Additional Information
on the Proposed Methodology "Energy Saving by Introduction of High Efficiency Centrifugal Chiller/Non Inverter"

1. Market share of chiller manufacturer in Thailand

In Thailand, most of the non-inverter type centrifugal chillers installed and operated are made by the American manufacturers such as Company A, B, and C according to an article published by BSRIA[1] in 2016, which is also indicated by interviews with chiller manufactures in Thailand. However, the dominant type of chiller provided by Company A in Thailand market use refrigerant which is regulated by Montreal Protocol on Substances that Deplete the Ozone Layer. Therefore, chillers of Company A are excluded from reference chiller even though they have one of the top shares in the chiller's market. Taking the standardization of COP values into consideration, Company B and C are selected as major manufactures in Thailand under this methodology.

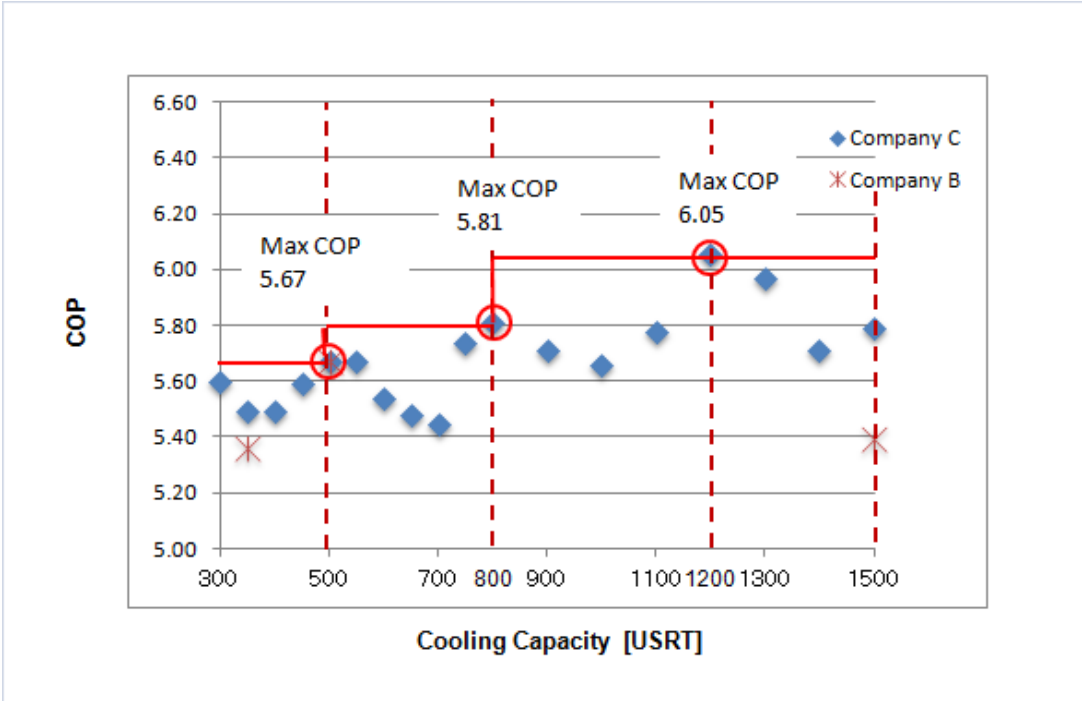
2. Research on reference COP values in Thailand

COP values of chillers marketed in Thailand are collected from the catalog data and manufacturer's information from Company B and C through visits and interviews. The collected COP values are shown in **Figure 1** below. It has been confirmed by chiller manufactures in Thailand that the values collected are representative of centrifugal chillers marketed in the country.

It is known that the chillers with larger cooling capacity tend to have higher energy efficiency than ones with smaller cooling capacity.

Accordingly, three (3) cooling capacity ranges, namely "300≤x<500", "500≤x<800" and "800≤x<1200" are set to determine the reference COP values for each range. The reference COP value for each range is determined conservatively from the COP value of the higher cooling capacity in each range. Since in the range of "1200≤x≤1500", all the collected data showed the smaller COP values than the reference COP value (6.05) for the range of "800≤x<1200", 6.05 is set to be applied also for the range of "1200≤x≤1500". (See **Figure 1**).

[1] The Building Services Research and Information Association (BSRIA) is a globally recognized source of strategic market intelligence and consultancy in the building services industry. The report for air conditioning, heating, renewable technology etc. are published by BSRIA regularly based on its survey.



Note 1 : COP values of Company A are excluded since it applies refrigerant of which ODP is not zero.

Figure 1: COP values of centrifugal chillers with non-inverter marketed in Thailand

3. Conclusion

It has been confirmed by chiller manufactures that the collected data on market share and COP values in **Table 1** are reliable. In terms of the selection of the reference COP for each cooling capacity range, the most efficient values are selected and shown in **Table 1** below.

Table 1 : Established $COP_{RE,i}$ for the proposed methodology

Cooling capacity/unit [USRt]	300≤x<500	500≤x<800	800≤x≤1500
$COP_{RE,i}$	5.67	5.81	6.05

Source : Data from Company B and C.
Note : "x" in the table represents cooling capacity per unit.

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