

ISO 50001

Energy Management System
(EnMS)

How to set
EnPI: baseline and target

SEC Regression Method

$$y = ax + b$$

Energy Performance Indicator

EnPI

$$y = ax + b$$

Setting (2009-2011) Baseline

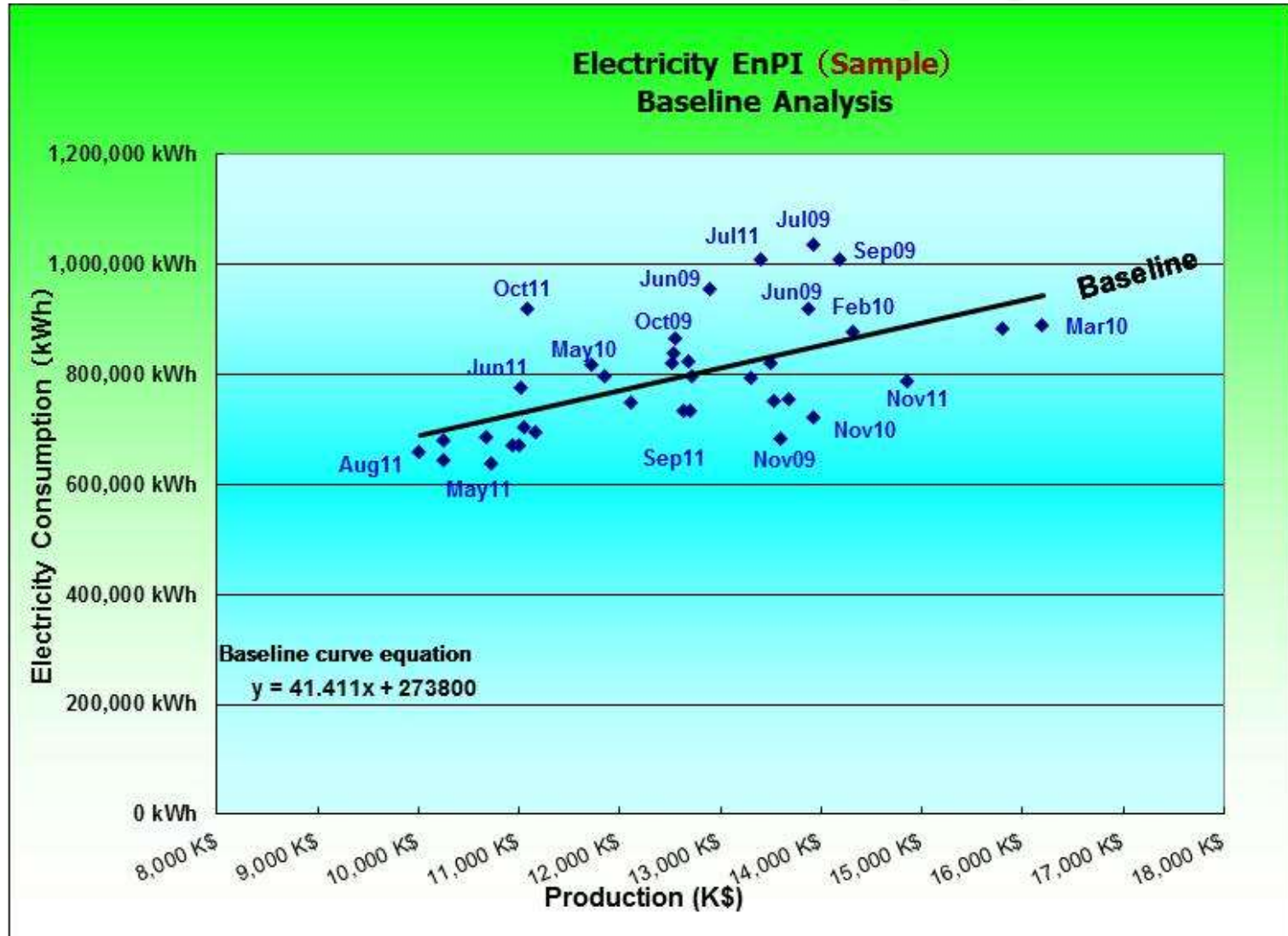
(Using the fact delivered)

Baseline Data

		Production (K\$)	Power Consumption (kWh)			Production (K\$)	Power Consumption (kWh)			Production (K\$)	Power Consumption (kWh)
BY2009	4-09	12,730 K\$	798,106 kWh	BY2010	4-10	13,310 K\$	793,073 kWh	BY2011	4-11	11,170 K\$	696,045 kWh
	5-09	11,870 K\$	798,471 kWh		5-10	11,740 K\$	817,074 kWh		5-11	10,740 K\$	637,537 kWh
	6-09	12,910 K\$	955,101 kWh		6-10	13,880 K\$	918,917 kWh		6-11	11,030 K\$	777,680 kWh
	7-09	13,410 K\$	1,009,306 kWh		7-10	13,940 K\$	1,036,444 kWh		7-11	10,690 K\$	687,291 kWh
	8-09	12,550 K\$	839,982 kWh		8-10	12,700 K\$	823,494 kWh		8-11	10,010 K\$	659,715 kWh
	9-09	14,200 K\$	1,009,962 kWh		9-10	15,810 K\$	884,264 kWh		9-11	11,060 K\$	704,581 kWh
	10-09	12,560 K\$	867,412 kWh		10-10	14,860 K\$	789,644 kWh		10-11	11,090 K\$	919,865 kWh
	11-09	13,610 K\$	684,664 kWh		11-10	13,940 K\$	723,767 kWh		11-11	11,020 K\$	671,022 kWh
	12-09	13,510 K\$	822,035 kWh		12-10	13,550 K\$	752,876 kWh		12-11	10,260 K\$	645,270 kWh
	1-10	12,530 K\$	820,795 kWh		1-11	12,120 K\$	749,812 kWh		1-12	10,260 K\$	679,777 kWh
2-10	14,330 K\$	879,303 kWh	2-11	12,720 K\$	734,127 kWh	2-12	10,950 K\$	672,481 kWh			
3-10	16,200 K\$	890,976 kWh	3-11	13,690 K\$	756,013 kWh	3-12	12,640 K\$	733,543 kWh			

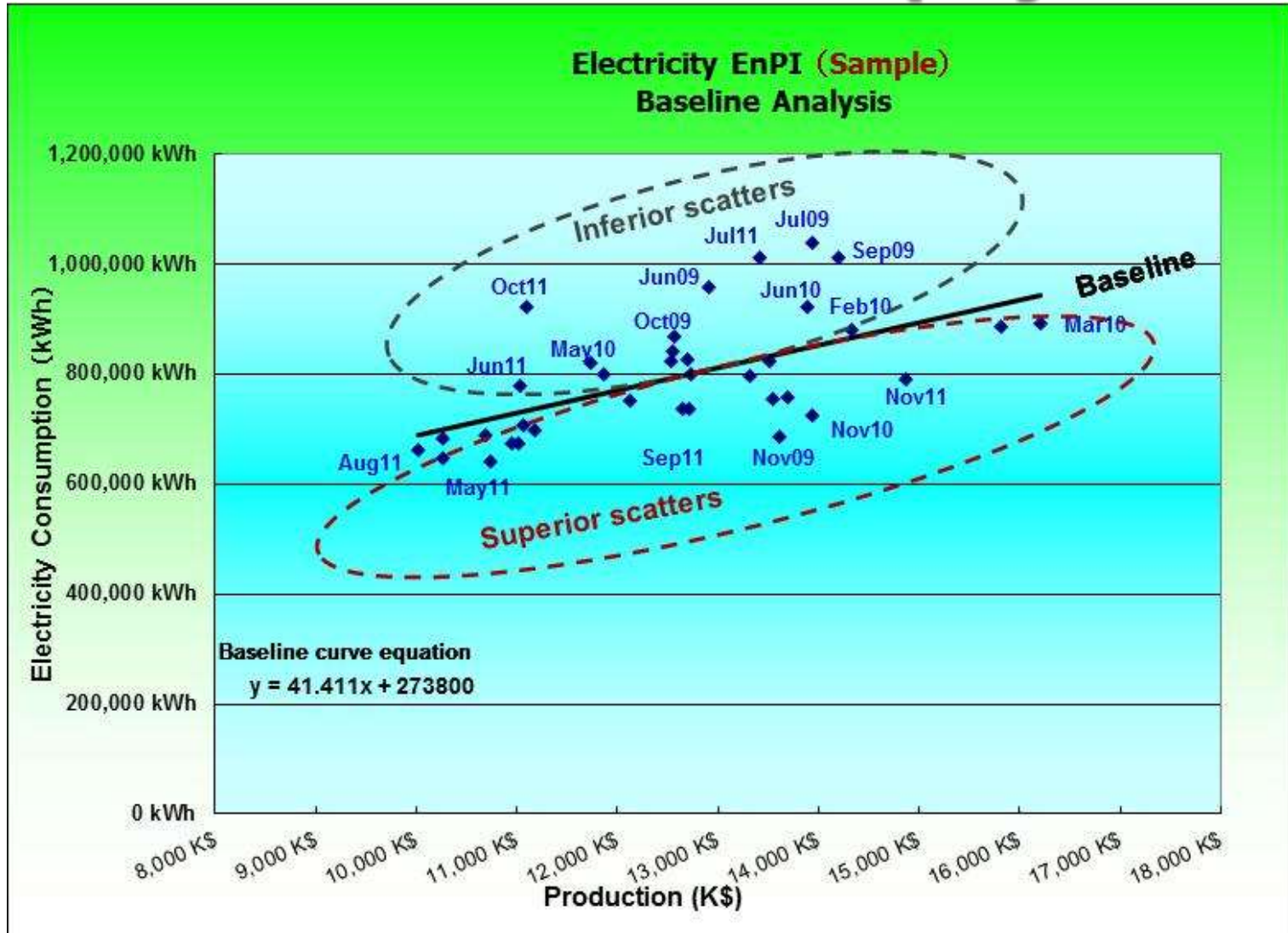
Baseline Analysis

(Using the fact delivered)

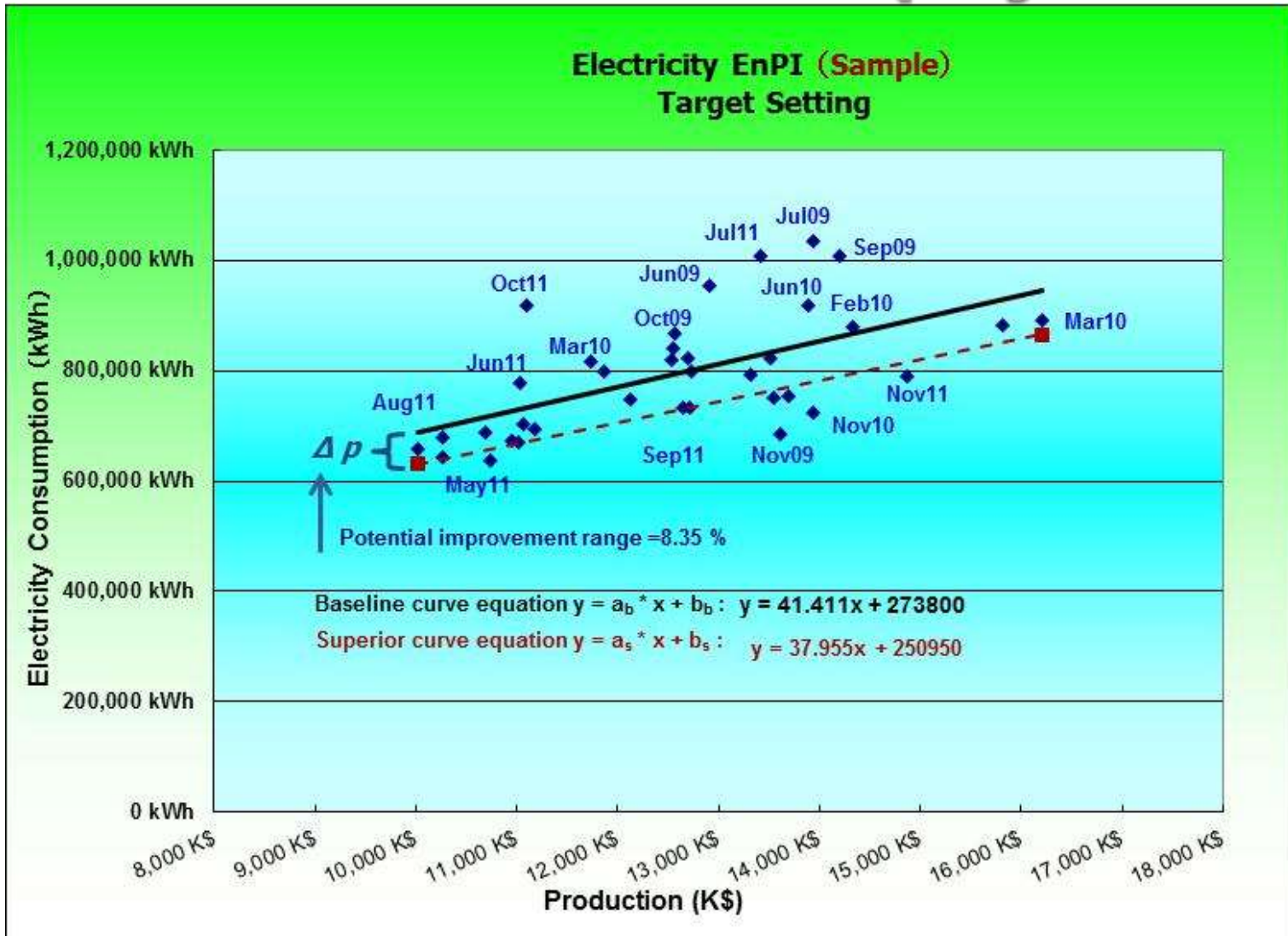


Scatter Grouping

(Using the fact delivered)



Performance Improvement Potential (Using the fact delivered)



Set 2009 as a Baseline

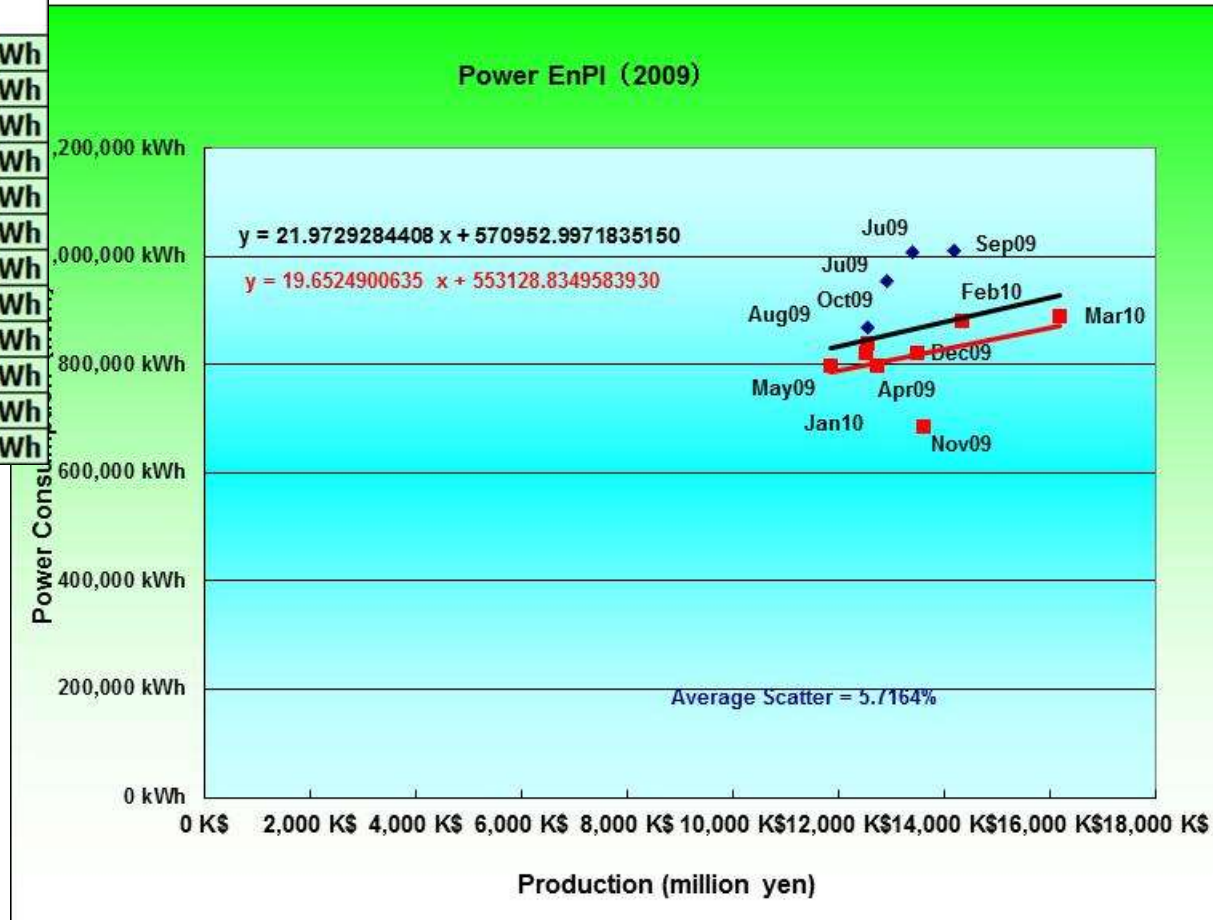
Evaluate how much you gain or lose today

(Using the fact delivered)

SEC Analysis

		Production (K\$)	Electricity Consumption (kWh)
2009	4-09	12,730 K\$	798,106 kWh
	5-09	11,870 K\$	798,471 kWh
	6-09	12,910 K\$	955,101 kWh
	7-09	13,410 K\$	1,009,306 kWh
	8-09	12,550 K\$	839,982 kWh
	9-09	14,200 K\$	1,009,962 kWh
	10-09	12,560 K\$	867,412 kWh
	11-09	13,610 K\$	684,664 kWh
	12-09	13,510 K\$	822,035 kWh
	1-10	12,530 K\$	820,795 kWh
	2-10	14,330 K\$	879,303 kWh
	3-10	16,200 K\$	890,976 kWh

Given data





Set 2009 as the baseline year to evaluate the electricity cusum loss at Mar2013

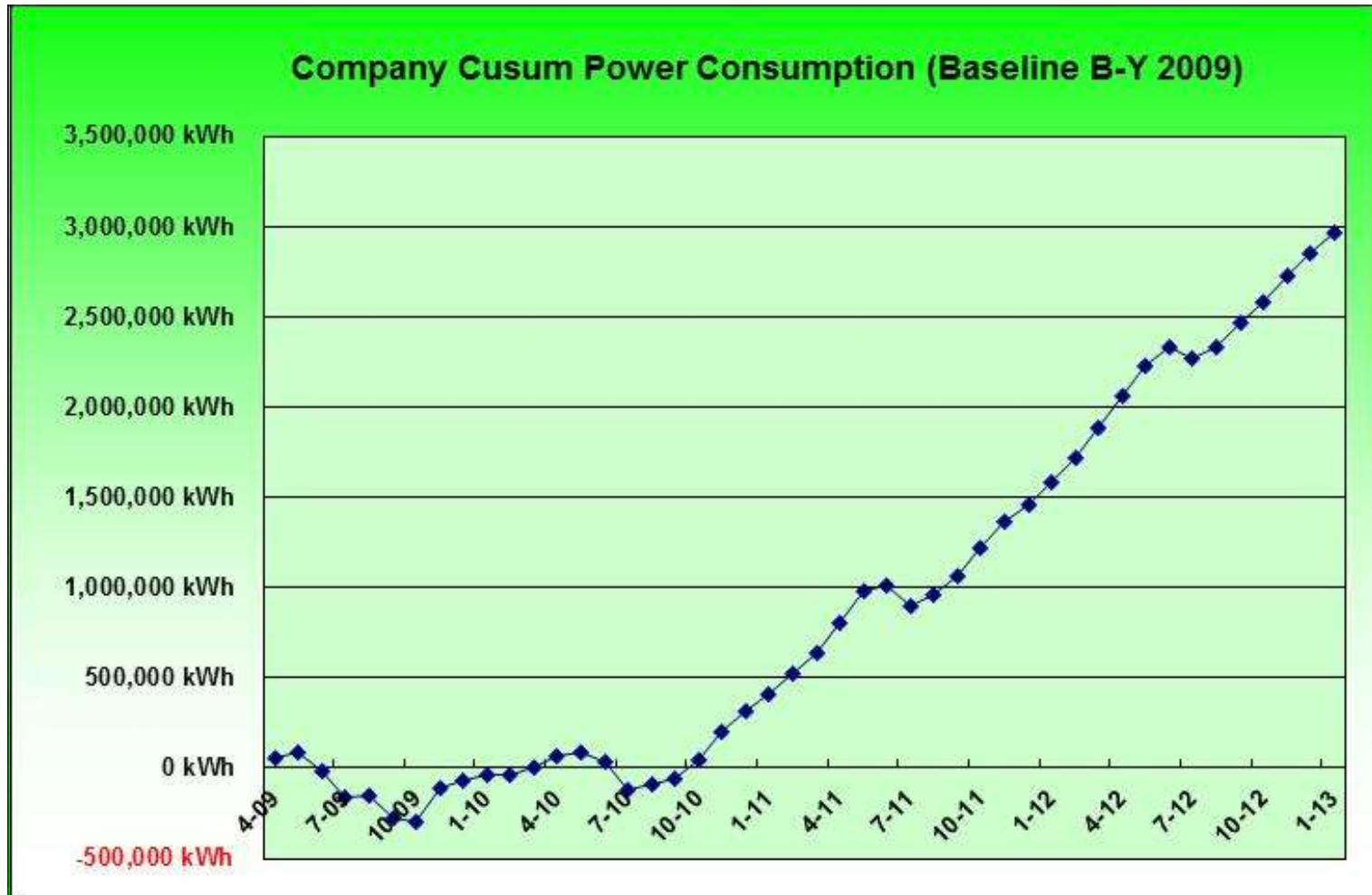
Baseline EnPI equation (Y=21.9729284408 x + 570952.9971835150)

	Production (K\$)	Electricity Consumption (kWh)	Adjusted to Baseline (kWh)	Electricity Save or Loss (kWh)	Cusum Savings (kWh)	Cusum Savings (\$)	
2009	4-09	12,730 K\$	798,106 kWh	850,668 kWh	52,562 kWh	52,562 kWh	6,617 \$
	5-09	12,870 K\$	798,471 kWh	841,777 kWh	33,300 kWh	85,862 kWh	10,808 \$
	6-09	12,910 K\$	955,101 kWh	854,624 kWh	-100,478 kWh	-14,616 kWh	-1,840 \$
	7-09	13,410 K\$	1,009,306 kWh	865,610 kWh	-143,696 kWh	-158,311 kWh	-19,928 \$
	8-09	12,550 K\$	839,982 kWh	846,713 kWh	6,732 kWh	-151,579 kWh	-19,081 \$
	9-09	14,200 K\$	1,009,962 kWh	882,969 kWh	-126,994 kWh	-278,573 kWh	-35,067 \$
	10-09	12,560 K\$	867,412 kWh	846,933 kWh	-20,479 kWh	-299,052 kWh	-37,645 \$
	11-09	13,610 K\$	684,664 kWh	870,005 kWh	185,340 kWh	-113,712 kWh	-14,314 \$
	12-09	13,510 K\$	822,035 kWh	867,807 kWh	45,772 kWh	-67,940 kWh	-8,552 \$
	1-10	12,530 K\$	820,795 kWh	846,274 kWh	25,479 kWh	-42,461 kWh	-5,345 \$
	2-10	14,330 K\$	879,303 kWh	885,825 kWh	6,522 kWh	-35,939 kWh	-4,524 \$
	3-10	16,200 K\$	890,976 kWh	926,914 kWh	35,939 kWh	-0 kWh	-0 \$
4-10	13,310 K\$	793,073 kWh	863,413 kWh	70,340 kWh	70,340 kWh	8,854 \$	
5-10	11,740 K\$	817,074 kWh	828,915 kWh	11,841 kWh	82,181 kWh	10,345 \$	
6-10	13,880 K\$	918,917 kWh	875,937 kWh	-42,979 kWh	39,201 kWh	4,935 \$	
7-10	13,940 K\$	1,036,444 kWh	877,256 kWh	-159,188 kWh	-119,987 kWh	-15,104 \$	
8-10	12,700 K\$	823,494 kWh	850,009 kWh	26,515 kWh	-93,472 kWh	-11,766 \$	
9-10	15,810 K\$	884,264 kWh	918,345 kWh	34,081 kWh	-59,391 kWh	-7,476 \$	
10-10	14,860 K\$	789,644 kWh	897,471 kWh	107,827 kWh	48,436 kWh	6,097 \$	
11-10	13,940 K\$	723,767 kWh	877,256 kWh	153,488 kWh	201,924 kWh	25,418 \$	
12-10	13,550 K\$	752,876 kWh	868,686 kWh	115,811 kWh	317,735 kWh	39,997 \$	
1-11	12,120 K\$	749,812 kWh	837,265 kWh	87,453 kWh	405,188 kWh	51,005 \$	
2-11	12,720 K\$	734,127 kWh	850,449 kWh	116,322 kWh	521,510 kWh	65,648 \$	
3-11	13,690 K\$	756,013 kWh	871,762 kWh	115,750 kWh	637,260 kWh	80,219 \$	
4-11	11,170 K\$	645,270 kWh	816,391 kWh	171,121 kWh	808,381 kWh	101,760 \$	
5-11	10,740 K\$	637,537 kWh	806,942 kWh	169,405 kWh	977,786 kWh	123,085 \$	
6-11	11,030 K\$	777,680 kWh	813,314 kWh	35,635 kWh	1,013,421 kWh	127,570 \$	
7-11	10,690 K\$	919,865 kWh	805,844 kWh	-114,022 kWh	899,400 kWh	113,217 \$	
8-11	10,010 K\$	733,543 kWh	790,902 kWh	57,359 kWh	956,759 kWh	120,438 \$	
9-11	11,060 K\$	704,581 kWh	813,974 kWh	109,393 kWh	1,066,152 kWh	134,208 \$	
10-11	11,090 K\$	659,715 kWh	814,633 kWh	154,918 kWh	1,221,070 kWh	153,709 \$	
11-11	11,020 K\$	671,022 kWh	813,095 kWh	142,072 kWh	1,363,142 kWh	171,594 \$	
12-11	10,260 K\$	696,045 kWh	796,395 kWh	100,350 kWh	1,463,492 kWh	184,226 \$	
1-12	10,260 K\$	679,777 kWh	796,395 kWh	116,619 kWh	1,580,111 kWh	198,906 \$	
2-12	10,950 K\$	672,481 kWh	811,557 kWh	139,075 kWh	1,719,186 kWh	216,413 \$	
3-12	12,640 K\$	687,291 kWh	848,691 kWh	161,400 kWh	1,880,586 kWh	236,730 \$	
4-12	9,501 K\$	601,644 kWh	779,709 kWh	178,066 kWh	2,058,652 kWh	259,145 \$	
5-12	9,646 K\$	609,961 kWh	782,905 kWh	172,945 kWh	2,231,597 kWh	280,916 \$	
6-12	9,674 K\$	684,446 kWh	783,515 kWh	99,069 kWh	2,330,666 kWh	293,387 \$	
7-12	11,341 K\$	878,282 kWh	820,157 kWh	-58,125 kWh	2,272,541 kWh	286,070 \$	
8-12	9,693 K\$	730,187 kWh	783,929 kWh	53,742 kWh	2,326,283 kWh	292,835 \$	
9-12	12,539 K\$	711,438 kWh	846,470 kWh	135,032 kWh	2,461,315 kWh	309,833 \$	
10-12	9,887 K\$	673,284 kWh	788,191 kWh	114,907 kWh	2,576,222 kWh	324,297 \$	
11-12	10,425 K\$	651,325 kWh	800,014 kWh	148,689 kWh	2,724,911 kWh	343,014 \$	
12-12	10,611 K\$	673,794 kWh	804,116 kWh	130,322 kWh	2,855,232 kWh	359,420 \$	
1-13	11,595 K\$	712,824 kWh	825,720 kWh	112,896 kWh	2,968,128 kWh	373,631 \$	
2-13	11,156 K\$	693,346 kWh	816,088 kWh	122,742 kWh	3,090,871 kWh	389,082 \$	
3-13	12,903 K\$	718,879 kWh	854,473 kWh	135,594 kWh	3,226,465 kWh	406,151 \$	

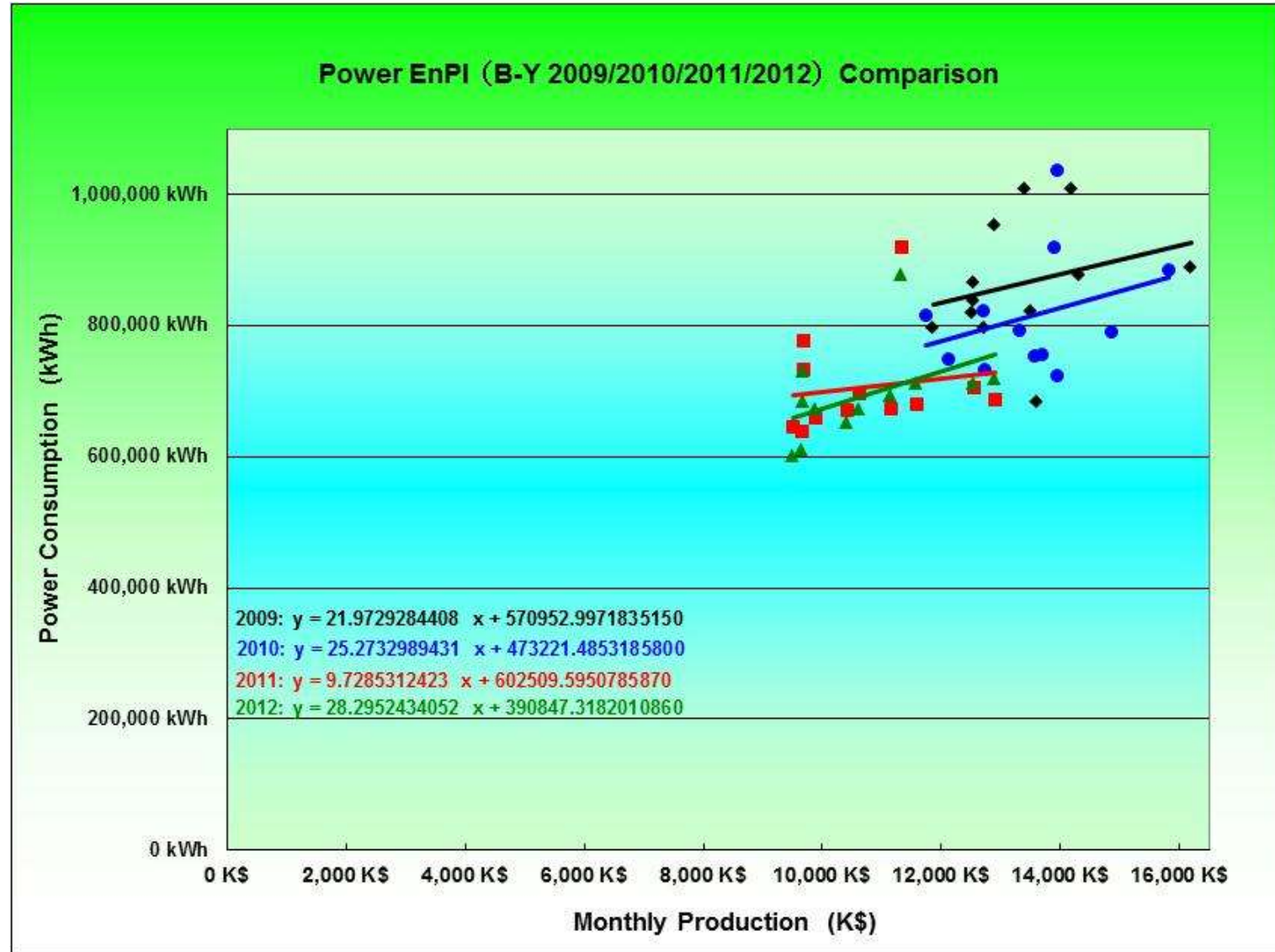
- 1) Each month production inserted in "x" to get baseline energy use
- 2) Baseline energy use is compared with the actual energy use to get save or loss
- 3) To get save or loss cusum
- 4) Always "0" in baseline period
- 5) Continue comparison to the baseline value to get cusum savings of Apr2009 to Mar2013

SEC Annual Analysis

(Using the fact delivered)

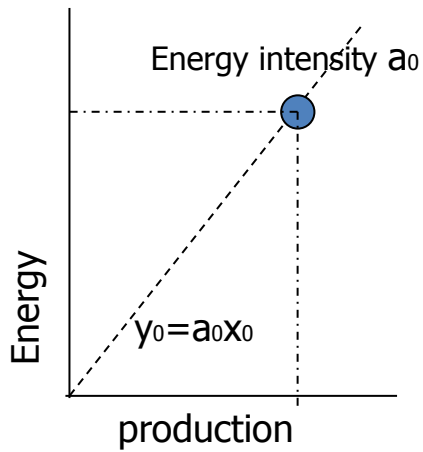


Save/Loss Cusum Curve

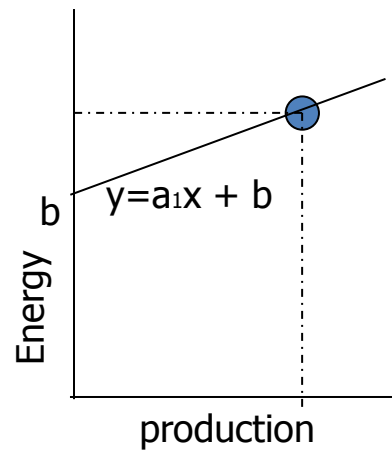


Wrap-up

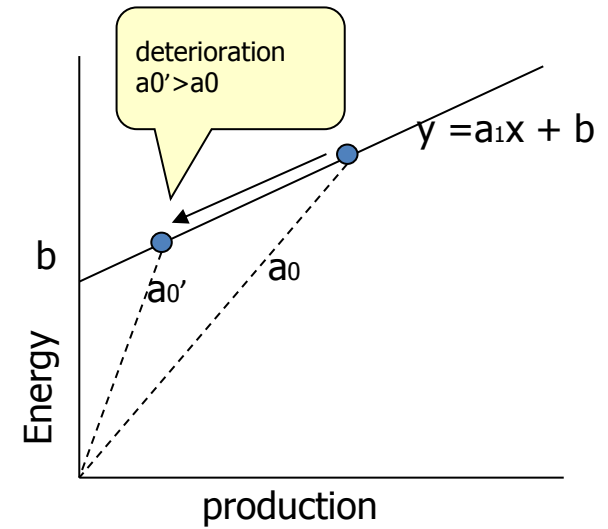
$$y = ax + b$$



Energy intensity



Actual energy characteristics



decrease production



For Questions, comments etc.,
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Information Material For The Energy Management System
Implementation in compliance with ...

ISO 50001

Energy Management System (EnMS)

Energy Efficiency Initiatives in Singapore