Additional Information on the Proposed Methodology
"Energy Saving by Introduction of Heat Recovery Electric Heat Pump"

1. Market share of chiller manufacturer in Vietnam

Air-cooled chiller is identified as reference equipment for cooling capacity of project Heat Recovery Electric Heat Pump (HREHP).

In Vietnam, the American manufacturers, such as Company A, Company B, and Company C, and the Japanese manufacturers, such as Company D, Company E, and Company F are dominant in the air-cooled chillers market according to an interview with a technical expert from Japanese engineering company.

2. Research on the COP values of chillers in Vietnam

2.1 Catalogue COP values

Catalogue COP values of air-cooled chillers available in Vietnam are collected on the web.

As a result, total 131 COP values are ranging from 4 USRt to 184 USRt are obtained.

2.2 Collected COP* values and determination of the reference COP values

COP values of air-cooled chillers are calculated from 131 catalogue data by manufacturer's testing based on industrial standards[1]. COP values are plotted in Figure 1 below.

It is observed that similar COP values fall into a certain cooling capacity range. Therefore, three cooling capacity ranges are set to determine the reference COP values for each range. The most efficient COP, which has the largest value, in each capacity range is selected as the reference COP and is shown in Table 1 below in red circles.

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[1] JIS B 8621:2011 Centrifugal Water Chillers, EN14511:2013, AHRI Standard 550/590 based on TOPSS version 192
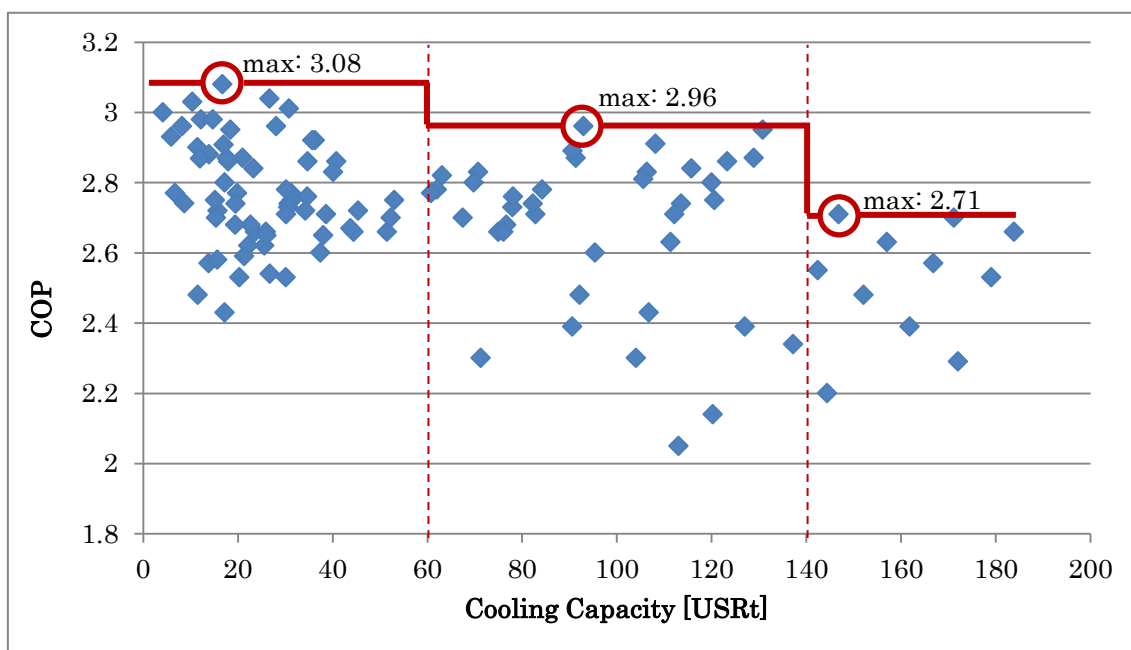
Figure 1: COP values of inverter type air-cooled chiller marketed in Vietnam

The reference COP for each cooling capacity range is determined and shown in Table 1 below. ("x" in the table represents cooling capacity per unit.)

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

Cooling capacity per unit (USRt)	4≤x≤60	60≤x≤140	140<x≤184
$COP_{RE,cool,i}$	3.08	2.96	2.71

*1 USRt = 12,000 BTU/hr = 3.52 kW