		Police HQ	EMH		45	45	1	25.0%	10.0%	24.0	365	93.7%	86.7%	98.2%	97.2%	0
10		Police HQ	RD1		30	30	1	25.0%	10.0%	24.0	365	93.3%	85.8%	97.8%	96.7%	0
11		Police HQ	RB1		30	30	0	25.0%	10.0%	24.0	365	93.3%	85.8%	97.8%	96.7%	0
12		Police HQ	UPS6		30	30	0	25.0%	10.0%	24.0	365	93.3%	85.8%	97.8%	96.7%	0
13		Police HQ	ELS		15	15	0	25.0%	10.0%	24.0	365	91.1%	81.9%	97.3%	96.0%	0
14		Police HQ	LSC		15	15	0	25.0%	10.0%	24.0	365	91.1%	81.9%	97.3%	96.0%	0
							8									

TRANSFORMER COUNT	Status Quo Transformer Losses									Powersmiths Transformer Losses									Compare Transformer Performance						
	Status Quo kW Losses (Normal Operation)	Status Quo kW Losses (Outside op. hrs)	Status Quo Annual additional kWh from transformers	Total kW Loses	Demand kW Dollars	Status Quo Annual Cost of Transformer Losses	Status Quo Additional Tons of Cooling (on peak)	Status Quo Annual additional kWh from A/C	Status Quo Annual Cost of Associated A/C	Powersmiths kW Losses (Normal Operation)	Powersmiths Transformer kW Losses (Outside op. hrs)	Powersmiths Annual additional kWh from transformers	Total kW Loses	Demand kW Dollars	Annual Cost of Powersmiths Losses	Powersmiths Additional Tons of Cooling (on peak)	Powersmiths Annual additional kWh from A/C	Powersmiths Annual Cost of Associated A/C	STATUS QUO Annual Operating Cost Total	POWERSMITHS Annual Operating Cost Total	Annual Dollar Savings with Powersmiths	Annual kWh Savings With Powersmiths	Annual Peak Ton Cooling Reduction	kW SAVINGS	kWh SAVINGS
2	0.00	0.00	-	-	$0.00	$ -	-	-	$ -	0.00	0.00	-	-	$0.00	$ -	-	-	$ -	$ -	$ -	$ -	0	-	-	0
3	1.14	1.02	10,012	2.16	$251.39	$ 652	-	-	$ -	0.34	0.23	3,017	0.57	$75.76	$ 196	-	-	$ -	$ 652	$ 196	$ 455	6995	-	1.59	6,995
4	1.14	1.02	10,012	2.16	$251.39	$ 652	-	-	$ -	0.34	0.23	3,017	0.57	$75.76	$ 196	-	-	$ -	$ 652	$ 196	$ 455	6995	-	1.59	6,995
5	0.93	0.83	8,129	1.76	$204.12	$ 529	-	-	$ -	0.27	0.17	2,371	0.44	$59.54	$ 154	-	-	$ -	$ 529	$ 154	$ 375	5758	-	1.32	5,758
6	0.93	0.83	8,129	1.76	$204.12	$ 529	-	-	$ -	0.27	0.17	2,371	0.44	$59.54	$ 154	-	-	$ -	$ 529	$ 154	$ 375	5758	-	1.32	5,758
7	0.93	0.83	8,129	1.76	$204.12	$ 529	-	-	$ -	0.27	0.17	2,371	0.44	$59.54	$ 154	-	-	$ -	$ 529	$ 154	$ 375	5758	-	1.32	5,758
8	0.71	0.66	6,260	1.37	$157.18	$ 408	-	-	$ -	0.20	0.12	1,712	0.32	$42.99	$ 111	-	-	$ -	$ 408	$ 111	$ 296	4547	-	1.05	4,547
9	0.71	0.66	6,260	1.37	$157.18	$ 408	-	-	$ -	0.20	0.12	1,712	0.32	$42.99	$ 111	-	-	$ -	$ 408	$ 111	$ 296	4547	-	1.05	4,547
10	0.51	0.47	4,456	0.98	$111.90	$ 290	-	-	$ -	0.16	0.10	1,385	0.26	$34.78	$ 90	-	-	$ -	$ 290	$ 90	$ 200	3071	-	0.73	3,071
11	0.00	0.00	-	-	$0.00	$ -	-	-	$ -	0.00	0.00	-	-	$0.00	$ -	-	-	$ -	$ -	$ -	$ -	0	-	-	0
12	0.00	0.00	-	-	$0.00	$ -	-	-	$ -	0.00	0.00	-	-	$0.00	$ -	-	-	$ -	$ -	$ -	$ -	0	-	-	0
13	0.00	0.00	-	-	$0.00	$ -	-	-	$ -	0.00	0.00	-	-	$0.00	$ -	-	-	$ -	$ -	$ -	$ -	0	-	-	0
14	0.00	0.00	-	-	$0.00	$ -	-	-	$ -	0.00	0.00	-	-	$0.00	$ -	-	-	$ -	$ -	$ -	$ -	0	-	-	0
			61,387	13.32	$1,541.40	$3,997		0	$0	2.05		17,958	3.36	$450.91	$1,169		0	$0	$ 3,997	$ 1,169	$ 2,828	43,429	0.00	9.97	43,429

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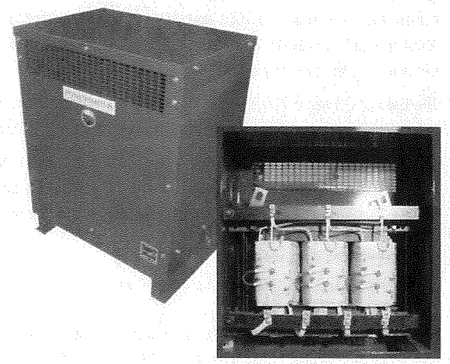
Appendix for ECM 15: Energy Efficient Transformers, FunPlex, Police HQ

II. Manufacturer Specification Sheets

POWERSMITHS

E-Saver-C3 The Green Transformer



APPLICATIONS

The E-Saver-C3 transformer is the ideal transformer for institutional and commercial environments where energy efficiency is a priority. Optimized for lowest life cycle cost, the E-Saver-C3 reduces waste by as much as 74%. The E-Saver-C3 is a practical and affordable solution for K-12, colleges and universities, healthcare, governments and commercial buildings where lowest life cycle cost and energy savings are a priority.

DESCRIPTION AND CHARACTERISTICS

The E-Saver-C3 sets new benchmarks for environmental protection, energy efficiency and reliability. Designed to provide the lowest life cycle cost, the E-Saver-C3 meets US DOE Candidate Level 3 efficiency ensuring lower operating losses than standard off-the shelf transformers. To provide superior performance and reduce environmental impact the E-Saver-C3 comes with a superior Nomex based insulation system impregnated with an organic epoxy adhesive.

QUIET OPERATION

Workplace productivity can be compromised when noisy transformers are located close to people. To meet this challenge, the E-Saver-C3 has embedded structural and acoustic treatments that combine to ensure quiet-operation. To ensure quiet operation noise tests are part of our ISO 9001 procedures for every transformer.

OPTIONAL INTEGRATED METERING

To facilitate on-site commissioning and monitoring, Powersmiths' SMART meter can be integrated into the transformer. SMART is an energy and power meter that serves as a data acquisition system, providing on-going energy and power quality data for the building's energy management systems and education for sustainability software such as Powersmiths Interactive Learning System. An optional port is available to provide safe external access to live transformer primary and secondary voltages and currents; operating temperature and TVSS status, without opening the transformer enclosure.

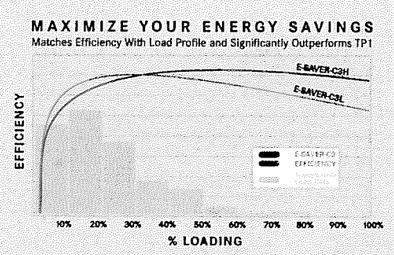
ENVIRONMENTAL BENEFIT

The E-Saver-C3 is built in an ISO 9001 (quality management) and ISO 14001 (environmental management) certified facility. Throughout the manufacturing process Powersmiths takes steps to ensure that waste is eliminated and hazardous materials are avoided. Because Powersmiths transformers generate lower losses, they reduce power drawn from generating stations resulting in less smog and lower greenhouse gas emissions.

TESTING AND WARRANTY

During manufacturing and assembly the E-Saver-C3 is subjected to rigorous testing to ensure: efficiency under various load profiles and loading conditions; quiet operation; and insulation integrity. Powersmiths is the only manufacturer to production-test transformers with actual computer-power loading in an ISO 9001 environment. Data is provided for individual units by selecting the NLT option.

The E-Saver-C3's long life and dependable performance is backed up by Powersmiths' industry leading 25 year pro-rated warranty. The warranty is automatically extended to 40 years when Powersmiths Cyberhawk MPC monitor, protection and control system is installed at the building entrance.



KEY FEATURES

- Reduces electricity waste to help you meet your sustainability goals
- Optimized to provide quiet, efficient electrical power for improved productivity
- Significantly exceeds NEMA TP-1 efficiency for low operating cost over life of transformer
- Provides the lowest life cycle cost of any transformer on the market
- Produced in an ISO 9001 and ISO 14001 certified facility to ensure high quality and low environmental impact

STANDARD CONFIGURATION

Powersmiths E-Saver-C3 is a copper wound, 3-phase common-core, ventilated, dry type isolation transformer, built in an ISO 9001 and ISO14001 environment to NEMA ST-20 and other applicable ANSI and IEEE standards. Primary and secondary terminals and voltage taps are readily accessible by removing the front cover plate; 10kV BIL.

The E-Saver-C3 has a 220˚C class insulation, is rated for 60Hz, and comes in a NEMA 2 ventilated indoor enclosure. It meets the efficiency requirements of DOE candidate Standard Level 3 (CSL 3).

The E-Saver-C3 comes in two models. The E-Saver-C3L is optimized for light loading, has a UL listed k-7 rating and a 130˚C temperature rise. The E-Saver-C3H is optimized for heavy loading, has a UL listed k-13 rating and a 105˚C temperature rise. The C3H model has an 80˚C option with k-20 rating.

SELECT

kVA: Rating of unit (15-1000 kVA, up to 5000 kVA)
DEG: 0 or 30 degrees phase shift
PV: Primary voltage, (600, 480, 415, 400, 380, 208, up to 15kV)
SV: Secondary voltage (208/120V, 480/277V, 600/347V, others available)

SAMPLE PART NUMBER

E-SAVER-C3L-75-480-208

* FEDERAL REGISTER - US Department of Energy, Office of Energy Efficiency and Renewable Energy. 10 CFR Part 430, July 29, 2004. Energy Conservation Program for Commercial and Industrial Equipment: Energy Conservation Standards for Distribution Transformers; Proposed Rule

TECHNICAL DATA

kVA	Impedance (%Z)	C3L Weight (lbs)	C3H Weight (lbs)	Case Size (Inches)
15	3.0 - 6.0%	200 - 250	210 - 260	A (18W x 17D x 27H)
30	3.0 - 6.0%	320 - 400	350 - 430	B (26W x 18D x 30H)
45	3.0 - 6.0%	400 - 500	420 - 520	B (26W x 18D x 30H)
75	3.0 - 6.0%	570 - 670	610 - 710	C (32W x 22D x 40H)
112.5	3.0 - 6.0%	850 - 950	880 - 1000	C (32W x 22D x 40H)
150	3.0 - 6.0%	1100 - 1300	1150 - 1350	D (38W x 27D x 48H)
225	3.0 - 6.0%	1550 - 1750	1700 - 1900	D+ (38W x 32D x 52H)
300	3.0 - 6.0%	1850 - 2050	1950 - 2150	D+ (38W x 32D x 52H)
500	3.0 - 6.0%	2500 - 2700	2900 - 3100	E+ (52W x 38D x 61H)
750	3.0 - 6.0%	3700 - 4300	4000 - 4400	F (64W x 47D x 67H)

The above data applies to configurations up to 600V, with NEMA 2 enclosure and standard temperature rise. Selection of some options may change enclosure size and weight. Consult factory for detailed product data sheet for these and other configurations.
*Specific case used determined by factory unless specified. Up to 5000kVA, 15kV class available.

AVAILABLE OPTIONS

SMART1: Integrated metering port

SMART2: Integrated Power & Energy Meter

SMART3: Integrated Meter with Web access

CYBERHAWK-TX: Efficiency & Power Meter

N3R: NEMA 3R, ventilated enclosure

T80: 80 deg. C operating Temp. rise (C3H model only)

F50: 50Hz design

1S: Single electrostatic shields

2S: Dual electrostatic shields

3S: Triple electrostatic shields

ECO: ECOLOGO certified

SPD: (120/208V OR 277/480V)
- **PRO80:** 80kA, 7 mode, Filter
- **PRO120:**120kA, 7 mode, Filter
- **PRO160:** 160kA, 7 mode, Filter
- **PRO200:** 200kA, 7 mode, Filter
- **PRO240:** 240kA, 7 mode, Filter

PROXX: Where xx is custom ID

LK: Lug kit, screw-type

COL: Color other than the factory standard

TSB: Terminal Safety Barrier

TS: Thermal Sensors at 170˚C and 200˚C

NLT: Nonlinear load test

SE: Sensitive Environment, extra low noise

C2AL: DOE class 2 efficiency, with aluminum windings

Warranty: Our Commitment to lasting performance is spelled out in the longest transformer warranty in the business - 25 years pro-rated. 40 year pro-rated warranty with the installation of the Cyberhawk MPC at the building entrance. E-Saver is a trademark of Powersmiths International Corp.

Technical specification subject to change without notice.

POWERSMITHS

POWERSMITHS INTERNATIONAL CORP. 10 Devon Road, Brampton, Ontario L6T 5B5 Canada
Phone: (905) 791-1493 Toll-free: (800) 747-9627 Fax: (905) 791-8870 Email: info@powersmiths.com
www.powersmiths.com

807-000431-121-A01