



Super-efficient Equipment and Appliance Deployment (SEAD) Initiative:

Lessons from the Technical Analysis of Room Air Conditioners

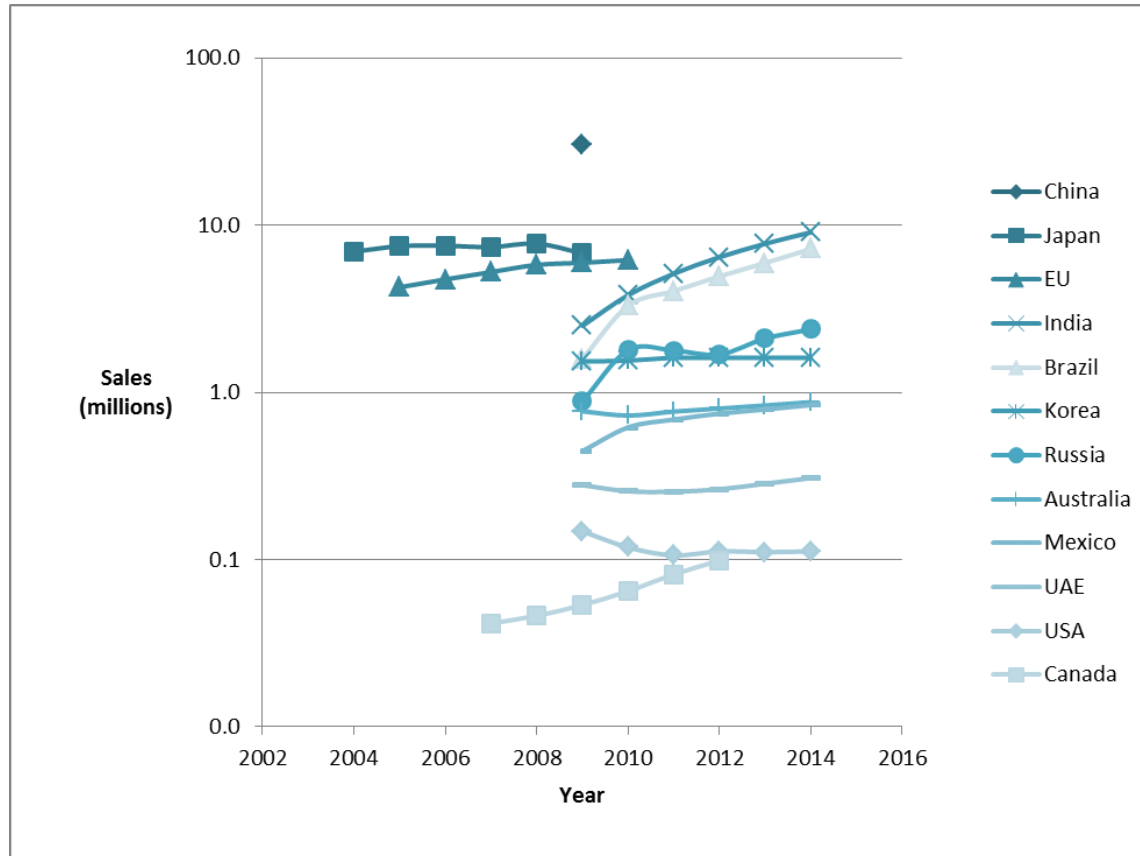


**International Energy Studies Group
Lawrence Berkeley National Laboratory**

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Room AC Market is Growing Rapidly



Source: BSRIA, and CLASP Mapping Report (Baillargeon, 2011)

90% of the market is dominated by 5 economies: China, Japan, EU, India, Brazil



Significant Potential for Energy Efficiency Improvement

Country	EER (W/W)		
	Min	Max	Average
Australia	2.67	4.88	3.16
Brazil	2.92	4.04	3.19
Canada	2.14	4.33	3.6
China	2.9	6.14	3.23
EU	2.21	5.55	3.22
India	2.35	3.6	2.8
Japan	2.37	6.67	4.1
Korea	3.05	5.73	3.78
Mexico	2.42	4.1	2.92
Russia	2.5	3.6	2.79
South Africa	2.28	5	2.91
UAE	2.14	3.22	2.69
USA	-	4.6	3.04

EERs of unducted split ACs in various economies in 2010-2011

Source: Catalog searches, IEA 4E M&B 2010, Baillargeon, 2011

Note: The data presented here are illustrative and cannot be compared directly *across countries* due to lack of availability of overlapping data sets and minor differences in test procedures, however, these data can be compared *within* each country studied



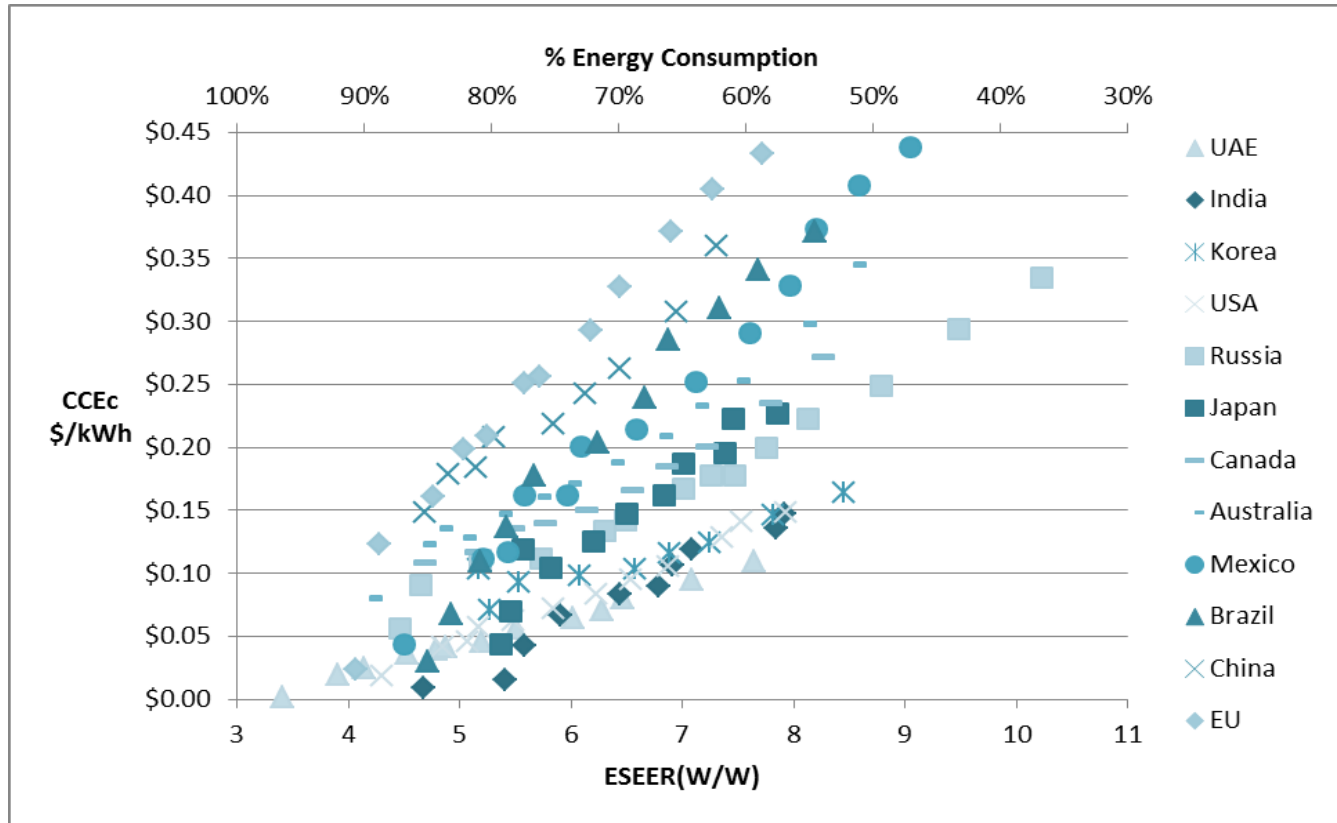
Summary of Efficiency Improvement Options

Option	Description	% improvement from base case	
		Min	Max
Efficient Heat Exchanger	high efficiency microchannel heat exchangers, larger sized heat exchangers	9.1%	28.6%
Efficient Compressors	two-stage rotary compressors, high efficiency scroll compressors with DC motors	6.5%	18.7%
Inverter/Variable Speed	AC, AC/DC or DC inverter driven compressors	20%	24.8%
Expansion Valve	Thermostatic and electronic expansion valves	5%	8.8%
Crankcase Heating	Reduced crankcase heating power and duration	9.8%	10.7%
Standby load	Reduced standby loads	2.2%	2.2%
Total/cumulative		60 %	72%

Note: Cumulative efficiency improvement is lower than a simple addition as the options are not mutually exclusive, i.e. improvement using one option reduces the baseline energy consumption to which the next efficiency improvement option is applied. Also, the improvements due to variable speed drives are climate and usage dependent. The energy savings figures presented here are representative of conditions in Europe.



Efficiency Improvement to ESEERs between 4.2- 7.44 W/W is Cost Effective



Cost effective reduction from a consumer perspective is % reduction for which the cost of conserved electricity (CCE) is less than tariff.

e.g. for India consumer tariff is 8 cents/kWh, ~30% reduction in energy consumption is cost effective.



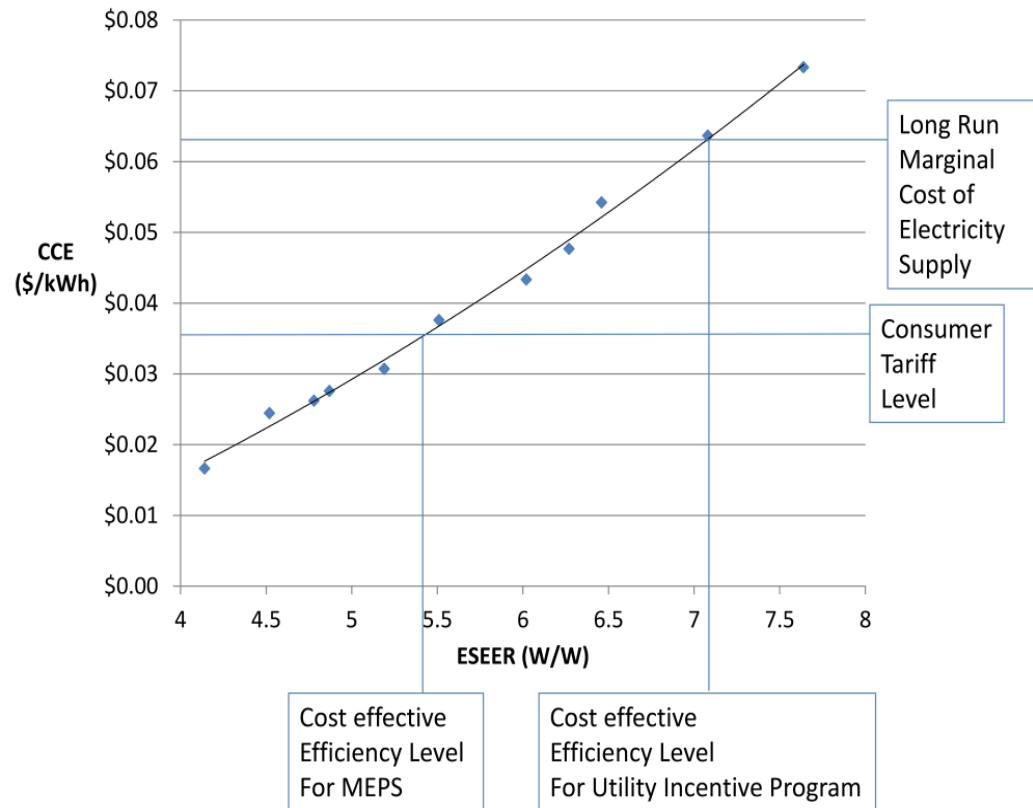
Savings Potential of over 123 Rosenfelds is Technically Feasible and 64 Rosenfelds is cost-effective by 2020. (i.e.123 and 64 medium sized power plants)

A	B	C	D	E	F	G	H
Country	Tarriff \$/kWh	Market Average ESEER	Economic Potential ESEER (W/W) @ Tariff = CCEc	Technical Potential Max ESEER (W/W)	2020 Energy Savings @ Economic Potential (Rosenfelds)	2020 Energy Savings @ Technical Potential (Rosenfelds)	2020 CO2 savings @ Technical Potential (tons/year)
Australia	0.10	4.03	4.48	8.55	0.35	2	4
Brazil	0.19	4.05	5.67	8.83	6	10	3
Canada	0.08	4.58	4.54	8.26	0	0.24	0.1
China	0.19	4.11	5.19	7.30	16	33	99
EU	0.19	4.09	5.00	8.33	11	30	32
India	0.08	3.56	5.55	7.91	19	29	78
Japan	0.22	5.21	7.44	7.85	8	9	11
Korea	0.07	4.80	5.33	8.45	1	4	5
Mexico	0.08	3.71	4.45	9.74	0.15	1	1
Russia	0.05	4.20	4.20	10.23	0	4	4
UAE	0.07	3.46	6.24	7.64	2	2	3
USA	0.11	3.87	6.80	8.00	0.2	0.24	0.4
Total					64	123	241

Note: 1 Rosenfeld=3 TWh/yr i.e. one 500 MW medium sized power plant



SEAD Technical Analysis can support Room AC Efficiency Improvement Policies and Programs





SEAD Room AC Technical Analysis (full report)

Available at: <http://superefficient.org/en/Activities/Technical%20Analysis.aspx>

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