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Project Completion Report on China's Room AC Reach Standard

For China Sustainable Energy Program
the Energy Foundation

By

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After much anticipation and hard work, China's reach standard for room air-conditioners was announced in September 2004, with the first tier going into effect on March 1, 2005 and the reach standard taking effect on January 1, 2009. This is a major milestone in the development of minimum energy efficiency standards in China: finally China has set a minimum standard that is meaningful and stringent. According to our preliminary analysis, the majority of room ACs products on the Chinese market in 2004 would not meet the 2009 reach standard requirement.

In addition to setting the minimum requirement, China's new AC standard also include classification requirement for the newly established Energy Information Label, as well as the certification requirement for CECP's Energy COnservation Label.

Highlights of the 2009 reach standard include:

- The Chinese Reach Standard for Room AC in 2009 is tighter than American counterpart, and almost matches the efficiency of American Central Air-Conditioners
- Summer peak demand reduction in 2020 due to the reach standard exceeds the capacity of the Three Gorges Project.

China's Room Air Conditioner Minimum Efficiency Standard

The 2005 standard values are shown below:

Room Air Conditioner Minimum Efficiency Standard

The measured value of EER of room air-conditioners must be greater than or equal to the values shown in Table 1.

Table 1. Energy Efficiency Ratios (EER)

Category	Rated Cooling (CC） W	EER W/W
Single-package		2.30
Split	CC ≤4500	2.60
	4500<CC≤7100	2.50
	7100 < CC ≤ 14000	2.40

Energy Efficiency Grades for the Energy Information Label

Based on the measured EER value, consult Table 2 to determine the Energy Efficiency Grade of the product.

Table 2 Energy Efficiency Grade specifications

Category	Rated Cooling（CC，W）	Energy Efficiency Grade				
		5	4	3	2	1
Single-package		2.30	2.50	2.70	2.90	3.10
Split	CC ≤4500	2.60	2.80	3.00	3.20	3.40
	4500<CC≤7100	2.50	2.70	2.90	3.10	3.30
	7100 < CC ≤ 14000	2.40	2.60	2.80	3.00	3.20

Energy Conservation Label Specification

The EER of energy-efficient room air conditioners must be greater than or equal to the values shown in Table 3.

Table 3. Energy Efficiency Specification

Category	Rated cooling（CC） W	EER W/W
Single-package		2.90
Split	CC ≤4500	3.20
	4500<CC≤7100	3.10
	7100 < CC ≤ 14000	3.00

On 1 January 2009, the reach standard will go into effect, raising the minimum standard as shown in Table 4:

Table 4. Energy Efficiency Ratios (EER) in 2009

Category	Rated Cooling (CC） W	EER W/W
Single-package		2.90
Split	CC ≤4500	3.20
	4500<CC≤7100	3.10
	7100 < CC ≤ 14000	3.00

The reach standard does not specify the energy efficiency grades or the energy efficiency specification to go into effect at that time.

Energy Savings from the New Standard

Savings due to this new standard are likely to be 10 TWh of electricity and 2.7 million tons of carbon by 2010, 46 TWh of electricity and 12.3 million tons of carbon by 2020 (Table 5). About 75% of the expected savings by 2020 stems from the more stringent reach standard to go in effect in 2009.

The peak demand reduction calculation depends on an accurate assessment of the coincident peak factor for room air conditioners in China. The reductions are likely to be about 4.5 GW in 2010 and 20.4 GW by 2020. The 2020 peak demand reduction estimate exceeds the 17 GW capacity of the Three Gorges Dam.

Table 5. Expected Energy Savings from the Room Air Conditioner Standard

Year	Stock	Shipments	Energy Savings	CO2 Savings	Carbon Savings	Peak Savings*
	millions	*millions*	*million kWh*	*million tonnes*	*million tonnes*	*GW*
2000	67	17.3				
2001	85	18.3				
2002	106	21.6				
2003	133	28.2				
2004	161	29.6				
2005	189	31.0	714	0.7	0.2	0.3
2006	218	32.6	1,464	1.4	0.4	0.6
2007	248	34.2	2,251	2.2	0.6	1.0
2008	278	35.9	3,077	3.0	0.8	1.4
2009	308	37.7	6,587	6.4	1.8	2.9
2010	337	38.5	10,166	9.9	2.7	4.5
2011	365	39.3	13,817	13.5	3.7	6.1
2012	390	40.0	17,541	17.1	4.7	7.7
2013	414	40.8	21,339	20.9	5.7	9.4
2014	435	41.7	25,188	24.6	6.7	11.1
2015	453	42.5	29,034	28.4	7.7	12.8
2016	469	43.3	32,837	32.1	8.8	14.5
2017	484	44.2	36,573	35.7	9.7	16.1
2018	497	45.1	40,142	39.2	10.7	17.7
2019	510	46.0	43,360	42.4	11.6	19.1
2020	522	46.9	46,113	45.1	12.3	20.4
Cumulative Total:		755	330,201	323	88	

*Peak savings shown here are illustrative, using the estimated coincident peak factor for room AC in *Energy Conservation Potential for China Major Energy-using Products Through Standards and Labels*, ACEEE and China National Institute of Standardization, 2003.

International Comparisons

Although product types and product categories of room air conditioners vary around the world, it is possible to provide a general comparison of China's new room air conditioner standard with those in effect in a number of other countries. In China, the most common room air conditioner is the split, wall-mounted air conditioner of less than 4500W power. The following tables are all expressed in EER.

By 2009, China's minimum room AC standards (for single package units) will have surpassed the current US standard and will have reached the current EU "A" level of efficiency for split units.

US and Canada

window	2.87
central	3.37

(based on SEER 13)

South Korea

window		2.88
split	CC<4000W	3.37
	4000-10,000W	2.97
	10,000-17,500	2.76

Singapore

Window	2.73

Taiwan

window	CC<2300W	2.71
	2300-4100W	2.77
	CC>4100W	2.60
split	CC<4100W	2.97
	CC>=4100W	2.73

European Union (labeling)

	G	F	E	D	C	B	A
window	<2	2	2.2	2.4	2.6	2.8	>3
split	<2.2	2.2	2.4	2.6	2.8	3	>3.2

Japan

window		*Heat pump*	*AC-only*
		2.85	2.67
split		*Heat pump*	*AC-only*
	CC<2500W	5.27	3.64
	2500-3200W	4.90	3.64
	3200-4000W	3.65	3.08
	4000-7100W	3.17	2.91
	>7100W	3.10	2.81

Note: There is some uncertainty about the accuracy and comparability of Japan's test measurements.

Budget Summary

LBNL has received US$ 75,000.00 from the Energy Foundation for this project. The project costs at the end of March 2005 is US $75,000, with the following breakdowns,

Energy Foundation Grant Summary

China Room AC Reach Standard Expenditures

	Project Budget	Total Project Costs	EF Portion
Revenue			
Energy Foundation	**$ 75,000**	**$ 75,000**	**$ 75,000**
Total Revenue	**$ 75,000**	**$ 75,000**	**$ 75,000**
Expenses			
Personnel:			
Lin, J			
Fridley, D			
Rosenquist, G			
Biermayer, P			
		subtotal	**$ 65,588**
Other Costs:			
Phone, Communications, Space etc.			**$ 9,412**
		Total	**$ 75,000**