**Additional Information
on Default Values**

Default values for boilers and chillers for the reference emission calculation

For projects introducing high efficiency boilers and heat recovery heat pumps, the methodology requires efficiencies of existing boilers and chillers at a project site for the calculation of the reference emissions.

Under the usual practice, efficiencies of boilers and chillers gradually deteriorate over the years even with regular maintenance, which leads to increase in BaU emissions.
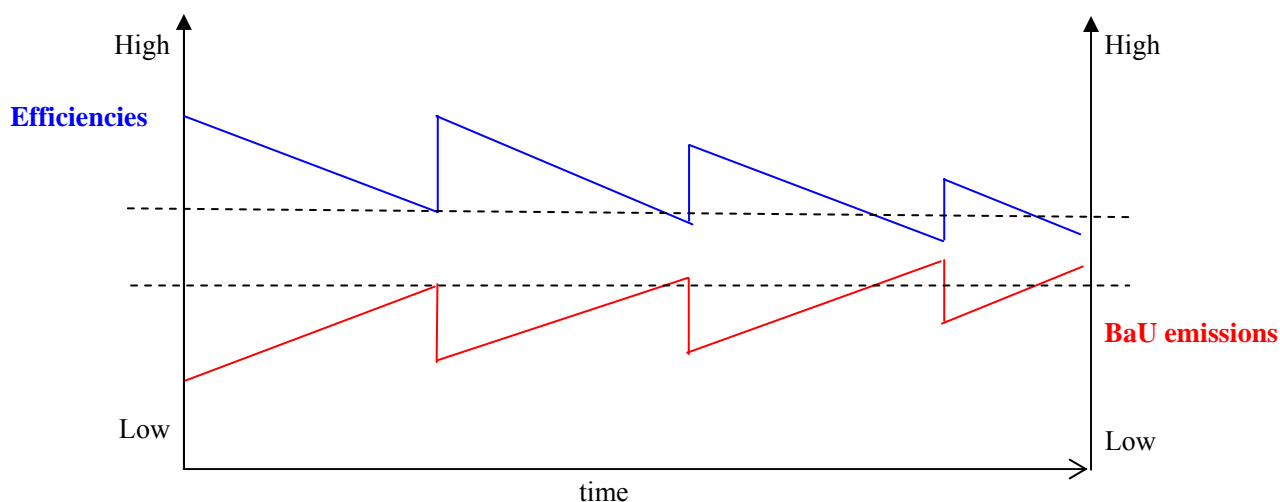

Figure 1: Image of a relationship between efficiencies and GHG emissions in the methodology

As per the JCM guideline[1], JCM methodologies need to establish conservative default efficiencies in order to ensure net emission reductions.

1) Default values for boiler efficiencies:

Default efficiencies for new boilers listed in a methodological tool[2] of the CDM are considered to be conservative compared with those of old boilers, and thus the values for new boilers are adopted (see Table 1). These values will be updated along with the revision of the CDM tool.

Table 1: Default efficiencies for new boilers in the CDM methodological tool (ver. 01.0) [2]

Technology of the energy generation system	Default efficiency
New natural gas fired boiler (w/o condenser)	92%
New oil fired boiler	90%
New coal fired boiler	85%

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[1] "Joint Crediting Mechanism Guidelines for Developing Proposed Methodology" (JCM_VN_GL_PM_ver01.0)

[2] Tool to determine the baseline efficiency of thermal or electric energy generation systems

2) Default values for chiller efficiencies:

In 2012 and in 2013, Hibiya Engineering Ltd. conducted energy audit for 15 four-star and five-star hotels in Ho Chi Minh City (HCMC) and Hanoi. Names of chiller manufacturers at the 15 hotels are listed in Table 2.

Table 2: Names of chiller manufacturers at 15 hotels

Chiller manufacturers	A	B	C
Hanoi	2	6	3
HCMC	1	2	1
Total	**3**	**8**	**4**
% share	**20%**	**53%**	**27%**

Interviews taken from facility managers and construction companies during the energy audit revealed that Vietnamese chiller market is dominated by three manufacturers, Carrier, Trane, and York. In addition to the three manufacturers, because its name was mentioned during the interviews and showed presence as efficient chiller brand in the Vietnamese market, Daikin is also included in the determination of default chiller efficiency.

For commercial buildings including hotels, the chiller capacity is in general less than 500RT in Viet Nam. Chiller efficiencies change over size of the cooling capacity; therefore, it is appropriate to establish the default chiller efficiencies by the range of cooling capacity.

In the SI metric system, Coefficient of Performance (COP) is used to measure chiller efficiencies. The higher the number in COP, the more efficient the chiller is. Table 3 shows COPs for different cooling capacity ranges by different manufacturers at the similar standard temperature condition. The COP information was retrieved from catalogues collected in Vietnam in June 2014 without any consideration of their market share, therefore, including high efficiency models.

Table 3: chiller COPs by cooling capacity and manufacturers*

Manufacturer	Cooling capacity (USRT)	COP	Chilled water temperature		Condenser water temperature	
A	209	6.04				
D	207	5.86		7		30
C	200	5.38	12.5	7	35.3	30
A	295	5.95				
D	300	5.97		7		30
C	300	5.55	12	7	37	32
D	449	5.97		7		30
B	450	6.18	12	7	37	32
C	450	5.63	12	7	37	32

*Additional information was collected, where possible, to fill in blanks that could not be found in the catalogues.

Table 4 shows an average between maximum and minimum COPs in each range of cooling capacity. They are tentatively considered as default chiller efficiencies.

Table 4: Default chiller efficiency

Cooling Capacity/unit (range of USRT)	200 USRT class (x≦250)	300USRT class (250＜x≦300)	450USRT class (300＜x≦500)
COP	5.71	5.75	5.91

3) Conservativeness check: comparison of default chiller efficiencies against existing chillers

Efficiency of existing chillers in various hotels in Vietnam was surveyed in July 2014, and the result is summarized in Table 5.

Table 5: Efficiency of existing chillers at hotels in Vietnam

Hotel	Manufacturer	USRT	COP	Default COP	Conservativeness check
Hotel A	B	167	5.37	5.71	○
Hotel B	B	483	4.13	5.91	○
Hotel C	C	253	4.99	5.75	○
Hotel D	B	383	4.14	5.75	○
Hotel E	B	300	5.28	5.75	○

Hotel F	A	500	5.02	5.91	○
	A	250	4.88	5.71	○
Hotel G	Other manufacturer	150	4.06	5.71	○
	B	150	4.40	5.71	○

The hotel that has the latest model among the surveyed targets was Hotel A, where the chiller was installed in December 2012 and its efficiency was COP 5.37. As shown in Table 5, none of the surveyed chillers exceeded the default chiller efficiencies in Table 4, even the most recently introduced chiller.

This survey result suggests that the application of the default chiller efficiencies of Table 4 in reference emission calculations leads to more conservative reference emissions than that of existing chiller efficiencies.

Thus, the default efficiency values applied in this methodology are the ones shown in Table 4.