# LATS LCC Manual

Contents

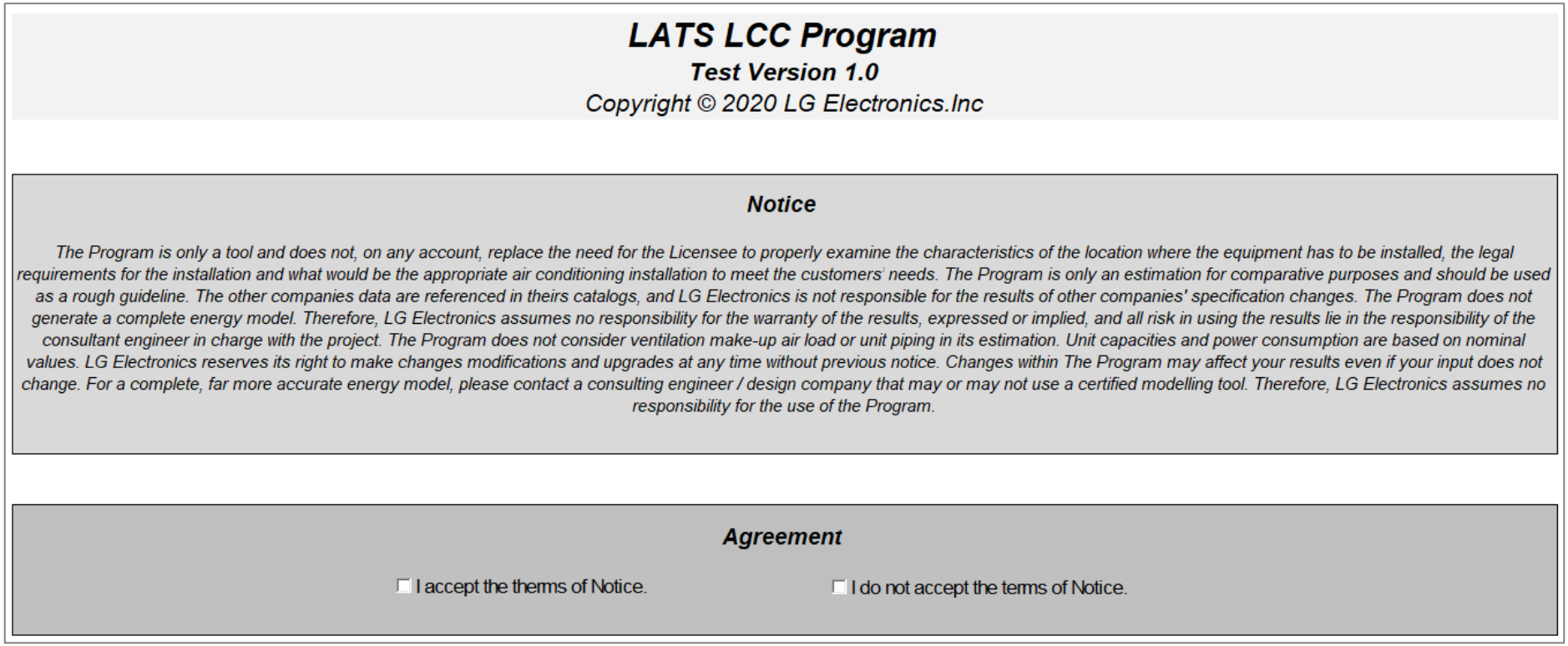


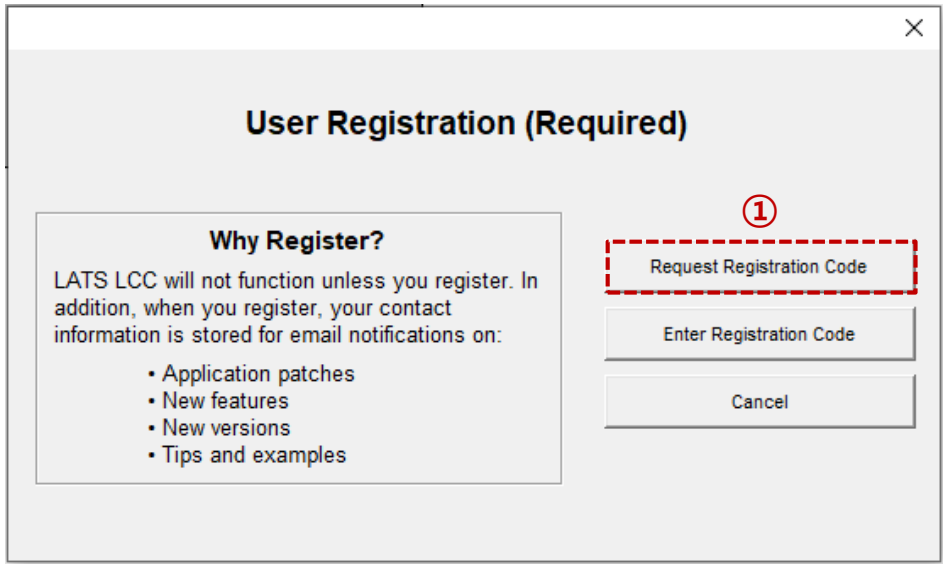
2022. 7

CAC Engineering R&D Team

LG Business Solutions

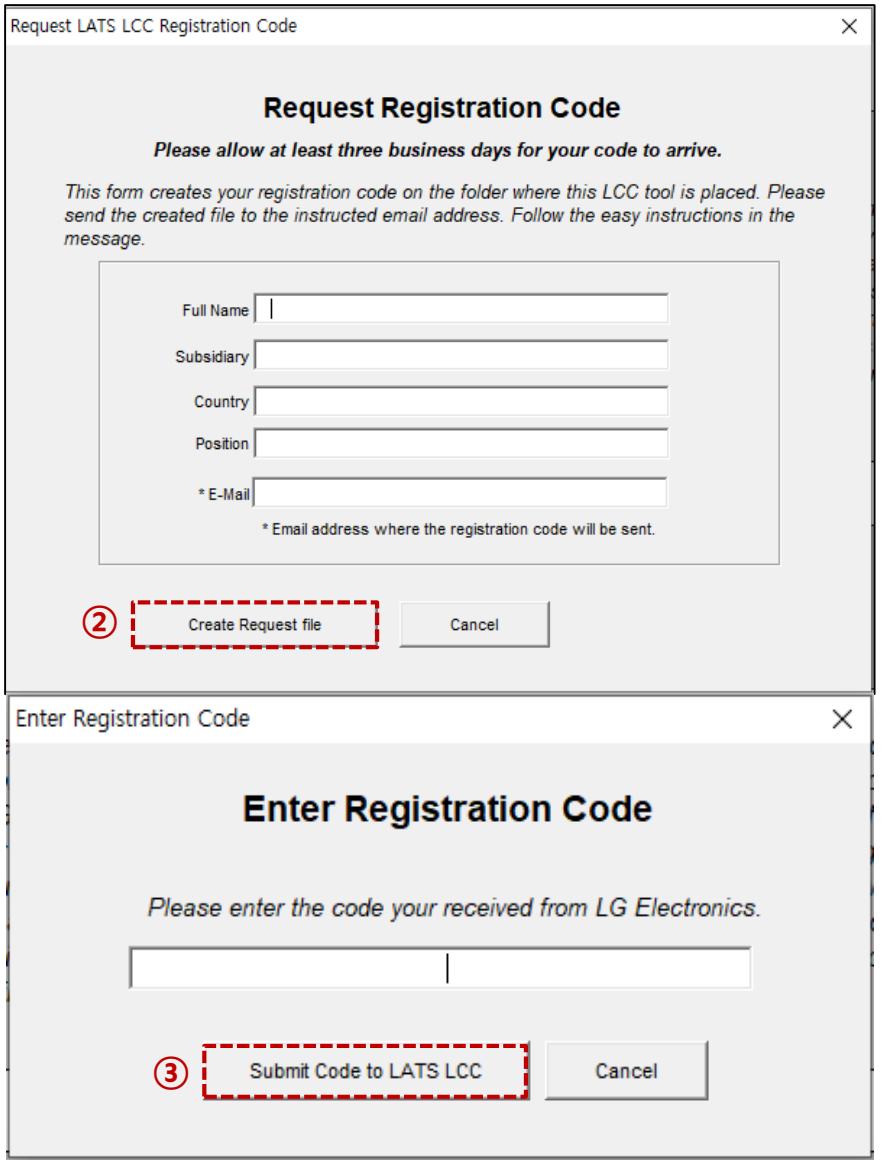
LATS LCC tool is available for LG Employee such as sales engineer. All users need to request authorization to use.
It is a Microsoft Excel-based tool.
Please check the Agreement after confirming the Notice.





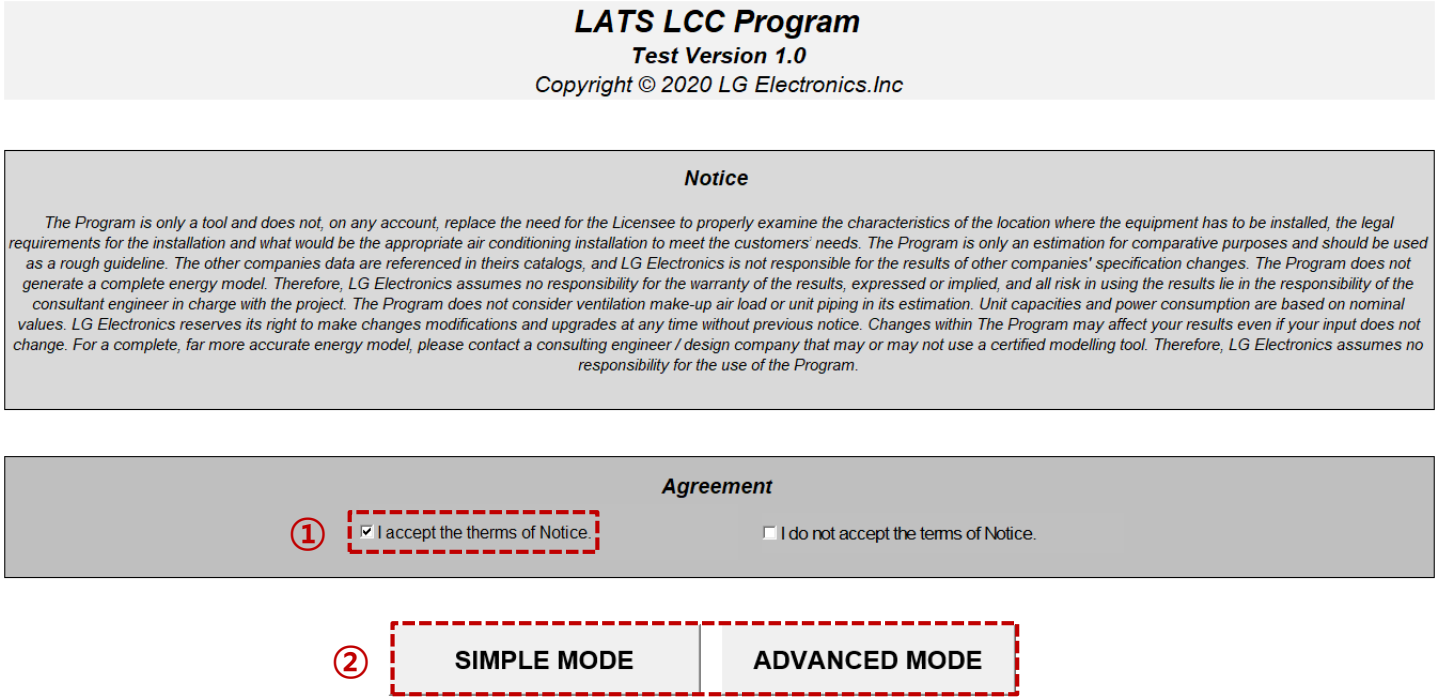

LATS LCC will not function unless you register.
In addition, when you register, your contract information is stored for email notification about : Application patches, New features, New versions, Tips and examples
User Registration is consist of Request Registration Code & Enter Registration Code.

① **Request Registration Code** : This is a space to input program user information. Please enter the user information in five items.
E-Mail is necessary input value, so you should be inputted the E-Mail. (E-mail address where the registration code will be sent.)




② **Create Request file** : This form creates your registration code on folder where this LCC tool is placed.
Please send the file to the corresponding e-mail(ae-energymodeling@lge.com).

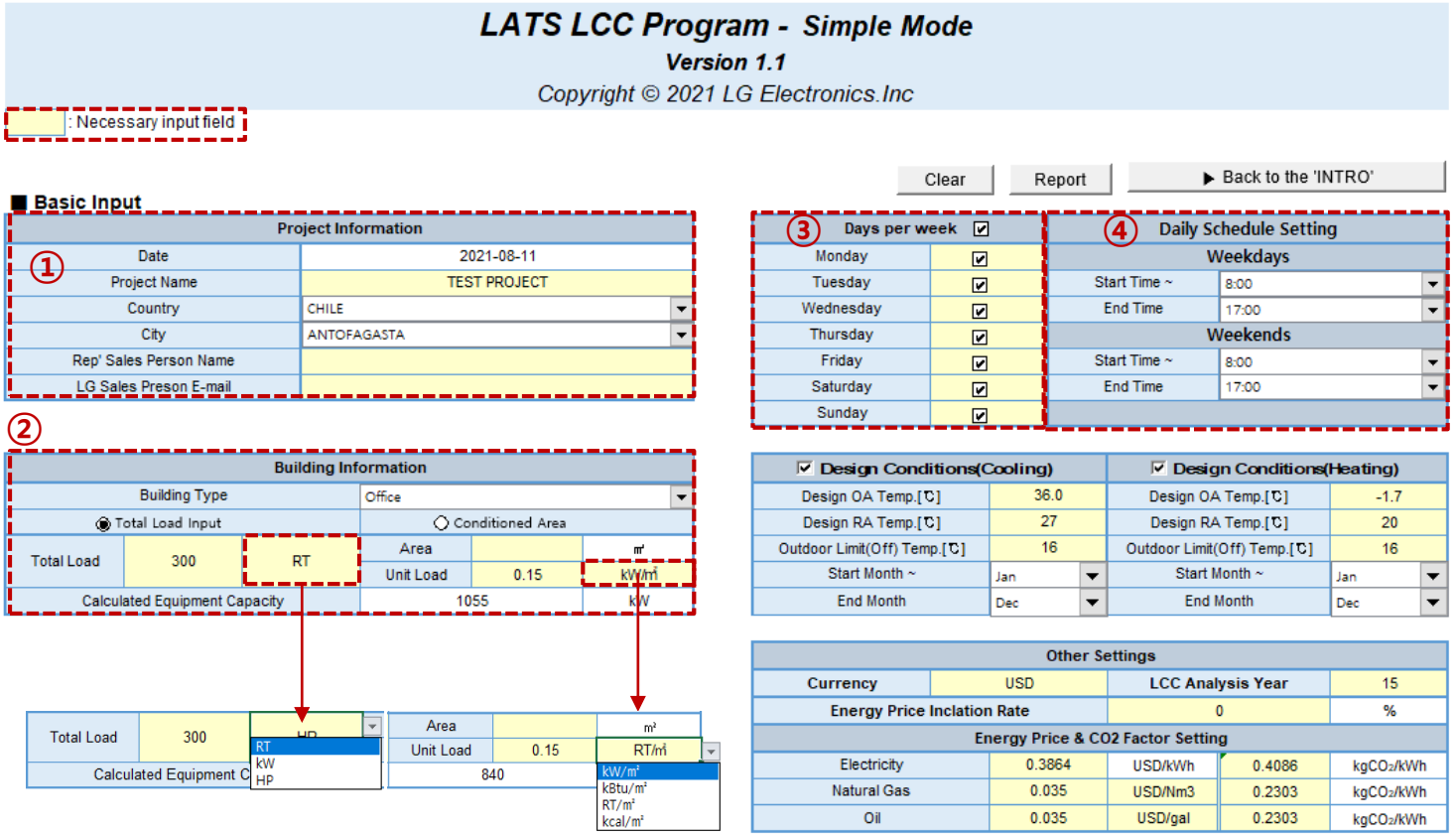
③ **Enter Registration Code** : Enter the registration code you received from the LATS LCC manager. And please click the submit button. If registered normally, users can use it after registration.




① If the registration code is registered normally, the user can select **Agreement**. When you click 'I accept the terms of Notice.' in the Agreement, the 'SIMPLE MODE' and 'ADVANCED MODE' buttons will appear as shown on the left.

② Please note that LATS LCC is divided into Simple Mode and Advanced Mode according to user usage and level.

Users can freely use one of the two modes according to the purpose of use.




① **Project Information** consists of Date, Project Name, Country, City, Rep's Sales Person Name, and LG Sales Person E-mail. Date is automatically inputted today's date. Next, select country and city.

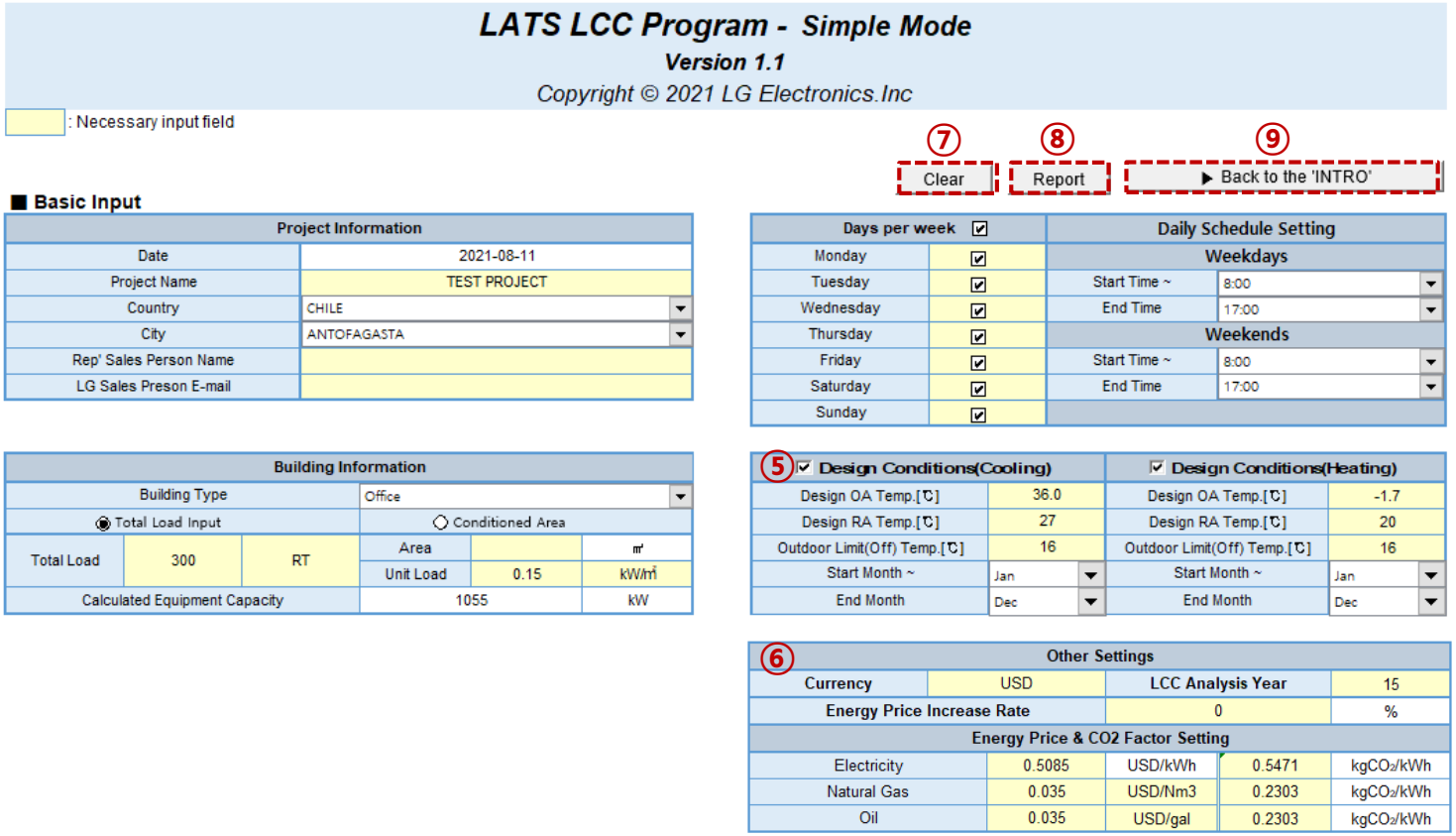
**Important!**
Yellow color cell is necessary input field, so please enter the required value at the yellow color cell.

② Please select only one type. **Building Information** is possible calculated equipment capacity. Select the method you want to calculate and enter the appropriate value. Building type consists of Office, Residential, Retail, and Hotel.

③ **Days per week** is selecting schedule by day of the week. You can choose the day of the week you want. If you want to operate on a full day of the week, please click on the check box at the top.

④ **Daily Schedule Setting** is that sets the time of the weekdays and weekend. You can set the time you want to operate.

* If you want change the unit, please click the unit cell(Only for yellow color cells).



**LATS LCC Program - Simple Mode**

**Version 1.1**

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: Necessary input field

⑦ Clear ⑧ Report ⑨ ▶ Back to the 'INTRO'

■ **Basic Input**

| Project Information | |
|---|---|
| Date | 2021-08-11 |
| Project Name | TEST PROJECT |
| Country | CHILE |
| City | ANTOFAGASTA |
| Rep' Sales Person Name | |
| LG Sales Preson E-mail | |

| Days per week | | Daily Schedule Setting | |
|---|---|---|---|
| Monday | ☑ | Weekdays | |
| Tuesday | ☑ | Start Time ~ | 8:00 |
| Wednesday | ☑ | End Time | 17:00 |
| Thursday | ☑ | Weekends | |
| Friday | ☑ | Start Time ~ | 8:00 |
| Saturday | ☑ | End Time | 17:00 |
| Sunday | ☑ | | |

| Building Information | | | | |
|---|---|---|---|---|
| Building Type | | | Office | |
| ◉ Total Load Input | | | ○ Conditioned Area | |
| Total Load | 300 | RT | Area | ㎡ |
| | | | Unit Load 0.15 | kW/㎡ |
| Calculated Equipment Capacity | | | 1055 | kW |

| ⑤ Design Conditions(Cooling) | | Design Conditions(Heating) | |
|---|---|---|---|
| Design OA Temp.[℃] | 36.0 | Design OA Temp.[℃] | -1.7 |
| Design RA Temp.[℃] | 27 | Design RA Temp.[℃] | 20 |
| Outdoor Limit(Off) Temp.[℃] | 16 | Outdoor Limit(Off) Temp.[℃] | 16 |
| Start Month ~ | Jan | Start Month ~ | Jan |
| End Month | Dec | End Month | Dec |

| ⑥ Other Settings | | | |
|---|---|---|---|
| Currency | USD | LCC Analysis Year | 15 |
| Energy Price Increase Rate | | 0 | % |
| Energy Price & CO2 Factor Setting | | | |
| Electricity | 0.5085 USD/kWh | 0.5471 | kgCO₂/kWh |
| Natural Gas | 0.035 USD/Nm3 | 0.2303 | kgCO₂/kWh |
| Oil | 0.035 USD/gal | 0.2303 | kgCO₂/kWh |

* If you want change the unit, please click the unit cell(Only for yellow color cells).

⑤ **Design conditions** can be inputted design outdoor air(OA), room air(RA) Temperature. Please select type of the design conditions. You can select not only one type but also two types at the same time. Design outdoor air temperature will be changed automatically according to the city. Outdoor Limit(Off) temperature that not need to cooling or heating operation.

⑥ Select the **currency** and LCC analysis year. CO2 emission factor(Elec.) is automatically inputted values depending on the region.
**Energy Price Increase Rate** is annual energy price increase rate. So if you want to apply annual energy price increase rate, please input the value.

⑦ **'Clear'** button deletes all inputted values.

⑧ Finally if you want to see the **report**, click the Report button.

⑨ **'▶ Back to the INTRO'** button takes you back to the Intro page.



LG Business Solutions

■ System Comparison

③ Pre-Setting for systems

① **Proposed**

| Source | Type | Cooling EER[W/W] | Heating(HP) COP(W/W) | Total PI [kW] |
|---|---|---|---|---|
| Heat Source | LG Multi V 5 | 4.33 | | 243.6 |
| Air Side | 4Way Cassette | | | 0.61 |
| Ventilation | | | | 0. |
| ② Total | | 4.32 | 76.46 | 244 |

Total Cost[USD]

| | | | | |
|---|---|---|---|---|
| Equipment | | USD | Installation | USD |
| DC Rate | | % | Maintenance | USD |
| **Total Cost** | | | | **USD** |

**Baseline 1**

| Source | Type | Cooling EER[W/W] | Heating(HP) | Total PI [kW] |
|---|---|---|---|---|
| Heat Source | VRF Air-cooled | | Heating(HP) | |
| Air Side | | | Gas Boiler | |
| Ventilation | | | Oil Boiler | |
| Total | | | Elec.Heater | |

⑤

**Baseline 1**

| Source | Type | Cooling EER[W/W] | Heating(HP) COP(W/W) | Total PI [kW] |
|---|---|---|---|---|
| Heat Source | VRF Air-cooled | 4.33 | | 243.6 |
| Air Side | Duct_High | | | 0.61 |
| Ventilation | | | | 0. |
| Total | | 4.32 | 76.46 | 244 |

④ Total Cost[USD]

| | | | | |
|---|---|---|---|---|
| Cost Reduction ratio from Proposed | 0 | % | | |
| Equipment | | USD | Installation | USD |
| DC Rate | | % | Maintenance | USD |
| **Total Cost** | | | | **USD** |

**Baseline 2**

| Source | Type | Cooling EER[W/W] | Elec.Heater Efficiency(%) | Total PI [kW] |
|---|---|---|---|---|
| Heat Source | LG Single Package(CC | 3.20 | | 329.7 |
| Air Side | | | | 29.94 |
| Ventilation | | | | 0. |
| Total | | 2.93 | | 360 |

Total Cost[USD]

| | | | | |
|---|---|---|---|---|
| Cost Reduction ratio from Proposed | 0 | % | | |
| Equipment | | USD | Installation | USD |
| DC Rate | | % | Maintenance | USD |
| **Total Cost** | | | | **USD** |

**Baseline 3**

| Source | Type | Cooling EER[W/W] | Gas Boiler Efficiency(%) | Total PI [kW] |
|---|---|---|---|---|
| Heat Source | Air-Cooled Chiller | 2.80 | | 376.8 |
| Air Side | FCU_Ducted Type | | | 21.1 |
| Ventilation | | | | 0. |
| Total | | 2.65 | | 398 |

Total Cost[USD]

| | | | | |
|---|---|---|---|---|
| Cost Reduction ratio from Proposed | 0 | % | | |
| Equipment | | USD | Installation | USD |
| DC Rate | | % | Maintenance | USD |
| **Total Cost** | | | | **USD** |

System comparison consists of Proposed, Baseline 1, Baseline 2, and Baseline 3. The name of the Proposed, Baseline 1, Baseline 2, and Baseline 3 can be changed.
Select Heat source, Air side, and Ventilation. Heat source of the Proposed does not include competitor models.

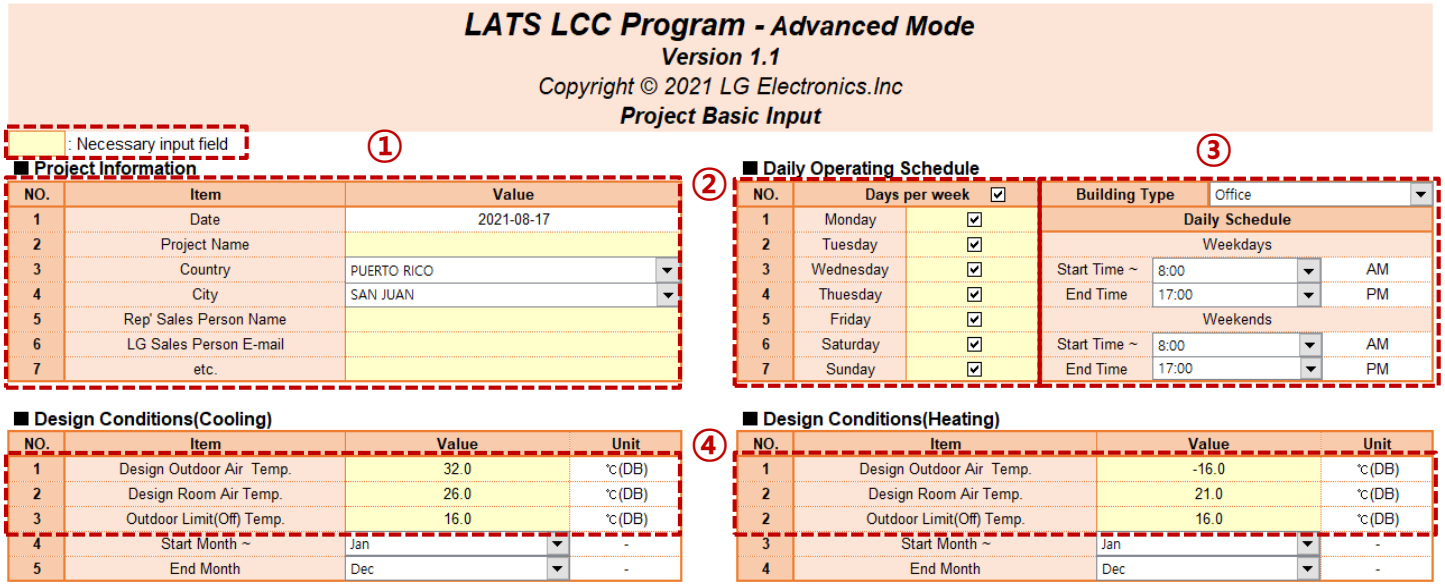
① **Heat source** of Baseline 1, Baseline 2, and Baseline 3 includes not only LG Model but also competitor model. Air side and Ventilation are the same as proposed.
**Cooling EER & Heating COP** of the heat source can be inputted by user.
Total PI will be changed automatically according to the type.

② **Total Cost** is divided into Equipment, Installation, DC Rate, and Maintenance. Total Cost is necessary inputted values for LCC analysis.

③ **'Pre-simulation'** is automatically calculated cooling EER, Heating COP, and Total PI.

④ **Cost Reduction ratio from Proposed** automatically calculates equipment cost of Baseline 1, Baseline 2, and Baseline 3 with selected ratio value from the equipment cost of proposed.

⑤ **Heating type** can be changed according to user's slecting. It is divided into Heating(HP), Gas Boiler, Oil Boiler, and Elec.Heater.




Advanced Mode consists of Basic Input & System Selection.

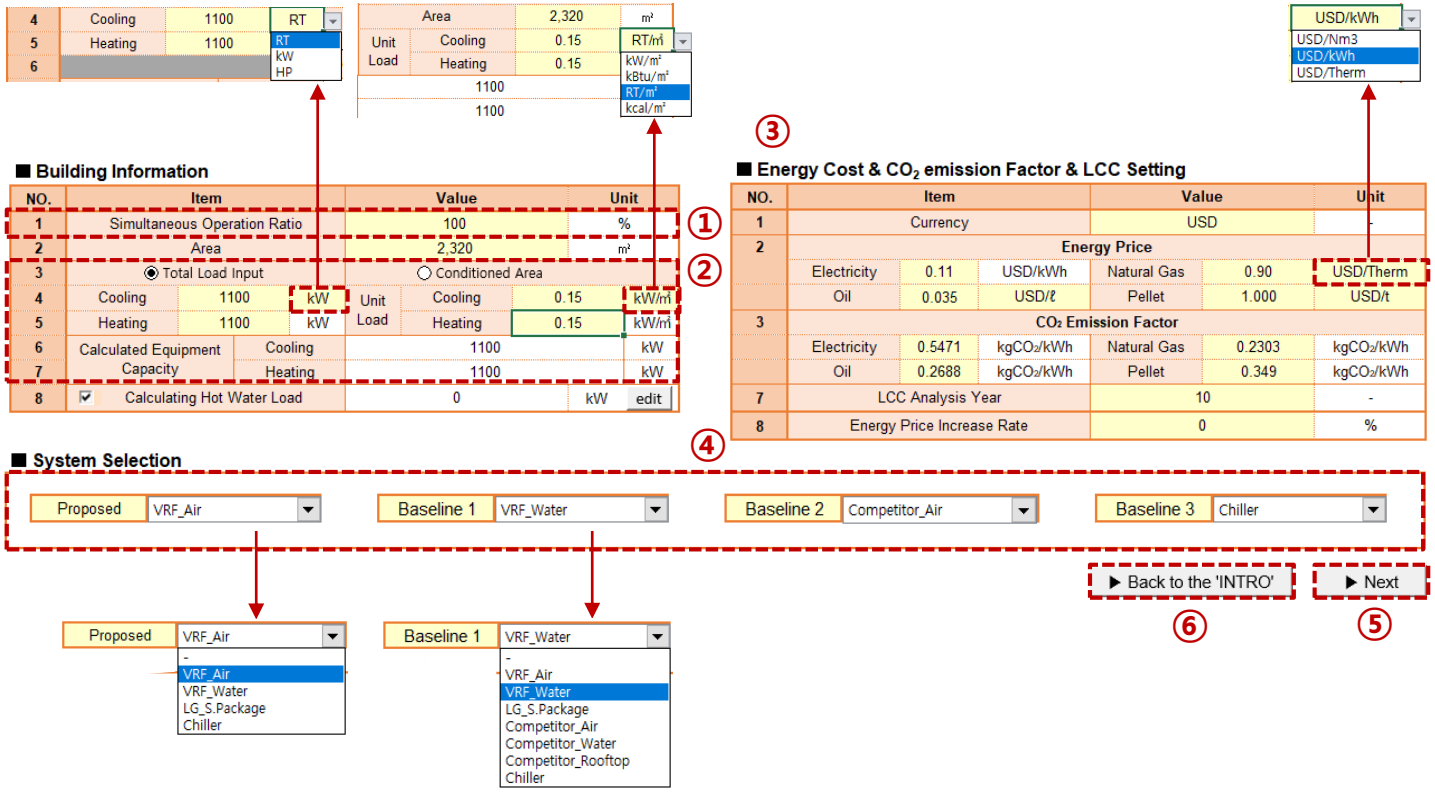
**Important!**
Yellow color cell is necessary input field, so please enter the required value at the yellow color cell.

① **Project Information** consists of Date, Project Name, Country, City, Rep's Sales Person Name, and LG Sales Person E-mail. Date is automatically inputted today's date. Next, select country and city.

② **Days per week** is selecting schedule by day of the week. You can choose the day of the week you want. If you want to operate on a full day of the week, please click on the check box at the top.

③ **Daily Schedule Setting** is that sets the time of the week and weekend. You can set the time you want to operate.

④ **Design conditions** can be inputted design OA, RA Temperature. Design outdoor air temperature will be changed automatically according to the city. Outdoor Limit(Off) temperature that not need to cooling or heating operation.




* If you want change the unit, please click the unit cell(Only for yellow color cells).

* Baseline 1, Baseline 2, and Baseline 3 system selection types are the same(including competitor systems).

Building Information is for inputting equipment capacity. Input method is divided into Total Load Input and Conditioned Area. Select the method you want to enter the appropriate value. Building type consists of Office, Residential, Retail, and Hotel.

① **Simultaneous Operation Ratio** is the percentage of overall system utilization.

② Please select only one type of input equipment capacity. Select the method you want to enter the appropriate value.

③ Select the currency type and LCC analysis year. CO2 emission factors are automatically inputted values depending on the region. **Energy Price Increase Rate** is annual energy price increase rate. So if you want to apply annual energy price increase rate, please input the value.

④ **System selection** is to select systems for LCC analysis. For system comparison, user should select at least two systems. Proposed includes only LG system, but Baseline 1, Baseline 2, and Baseline 3 include LG system and competitor system.

⑤ Finally, **'▶ Next'** button is used to move to the next page after entering all values.

⑥ **'▶ Back to the 'INTRO''** button takes you back to the Intro page.

■ Building Information

| NO. | Item | | | Value | | Unit |
|---|---|---|---|---|---|---|
| 1 | Simultaneous Operation Ratio | | | 100 | | % |
| 2 | Area | | | 2,320 | | ㎡ |
| 3 | ◉ Total Load Input | | | ○ Conditioned Area | | |
| 4 | Cooling | 1100 | kW | Unit Load Cooling | 0.15 | kW/㎡ |
| 5 | Heating | 1100 | kW | Heating | 0.15 | kW/㎡ |
| 6 | Calculated Equipment Capacity | Cooling | | 1100 | | kW |
| 7 | | Heating | | 1100 | | kW |
| 8 | ☑ Calculating Hot Water Load | | | 0 | kW | edit |

① If you want to use the Hot Water function, click the check box on **Calculating Hot Water Load**. Click to appear a sheet as follows (input sheet for hot water load). Additionally, if you want to edit the values, please click the 'edit' button.

***LATS LCC Program - Calculating Hot Water Load***

***Test Version 1.1***

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Load Default Values ▶ OK

| No. | Select the Hot Water Load Input Type | | | | | Unit |
|---|---|---|---|---|---|---|
| 1 | ◉ Total Hot Water Load Input | | | | | |
| | ② Calculated Hot water load | | | | | kW |
| 2 | ③ ○ Calculating Hot Water Load Input | | | ④ Method 2. By number of people | | 2 |
| | Area | 0 | ㎡ | Pre-heating | 0 | hour |
| | People | 0.1 | # of People | Post-heating | 0 | hour |
| | Cold water target | 15 | ℃ | Daily Water | 4.2 | l/person per day |
| | Hot water target | 55 | ℃ | | | |
| 3 | Calculated Hot water load per hour | | | 0 | | kW |

Necessary Input Fields

Additional (option) Input Fields

Method 1. By Area x unit people per area
Method 1. By Area x unit people per area
Method 2. By number of people

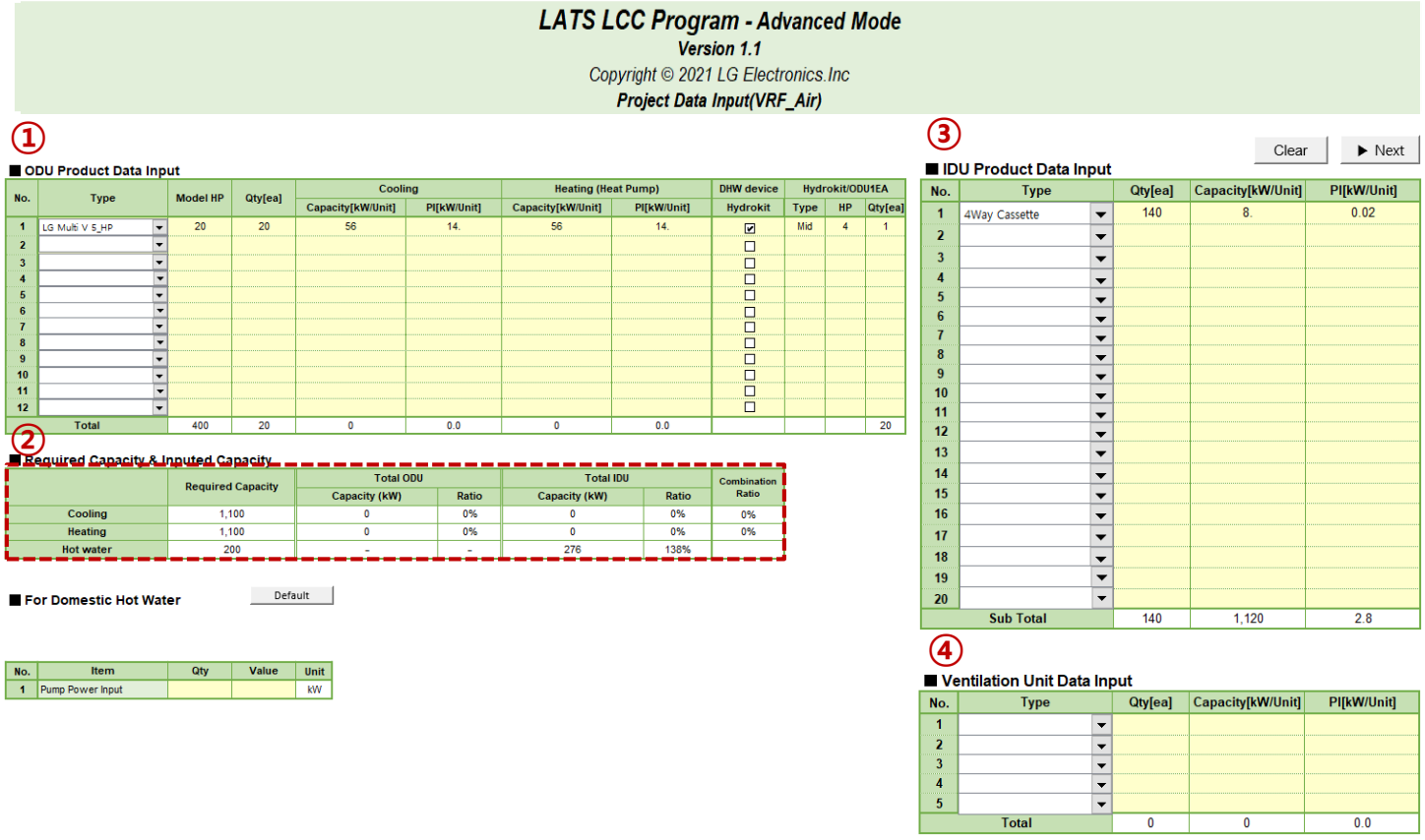
② There are two ways to input hot water load. First, if you know the hot water load value, you can enter it directly.

③ The second method is to enter the variables used to calculate the hot water load.
If you know the values of the variables required to calculate the hot water load, you can enter the values for the variables directly. If you enter the values corresponding to the variables, the hot water load value is calculated automatically.

| No. | Item | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Building Type | Office | | | | | | | | | | |
| 2 | Operating Schedule(Hours) | | | | | | | | | | | |
| 3 | ⑤ Monthly Peak Load Ratio (%) | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

④ The way to enter the number of people is divided into two. Method 1 is by area x unit people per area and Meathod 2 is by number of people. You can select and enter the method you want.

⑤ Setting for **monthly peak load ratio.** Users can change peak load rate of hot water per month.



**LATS LCC Program - Advanced Mode**

**Version 1.1**

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**Project Data Input(VRF_Air)**

① ■ ODU Product Data Input

| No. | Type | Model HP | Qty[ea] | Cooling | | Heating (Heat Pump) | | DHW device | Hydrokit/ODU1EA | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Capacity[kW/Unit] | PI[kW/Unit] | Capacity[kW/Unit] | PI[kW/Unit] | Hydrokit | Type | HP | Qty[ea] |
| 1 | LG Multi V 5_HP | 20 | 20 | 56 | 14. | 56 | 14. | ☑ | Mid | 4 | 1 |
| 2 | | | | | | | | ☐ | | | |
| 3 | | | | | | | | ☐ | | | |
| 4 | | | | | | | | ☐ | | | |
| 5 | | | | | | | | ☐ | | | |
| 6 | | | | | | | | ☐ | | | |
| 7 | | | | | | | | ☐ | | | |
| 8 | | | | | | | | ☐ | | | |
| 9 | | | | | | | | ☐ | | | |
| 10 | | | | | | | | ☐ | | | |
| 11 | | | | | | | | ☐ | | | |
| 12 | | | | | | | | ☐ | | | |
| Total | | 400 | 20 | 0 | 0.0 | 0 | 0.0 | | | | 20 |

② ■ Required Capacity & Inputed Capacity

| | Required Capacity | Total ODU | | Total IDU | | Combination Ratio |
|---|---|---|---|---|---|---|
| | | Capacity (kW) | Ratio | Capacity (kW) | Ratio | |
| Cooling | 1,100 | 0 | 0% | 0 | 0% | 0% |
| Heating | 1,100 | 0 | 0% | 0 | 0% | 0% |
| Hot water | 200 | - | - | 276 | 138% | |

■ For Domestic Hot Water  Default

| No. | Item | Qty | Value | Unit |
|---|---|---|---|---|
| 1 | Pump Power Input | | | kW |

③ ■ IDU Product Data Input  Clear  ▶ Next

| No. | Type | Qty[ea] | Capacity[kW/Unit] | PI[kW/Unit] |
|---|---|---|---|---|
| 1 | 4Way Cassette | 140 | 8. | 0.02 |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |
| 16 | | | | |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |
| 20 | | | | |
| Sub Total | | 140 | 1,120 | 2.8 |

④ ■ Ventilation Unit Data Input

| No. | Type | Qty[ea] | Capacity[kW/Unit] | PI[kW/Unit] |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| Total | | 0 | 0 | 0.0 |

① **ODU Product Data Input** is for selecting type of the outdoor unit and inputting Model HP, Quantity, Capacity, and Power Input of outdoor units.

**- ODU Type(Proposed)**
: LG Multi V 5, LG Multi V_Pro, LG Multi V_Tropical, LG Multi, LG Multi V S, LG Single

**- ODU Type(Alt 1, Alt 2, and Alt 3)**
: VRF Air-cooled, Multi Split, VRF Mini, Single Split(Constant), Single Split(Inverter)

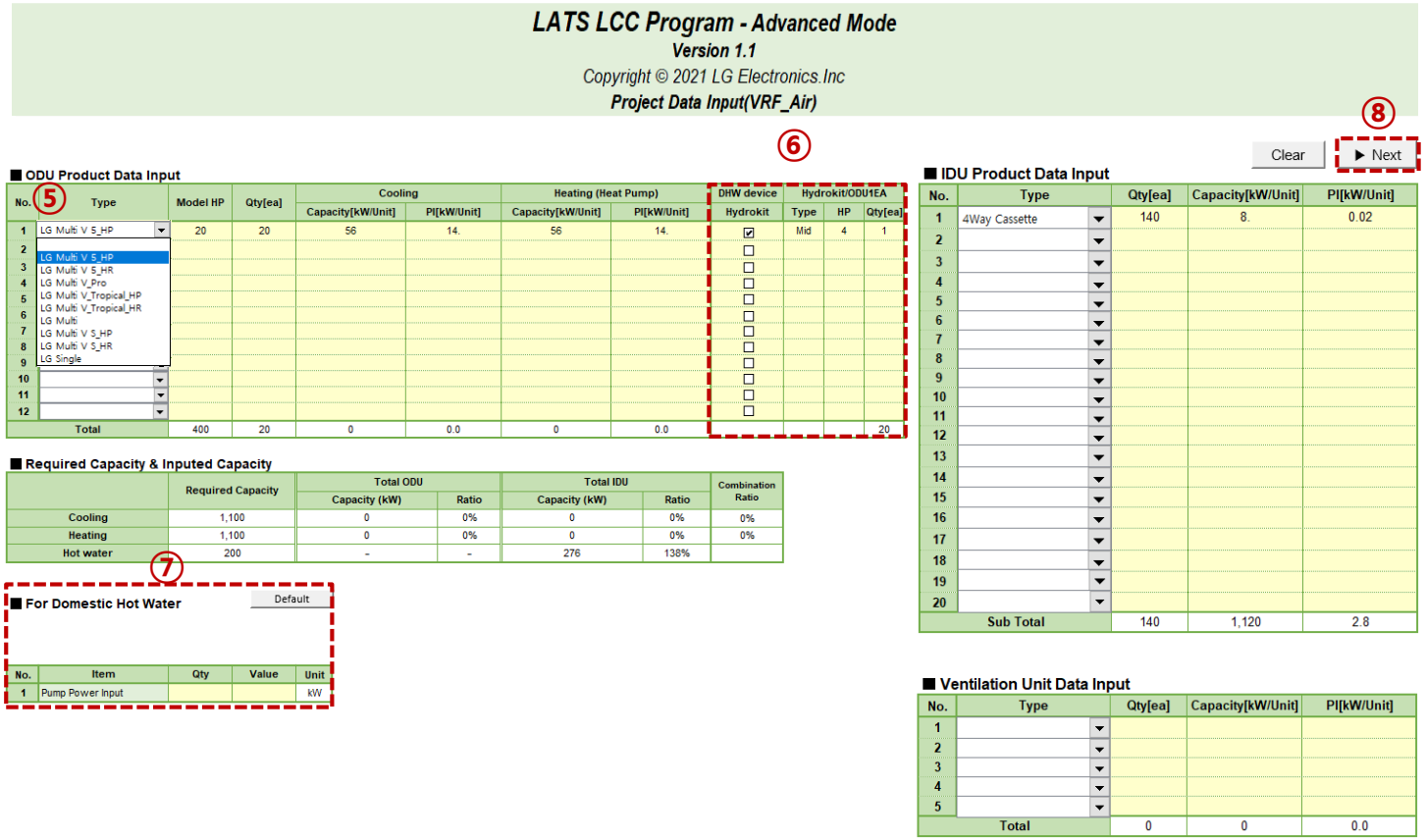
② **Required Capacity & Inputted Capacity** is only for checking whether the inputted capacity is enough for required capacity.

③ **IDU Product Data Input** is for selecting type of the indoor unit and inputted Quantity, Capacity, and Power Input of indoor units.

**- IDU Type**
: 1Way, 2Way, and 4Way Cassette, High static, Middle static, and Low static Duct, Wall mounted, Floor Standing, Ceiling Suspended, Console, and AHU

④ **Ventilation Unit Data Input** is for selecting type of the ventilation unit and inputting Quantity, Capacity, and Power Input of ventilation units.

**- Venti Type** : ERV, FAU, DOAS



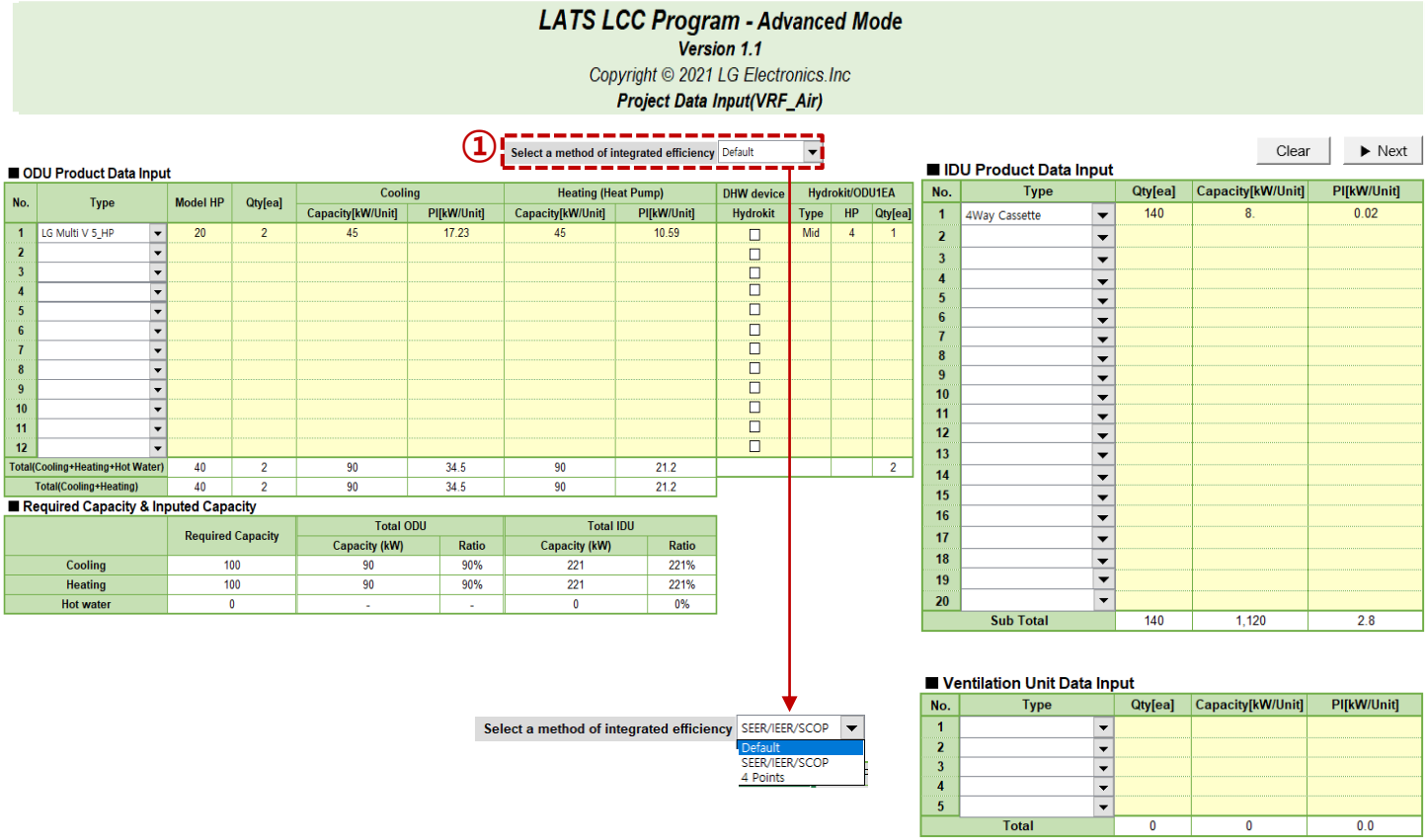

**Hydrokit(Hot water) function** is only applicable to LG Air-cooled VRF. The systems for our Air-cooled VRF is 'VRF_Air'.

⑤ Only 'LG_Multi V 5, LG_Multi V_Tropical, and LG_Multi V S' systems are eligible for hydrokit (Hot water). Among these systems, heat recovery function only apply if the product type is named '_HR'. If you want to apply the case where heat recovery, please select the product marked '_HR'. Otherwise, please select the product marked '_HP' at the end.

⑥ To distinguish the ODU system with the Hydrokit, please click the connected ODU as follows. Also, please select the type, horsepower, and number of hydrokit connected to a single ODU.

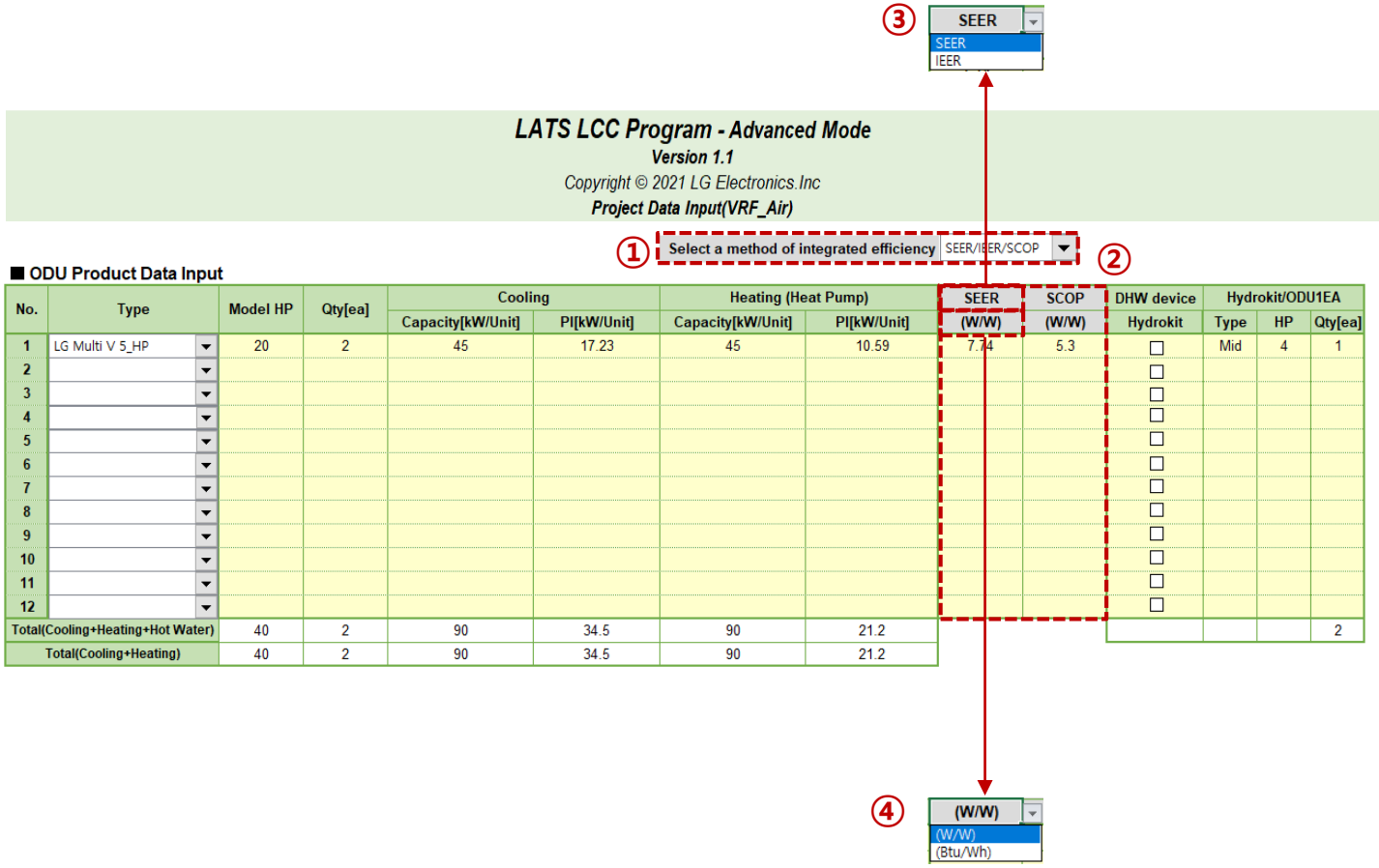
⑦ Users need to type in the power input of Hot water pump when using **'Domestic Hot Water'** function.

⑧ Finally, **'▶ Next'** button is to move to the next page after entering all values.




**'SEER/IEER/SCOP' function** is three choices are available : Default, SEER/IEER/SCOP, and 4 Points

① If user knows the 'SEER/IEER/SCOP' values, click the item of the 'SEER/IEER/SCOP' and input the value. And if user knows the values of the 'EER/COP', user can input the values. But if user doesn't use this function, user uses it after selecting **'Default'**.

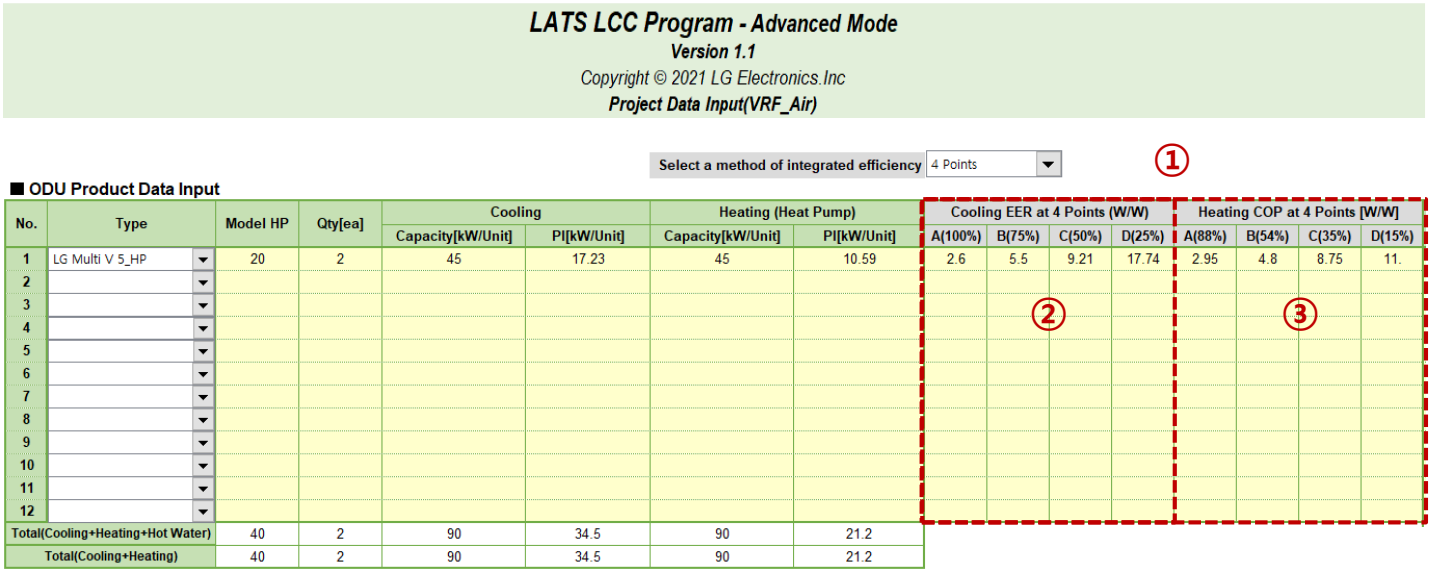



① When you click the 'SEER/IEER/SCOP', the 'SEER/SCOP' input cell appears. Input the values corresponding to **'SEER/SCOP'** in the input cell.

② The 'SEER/SCOP' calculation is calculated as the difference between the user-inputted 'SEER/SCOP' values and the ratio of the 'SEER/SCOP' values calculated based on the rated value.

③ Only 'SEER/SCOP' can be inputted in the current cell. However, if you want to enter the **'IEER'** values, if you click a cell in the SEER notation, the notation changes so that you can select and input the 'IEER'.

④ If the user wants to change the 'SEER/IEER' input **unit**, the unit can be changed to **'(Btu/Wh)'** by clicking on the cell inputted as **'(W/W)'**.



**LATS LCC Program - Advanced Mode**

**Version 1.1**

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**Project Data Input(VRF_Air)**

Select a method of integrated efficiency: 4 Points ①

■ ODU Product Data Input

| No. | Type | Model HP | Qty[ea] | Cooling | | Heating (Heat Pump) | | Cooling EER at 4 Points (W/W) | | | | Heating COP at 4 Points [W/W] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Capacity[kW/Unit] | PI[kW/Unit] | Capacity[kW/Unit] | PI[kW/Unit] | A(100%) | B(75%) | C(50%) | D(25%) | A(88%) | B(54%) | C(35%) | D(15%) |
| 1 | LG Multi V 5_HP | 20 | 2 | 45 | 17.23 | 45 | 10.59 | 2.6 | 5.5 | 9.21 | 17.74 | 2.95 | 4.8 | 8.75 | 11. |
| 2 | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | ② | | | | ③ | | |
| 4 | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | |
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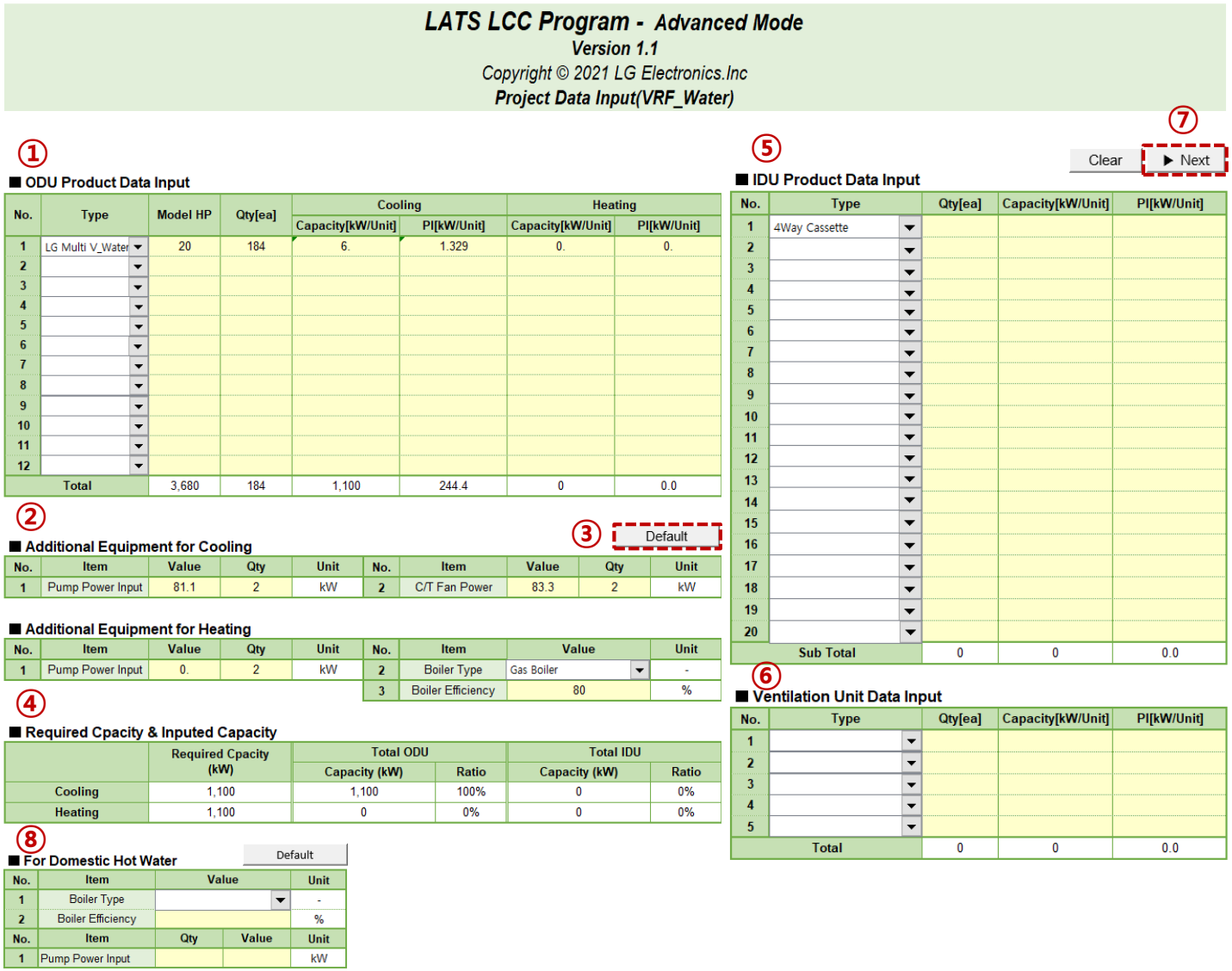
| 11 | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | |
| Total(Cooling+Heating+Hot Water) | | 40 | 2 | 90 | 34.5 | 90 | 21.2 | | | | | | | | |
| Total(Cooling+Heating) | | 40 | 2 | 90 | 34.5 | 90 | 21.2 | | | | | | | | |

① If the user knows **the 'EER/COP' 4 Points** values of the system, select the item '4 Points'. Click to generate 'Cooling EER 4 Points' and 'Heating COP 4 Points' input cells. You can input the appropriate value.

② **The 4 points in Cooling EER** are A(100%), B(75%), C(50%), and D(25%) so please check the ratio carefully and input it.

③ **The 4 points in the Heating COP** are A(88%), B(54%), C(35%), and D(15%) so please check the ratio carefully and input it. The ration is different from the Cooling EER, so please enter it carefully.



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**Version 1.1**

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**Project Data Input(VRF_Water)**

① ■ ODU Product Data Input

| No. | Type | Model HP | Qty[ea] | Cooling | | Heating | |
|---|---|---|---|---|---|---|---|
| | | | | Capacity[kW/Unit] | PI[kW/Unit] | Capacity[kW/Unit] | PI[kW/Unit] |
| 1 | LG Multi V_Water | 20 | 184 | 6. | 1.329 | 0. | 0. |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| Total | | 3,680 | 184 | 1,100 | 244.4 | 0 | 0.0 |

② ■ Additional Equipment for Cooling

③ Default

| No. | Item | Value | Qty | Unit | No. | Item | Value | Qty | Unit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Pump Power Input | 81.1 | 2 | kW | 2 | C/T Fan Power | 83.3 | 2 | kW |

■ Additional Equipment for Heating

| No. | Item | Value | Qty | Unit | No. | Item | Value | Unit |
|---|---|---|---|---|---|---|---|---|
| 1 | Pump Power Input | 0. | 2 | kW | 2 | Boiler Type | Gas Boiler | - |
| | | | | | 3 | Boiler Efficiency | 80 | % |

④ ■ Required Cpacity & Inputed Capacity

| | Required Cpacity (kW) | Total ODU | | Total IDU | |
|---|---|---|---|---|---|
| | | Capacity (kW) | Ratio | Capacity (kW) | Ratio |
| Cooling | 1,100 | 1,100 | 100% | 0 | 0% |
| Heating | 1,100 | 0 | 0% | 0 | 0% |

⑧ ■ For Domestic Hot Water Default

| No. | Item | Value | | Unit |
|---|---|---|---|---|
| 1 | Boiler Type | | | - |
| 2 | Boiler Efficiency | | | % |
| No. | Item | Qty | Value | Unit |
| 1 | Pump Power Input | | | kW |

⑤ ■ IDU Product Data Input

⑦ Clear ▶ Next

| No. | Type | Qty[ea] | Capacity[kW/Unit] | PI[kW/Unit] |
|---|---|---|---|---|
| 1 | 4Way Cassette | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |
| 16 | | | | |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |
| 20 | | | | |
| Sub Total | | 0 | 0 | 0.0 |

⑥ ■ Ventilation Unit Data Input

| No. | Type | Qty[ea] | Capacity[kW/Unit] | PI[kW/Unit] |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| Total | | 0 | 0 | 0.0 |

① **ODU Product Data Input** is for selecting type of the outdoor unit and inputting Model HP, Quantity, Capacity, and Power Input. Water-cooled VRF Type is only one type.

② **Additional Equipment for Cooling** items are divided into Pump Power Input and Cooling Tower Fan Power. **Additional Equipment for heating** items are divided into Pump Power Input, Boiler Type, and Boiler Efficiency. Boiler Type can be selected Gas boiler or Oil boiler.

* Users can see the detail Information in the Reference of the Report.

③ **'Default'** button is to calculate automatically Pump Power Input, Cooling Tower Fan Power, and Boiler Efficiency.

④ **Required Capacity & Inputted Capacity** is only for checking whether the inputted capacity is enough for required capacity.

⑤ **IDU Product Data Input** is for selecting type of the indoor unit and inputting Quantity, Capacity, and Power Input.

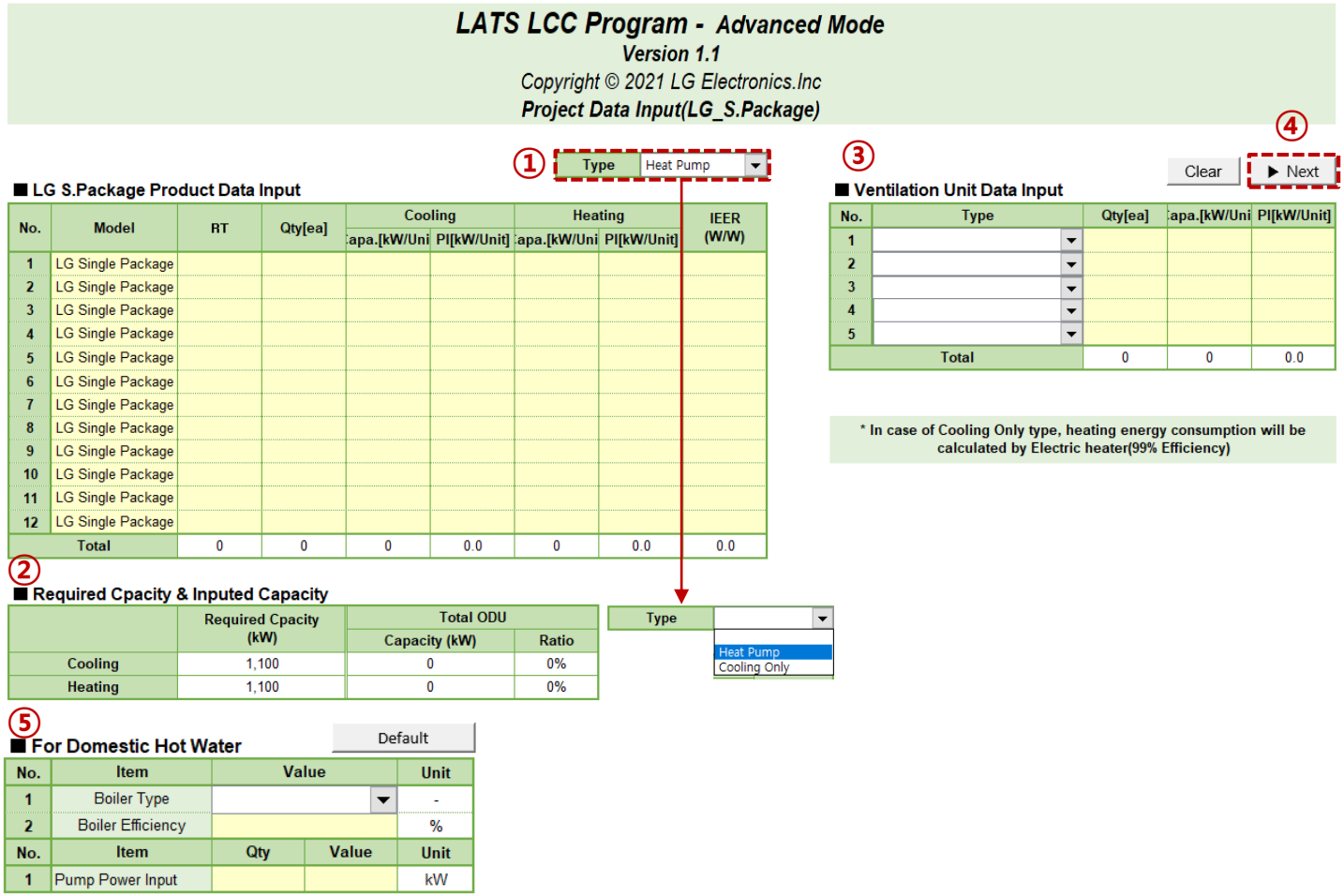
**- IDU Type**

: 1Way, 2Way, and 4Way Cassette, High static, Middle static, and Low static Duct, Wall mounted, Floor Standing, Ceiling Suspended, Console, and AHU

⑥ **Ventilation Unit Data Input** is for selecting type of the ventilation unit and inputting Quantity, Capacity, and Power Input.

⑦ Finally, **'▶ Next'** button is to move to the next page after entering all values.

⑧ **For Domestic Hot Water** is only input about hot water.




Single Package Input UI is the same as Rooftop.

① **Type of the Single Package** is divided into Heat Pump and Cooling Only.
LG S.Package(Rooftop) can be inputted RT, Quantity, Capacity, Power Input, IEER.

② **Required Capacity & Inputted Capacity** is only for checking whether the inputted capacity is enough for required capacity.

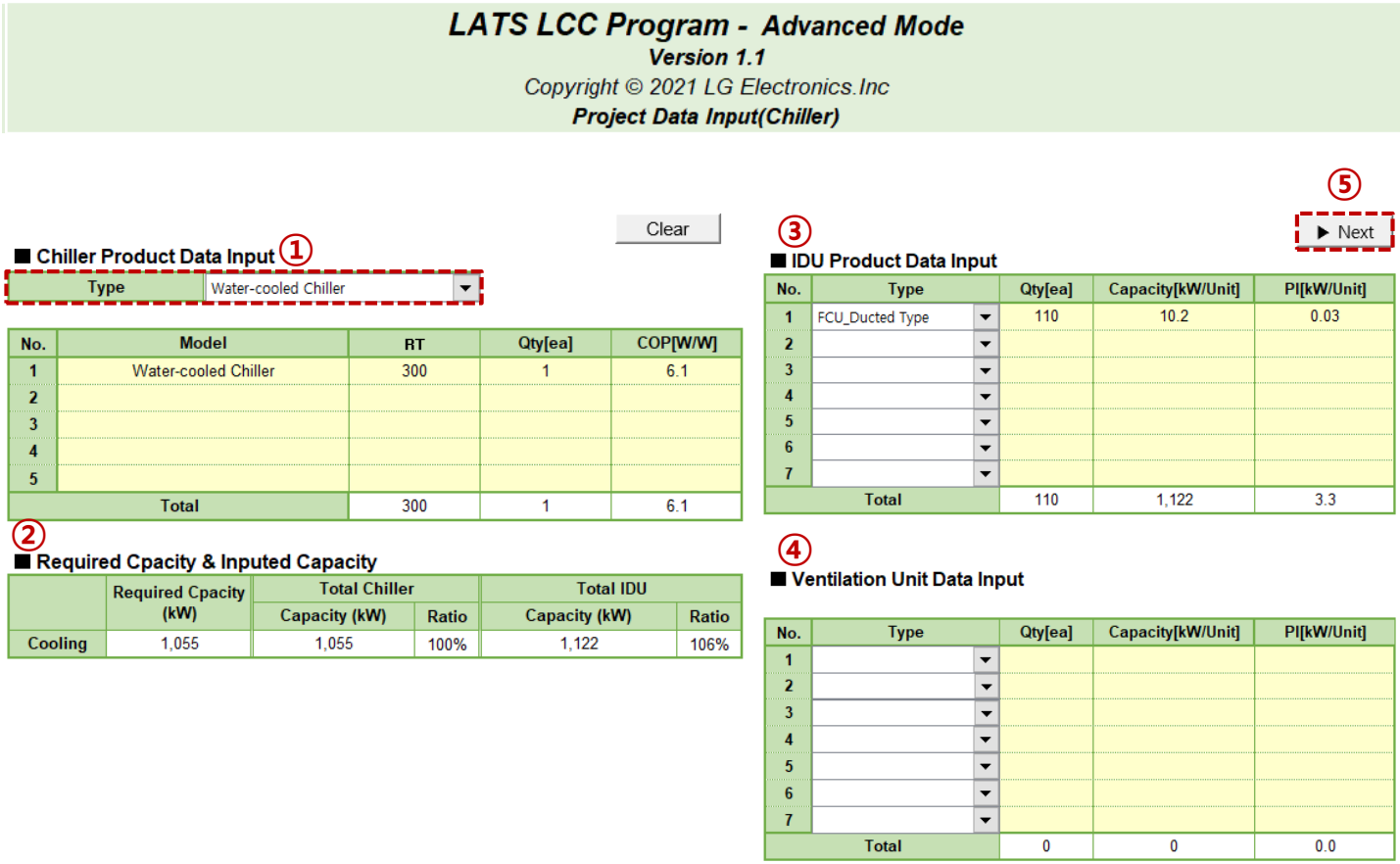
③ **Ventilation Unit Data Input** is for selecting type of the ventilation unit and requires Quantity, Capacity, and Power Input.

**- Venti Type** : ERV, FAU, and DOAS

*In case of Cooling Only type, heating energy consumption will be calculated by Electric heater(99% Efficiency).

④ Finally, **'▶ Next'** button is to move to the next page after entering all values.

⑤ **For Domestic Hot Water** is only input about hot water.



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**Project Data Input(Chiller)**

Clear

⑤ ▶ Next

■ Chiller Product Data Input ①

| Type | Water-cooled Chiller |
|---|---|

| No. | Model | RT | Qty[ea] | COP[W/W] |
|---|---|---|---|---|
| 1 | Water-cooled Chiller | 300 | 1 | 6.1 |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| Total | | 300 | 1 | 6.1 |

② ■ Required Cpacity & Inputed Capacity

| | Required Cpacity (kW) | Total Chiller | | Total IDU | |
|---|---|---|---|---|---|
| | | Capacity (kW) | Ratio | Capacity (kW) | Ratio |
| Cooling | 1,055 | 1,055 | 100% | 1,122 | 106% |

③ ■ IDU Product Data Input

| No. | Type | Qty[ea] | Capacity[kW/Unit] | PI[kW/Unit] |
|---|---|---|---|---|
| 1 | FCU_Ducted Type | 110 | 10.2 | 0.03 |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| Total | | 110 | 1,122 | 3.3 |

④ ■ Ventilation Unit Data Input

| No. | Type | Qty[ea] | Capacity[kW/Unit] | PI[kW/Unit] |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| Total | | 0 | 0 | 0.0 |

① **Type of the chiller** is to select chiller type, LG ISC, Air-cooled Chiller, and Water-cooled Chiller. Chiller Product Data Input requires RT, Quantity, and COP(efficiency).

② **Required Capacity & Inputted Capacity** is only for checking whether the inputted capacity is enough for required capacity.

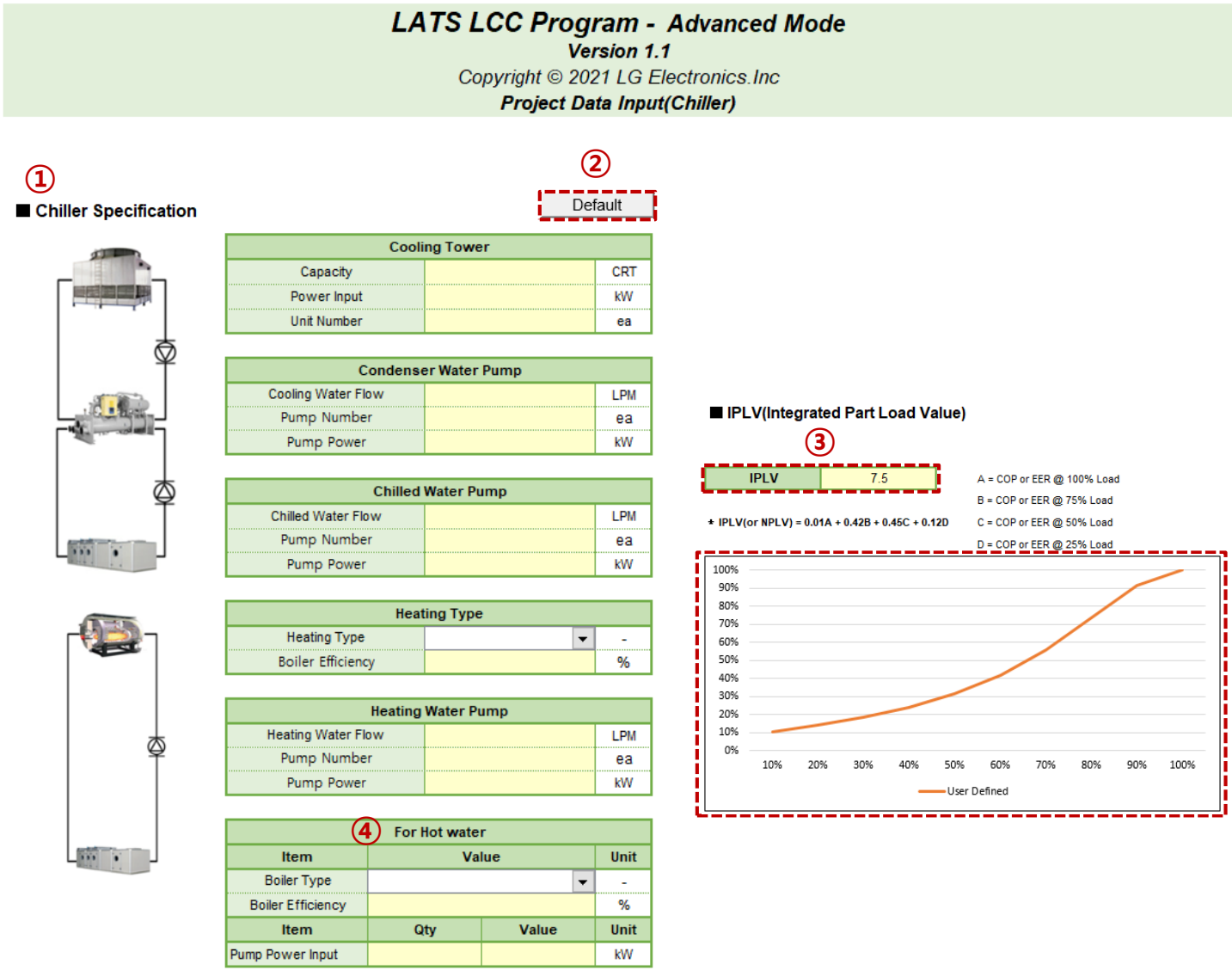
③ **IDU Product Data Input** is for selecting type of the indoor unit and requires Quantity, Capacity, and Power Input.

**- IDU Type**
: FCU_Cassette Type, FCU_Ducted Type, and AHU

④ **Ventilation Unit Data Input** is for selecting type of the ventilation unit and requires Quantity, Capacity, and Power Input.

**- Venti Type** : ERV, FAU, and DOAS

⑤ Finally, **'▶ Next'** button is to move to the next page after entering all values.



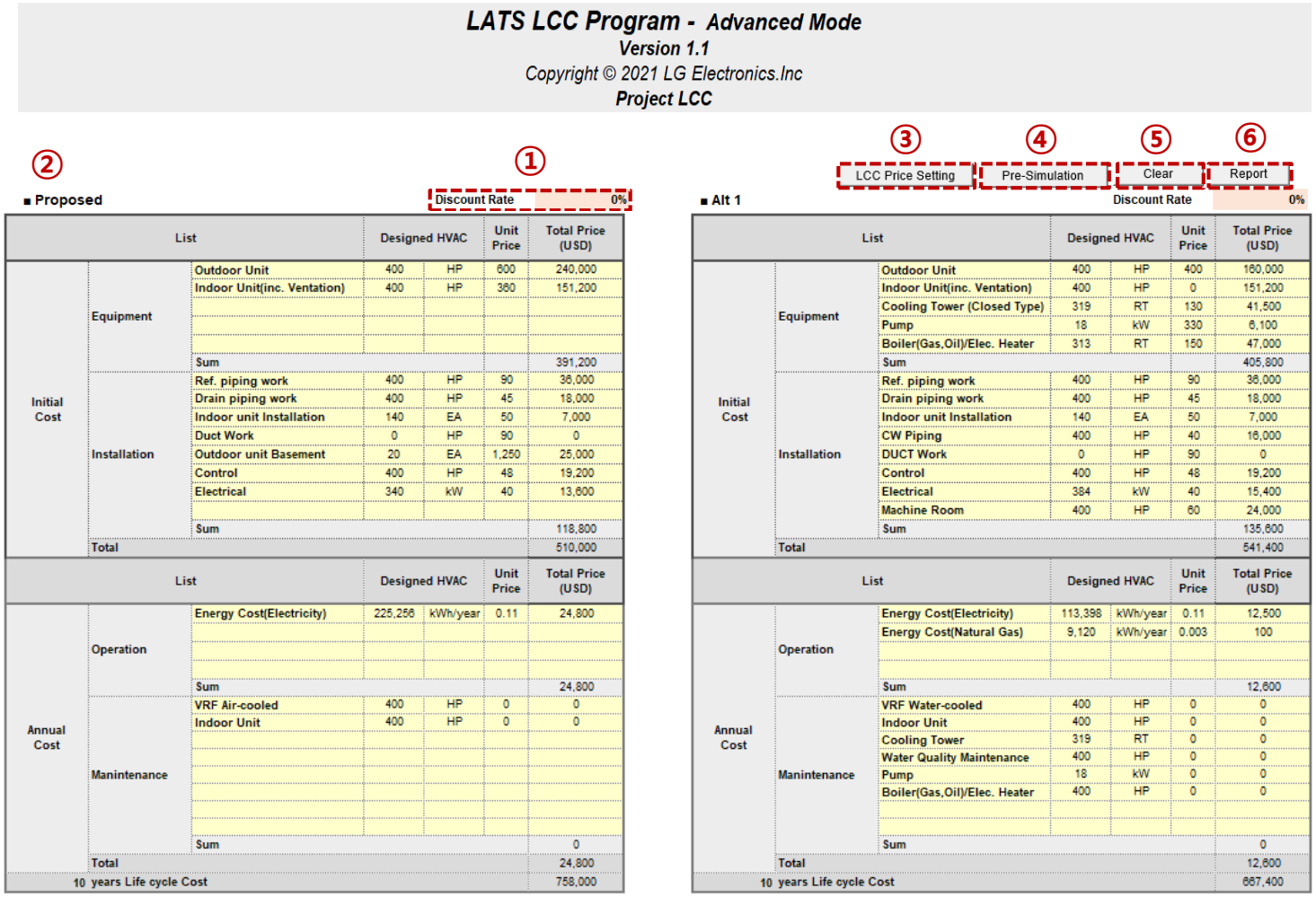

① **Chiller Specification** is for inputting additional equipment such as Cooling Tower, Pump, Boiler, etc.
Cooling Tower requires Capacity, Power Input, and Unit Number.
Condenser Water Pump requires Cooling Water Flow in condenser water side, Pump Number, and Pump power.
Chiller Water Pump requires Chilled Water Flow, Pump Number, and Pump power.
Heating Type can be selected between Gas Boiler and Oil Boiler. Boiler Efficiency is required for calculation.
If user wants more detail information, please refer to the Reference of Report.

② **'Default'** button is to automatically calculate values of Cooling Tower, Condenser Water Pump, Chilled Water Pump, Heating Type, and Heating Water Pump based on the ASHRAE Standard 90-1.

③ When users leave IPLV field blank, LCC tool calculates chiller performance at partial load condition based on ASHRAE Standard 90-1. minimum efficiency values.
Users can type in the IPLV values. In this case, LCC tool modifies chiller performance at partial load condition according to the inputted IPLV.

The graph below changes according to the IPLV value entered by the user.

④ **For Domestic Hot Water** is only input about hot water.



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**Project LCC**

② ① ③ ④ ⑤ ⑥

■ Proposed — Discount Rate 0% — LCC Price Setting | Pre-Simulation | Clear | Report — ■ Alt 1 — Discount Rate 0%

| List | | | Designed HVAC | | Unit Price | Total Price (USD) |
|---|---|---|---|---|---|---|
| Initial Cost | Equipment | Outdoor Unit | 400 | HP | 600 | 240,000 |
| | | Indoor Unit(inc. Ventation) | 400 | HP | 360 | 151,200 |
| | | Sum | | | | 391,200 |
| | Installation | Ref. piping work | 400 | HP | 90 | 36,000 |
| | | Drain piping work | 400 | HP | 45 | 18,000 |
| | | Indoor unit Installation | 140 | EA | 50 | 7,000 |
| | | Duct Work | 0 | HP | 90 | 0 |
| | | Outdoor unit Basement | 20 | EA | 1,250 | 25,000 |
| | | Control | 400 | HP | 48 | 19,200 |
| | | Electrical | 340 | kW | 40 | 13,600 |
| | | Sum | | | | 118,800 |
| | Total | | | | | 510,000 |
| Annual Cost | Operation | Energy Cost(Electricity) | 225,256 | kWh/year | 0.11 | 24,800 |
| | | Sum | | | | 24,800 |
| | Manintenance | VRF Air-cooled | 400 | HP | 0 | 0 |
| | | Indoor Unit | 400 | HP | 0 | 0 |
| | | Sum | | | | 0 |
| | Total | | | | | 24,800 |
| 10 years Life cycle Cost | | | | | | 758,000 |

| List | | | Designed HVAC | | Unit Price | Total Price (USD) |
|---|---|---|---|---|---|---|
| Initial Cost | Equipment | Outdoor Unit | 400 | HP | 400 | 160,000 |
| | | Indoor Unit(inc. Ventation) | 400 | HP | 0 | 151,200 |
| | | Cooling Tower (Closed Type) | 319 | RT | 130 | 41,500 |
| | | Pump | 18 | kW | 330 | 6,100 |
| | | Boiler(Gas,Oil)/Elec. Heater | 313 | RT | 150 | 47,000 |
| | | Sum | | | | 405,800 |
| | Installation | Ref. piping work | 400 | HP | 90 | 36,000 |
| | | Drain piping work | 400 | HP | 45 | 18,000 |
| | | Indoor unit Installation | 140 | EA | 50 | 7,000 |
| | | CW Piping | 400 | HP | 40 | 16,000 |
| | | DUCT Work | 0 | HP | 90 | 0 |
| | | Control | 400 | HP | 48 | 19,200 |
| | | Electrical | 384 | kW | 40 | 15,400 |
| | | Machine Room | 400 | HP | 80 | 24,000 |
| | | Sum | | | | 135,600 |
| | Total | | | | | 541,400 |
| Annual Cost | Operation | Energy Cost(Electricity) | 113,398 | kWh/year | 0.11 | 12,500 |
| | | Energy Cost(Natural Gas) | 9,120 | kWh/year | 0.003 | 100 |
| | | Sum | | | | 12,600 |
| | Manintenance | VRF Water-cooled | 400 | HP | 0 | 0 |
| | | Indoor Unit | 400 | HP | 0 | 0 |
| | | Cooling Tower | 319 | RT | 0 | 0 |
| | | Water Quality Maintenance | 400 | HP | 0 | 0 |
| | | Pump | 18 | kW | 0 | 0 |
| | | Boiler(Gas,Oil)/Elec. Heater | 400 | HP | 0 | 0 |
| | | Sum | | | | 0 |
| | Total | | | | | 12,600 |
| 10 years Life cycle Cost | | | | | | 667,400 |

The Life Cycle Cost of system is divided into initial cost and annual cost. Initial Cost consists of equipment cost and installation cost. Annual Cost consists of operation cost and maintenance cost.
In the LCC sheet, users can input each costs of Proposed, Alt 1, Alt 2, and Alt 3 system.

① **Discount Rate** is for applying ratio of discount from list price of equipment by sales. If user can not enter the value, equipment price will be calculated by the prices in the LCC Price Setting, which users can modify.

② **Initial Cost and Annual Cost** list can be modified.

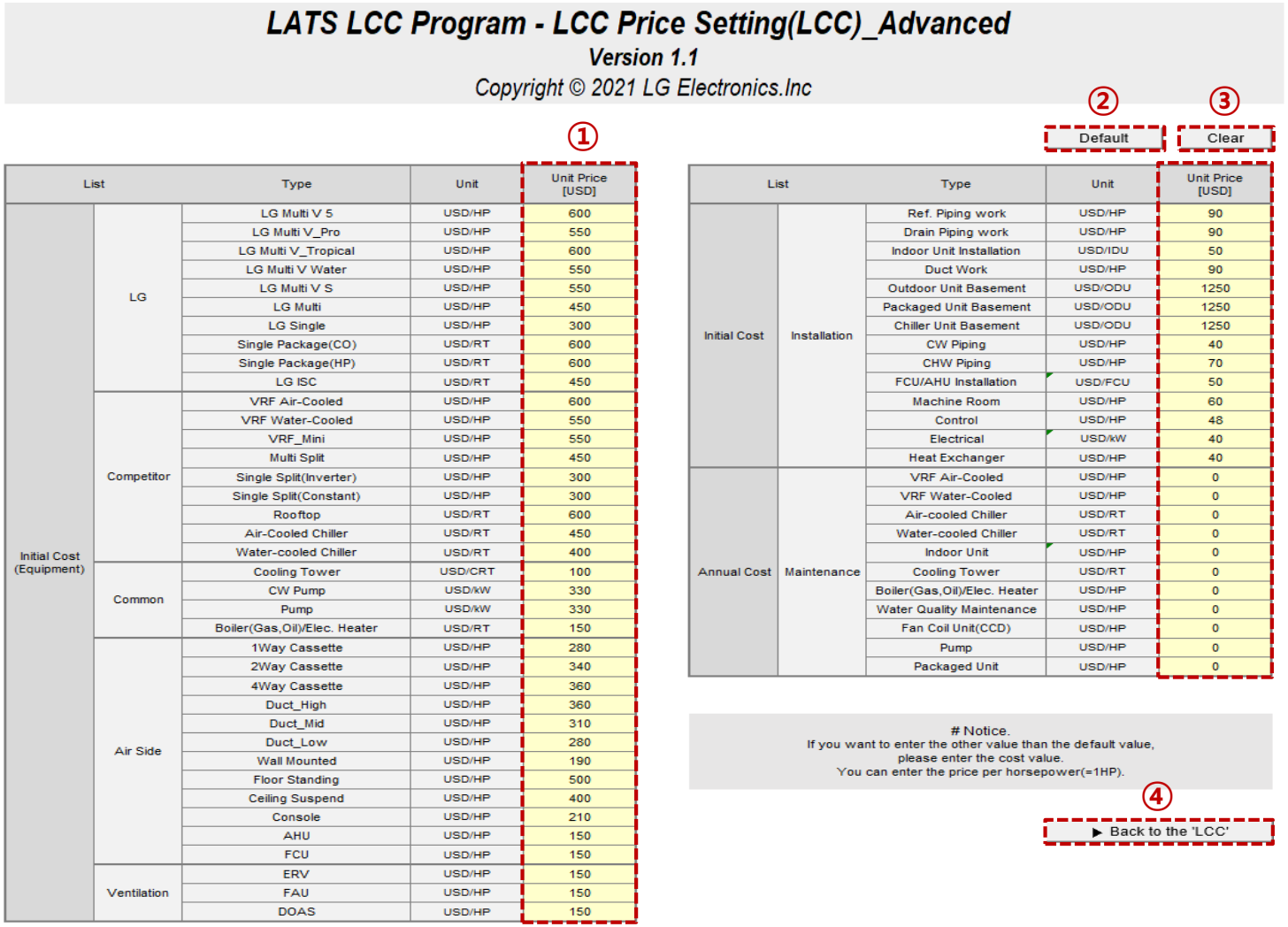
**Important!**
If you are changed the list and cost, do not click the Pre-simulation. Because it is simulated again with the pre-designated values rather than the values you entered.

③ If user wants to changed the unit price, please click the '**LCC Price Setting'**. Detail information of the LCC Price Setting is contained next page.

④ **'Pre-Simulation'** is automatically calculated initial cost and annual cost. In addition to price calculation, the list is automatically listed.

⑤ **'Clear'** button deletes all inputted values.

⑥ If you want to see the result, click the **'Report'** button.



**LATS LCC Program - LCC Price Setting(LCC)_Advanced**

**Version 1.1**

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① ② Default ③ Clear

| List | | Type | Unit | Unit Price [USD] |
|---|---|---|---|---|
| Initial Cost (Equipment) | LG | LG Multi V 5 | USD/HP | 600 |
| | | LG Multi V_Pro | USD/HP | 550 |
| | | LG Multi V_Tropical | USD/HP | 600 |
| | | LG Multi V Water | USD/HP | 550 |
| | | LG Multi V S | USD/HP | 550 |
| | | LG Multi | USD/HP | 450 |
| | | LG Single | USD/HP | 300 |
| | | Single Package(CO) | USD/RT | 600 |
| | | Single Package(HP) | USD/RT | 600 |
| | | LG ISC | USD/RT | 450 |
| | Competitor | VRF Air-Cooled | USD/HP | 600 |
| | | VRF Water-Cooled | USD/HP | 550 |
| | | VRF_Mini | USD/HP | 550 |
| | | Multi Split | USD/HP | 450 |
| | | Single Split(Inverter) | USD/HP | 300 |
| | | Single Split(Constant) | USD/HP | 300 |
| | | Rooftop | USD/RT | 600 |
| | | Air-Cooled Chiller | USD/RT | 450 |
| | | Water-cooled Chiller | USD/RT | 400 |
| | Common | Cooling Tower | USD/CRT | 100 |
| | | CW Pump | USD/kW | 330 |
| | | Pump | USD/kW | 330 |
| | | Boiler(Gas,Oil)/Elec. Heater | USD/RT | 150 |
| | Air Side | 1Way Cassette | USD/HP | 280 |
| | | 2Way Cassette | USD/HP | 340 |
| | | 4Way Cassette | USD/HP | 360 |
| | | Duct_High | USD/HP | 360 |
| | | Duct_Mid | USD/HP | 310 |
| | | Duct_Low | USD/HP | 280 |
| | | Wall Mounted | USD/HP | 190 |
| | | Floor Standing | USD/HP | 500 |
| | | Ceiling Suspend | USD/HP | 400 |
| | | Console | USD/HP | 210 |
| | | AHU | USD/HP | 150 |
| | | FCU | USD/HP | 150 |
| | Ventilation | ERV | USD/HP | 150 |
| | | FAU | USD/HP | 150 |
| | | DOAS | USD/HP | 150 |

| List | | Type | Unit | Unit Price [USD] |
|---|---|---|---|---|
| Initial Cost | Installation | Ref. Piping work | USD/HP | 90 |
| | | Drain Piping work | USD/HP | 90 |
| | | Indoor Unit Installation | USD/IDU | 50 |
| | | Duct Work | USD/HP | 90 |
| | | Outdoor Unit Basement | USD/ODU | 1250 |
| | | Packaged Unit Basement | USD/ODU | 1250 |
| | | Chiller Unit Basement | USD/ODU | 1250 |
| | | CW Piping | USD/HP | 40 |
| | | CHW Piping | USD/HP | 70 |
| | | FCU/AHU Installation | USD/FCU | 50 |
| | | Machine Room | USD/HP | 60 |
| | | Control | USD/HP | 48 |
| | | Electrical | USD/kW | 40 |
| | | Heat Exchanger | USD/HP | 40 |
| Annual Cost | Maintenance | VRF Air-Cooled | USD/HP | 0 |
| | | VRF Water-Cooled | USD/HP | 0 |
| | | Air-cooled Chiller | USD/RT | 0 |
| | | Water-cooled Chiller | USD/RT | 0 |
| | | Indoor Unit | USD/HP | 0 |
| | | Cooling Tower | USD/RT | 0 |
| | | Boiler(Gas,Oil)/Elec. Heater | USD/HP | 0 |
| | | Water Quality Maintenance | USD/HP | 0 |
| | | Fan Coil Unit(CCD) | USD/HP | 0 |
| | | Pump | USD/HP | 0 |
| | | Packaged Unit | USD/HP | 0 |

# Notice.
If you want to enter the other value than the default value,
please enter the cost value.
You can enter the price per horsepower(=1HP).

④ ▶ Back to the 'LCC'

① **LCC Unit Price Setting** is for setting the unit price of our own products and competitor's products. Basically users can enter the price per horsepower(=1HP).

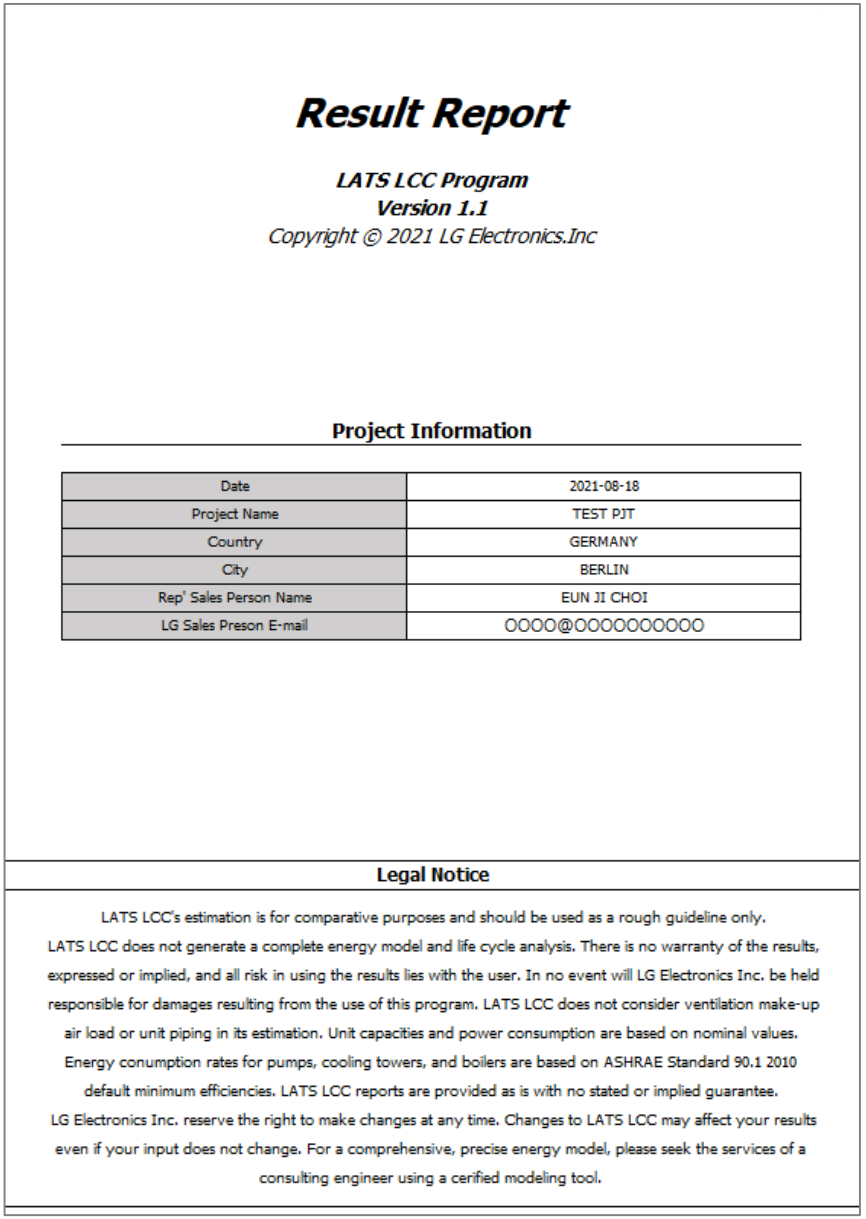
* The type of the input system can not be changed.

② If users want to enter the default value, please click the **'Default'** button.

* The default unit price value means the average system unit price value for each region. So default value could not be the same as actual prices.

③ If users want to delete all unit price, click the **'Clear'** button.

④ **'▶ Back to the LCC'** button takes you back to the Project LCC page.



**Result Report**

***LATS LCC Program***
***Version 1.1***
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**Project Information**

| | |
|---|---|
| Date | 2021-08-18 |
| Project Name | TEST PJT |
| Country | GERMANY |
| City | BERLIN |
| Rep' Sales Person Name | EUN JI CHOI |
| LG Sales Preson E-mail | OOOO@OOOOOOOOO |

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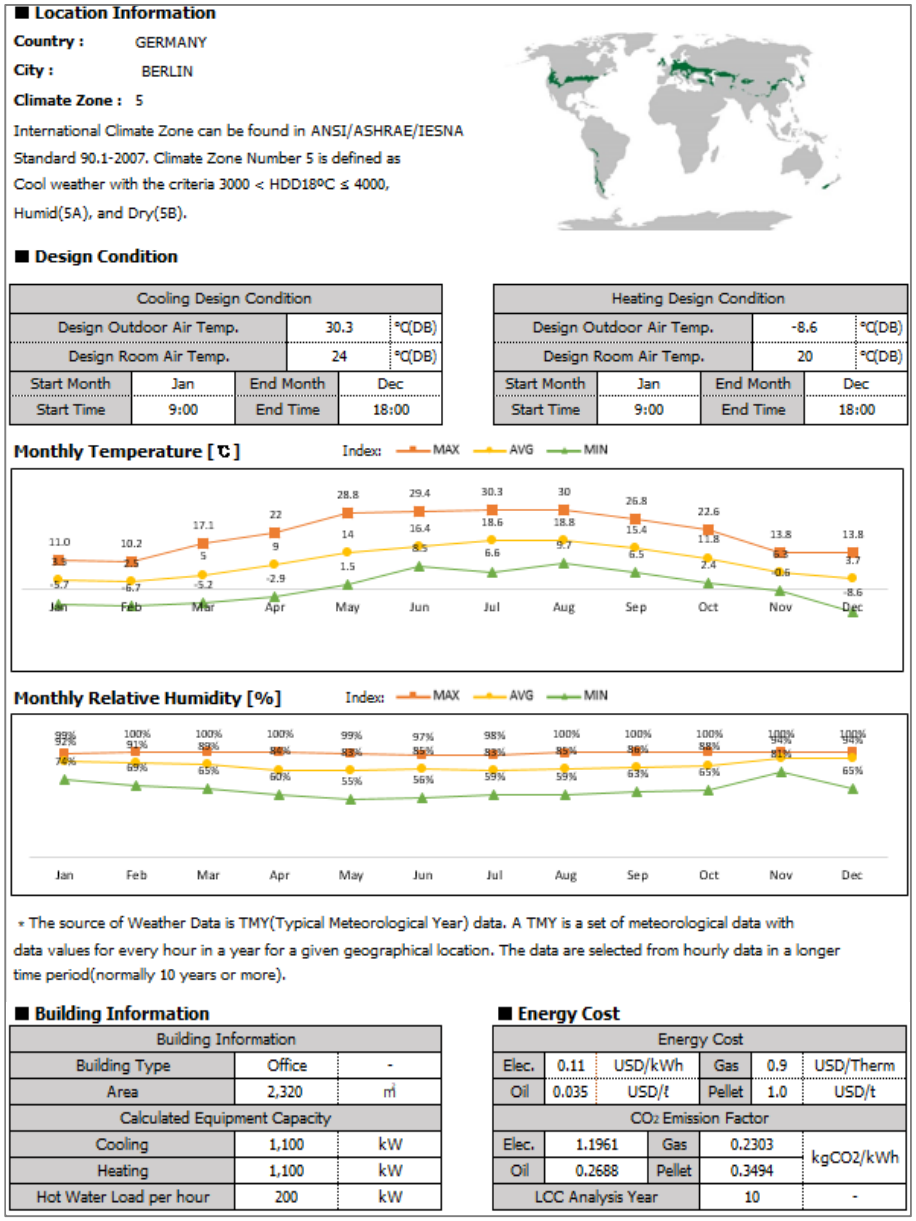
The report can be printed in A4 size and saved in PDF format. The cover page of the report consists of followings:

■ **'Save as PDF'** button is the function to save the report as PDF. The PDF file will be saved in the same folder where operating excel file locates.

■ **Project Information** consists of Date, Project Name, Country, City, Rep'Sales Person Name, and LG Sales Person E-mail. This is inputted value according to the data entered 'Basic Input'.

■ **'Legal Notice'** is very important. Please read the notice message at least once before using the report.



■ **Location Information**

**Country :** GERMANY

**City :** BERLIN

**Climate Zone :** 5

International Climate Zone can be found in ANSI/ASHRAE/IESNA Standard 90.1-2007. Climate Zone Number 5 is defined as Cool weather with the criteria 3000 < HDD18°C ≤ 4000, Humid(5A), and Dry(5B).

■ **Design Condition**

| Cooling Design Condition | | | |
|---|---|---|---|
| Design Outdoor Air Temp. | 30.3 | | ℃(DB) |
| Design Room Air Temp. | 24 | | ℃(DB) |
| Start Month | Jan | End Month | Dec |
| Start Time | 9:00 | End Time | 18:00 |

| Heating Design Condition | | | |
|---|---|---|---|
| Design Outdoor Air Temp. | -8.6 | | ℃(DB) |
| Design Room Air Temp. | 20 | | ℃(DB) |
| Start Month | Jan | End Month | Dec |
| Start Time | 9:00 | End Time | 18:00 |

**Monthly Temperature [℃]** Index: MAX AVG MIN



**Monthly Relative Humidity [%]** Index: MAX AVG MIN



* The source of Weather Data is TMY(Typical Meteorological Year) data. A TMY is a set of meteorological data with data values for every hour in a year for a given geographical location. The data are selected from hourly data in a longer time period(normally 10 years or more).

■ **Building Information**

| Building Information | | |
|---|---|---|
| Building Type | Office | - |
| Area | 2,320 | ㎡ |
| Calculated Equipment Capacity | | |
| Cooling | 1,100 | kW |
| Heating | 1,100 | kW |
| Hot Water Load per hour | 200 | kW |

■ **Energy Cost**

| Energy Cost | | | | | |
|---|---|---|---|---|---|
| Elec. | 0.11 | USD/kWh | Gas | 0.9 | USD/Therm |
| Oil | 0.035 | USD/ℓ | Pellet | 1.0 | USD/t |
| $CO_2$ Emission Factor | | | | | |
| Elec. | 1.1961 | Gas | 0.2303 | | kgCO2/kWh |
| Oil | 0.2688 | Pellet | 0.3494 | | |
| LCC Analysis Year | | | 10 | | - |

■ **Location Information** consists of Country, City, Climate Zone and Climate Zone Specification with Climate zone map, which briefly shows the where is corresponding to that climate zone.

* These climate zones were first adopted in the 2004 IECC Supplement and the ASHRAE 90.1(2004) edition.

■ **Design Conditions** are the same as inputted data. Monthly temperature and Monthly relative humidity graph shows the maximum, minimum and average temperatures and relative humidity per month.

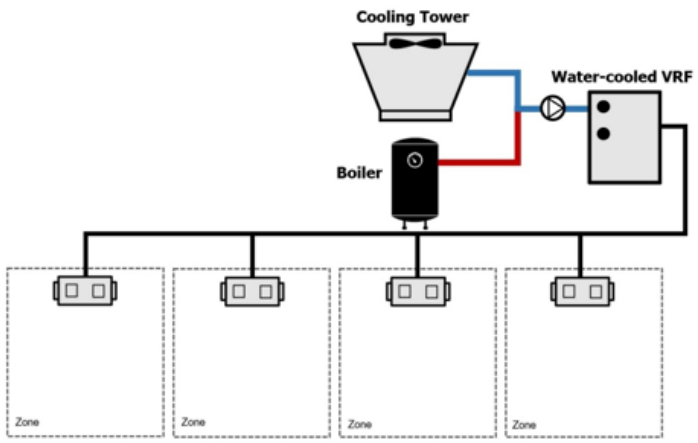
■ **Building Information & Energy Cost** is the same as inputted data. If you wants to change the value, go back to the 'Basic Input'.

■ System Component

| Proposed | Water_cooled VRF |
|---|---|

| | Type | Total Capacity[kW] | Type | Total Capacity[kW] |
|---|---|---|---|---|
| Heat Source | LG Multi V 5 | - | LG Boiler | - |
| | LG Multi V_Pro | - | LG Chiller | - |
| | LG Multi V_Tropical | - | LG Cooling Tower | 1,120 |
| | LG Multi V_Water | 1,120 | | |
| | LG Multi V S | - | | |
| | LG Multi | - | | |
| | LG Single | - | | |
| | LG Single Package | - | | |
| Air Side | 1Way Cassette | - | Wall mounted | - |
| | 2Way Cassette | - | Floor Standing | - |
| | 4Way Cassette | - | Ceiling Suspended | - |
| | Duct_High | 1,120 | Console | - |
| | Duct_Mid | - | AHU | - |
| | Duct_Low | - | FCU | - |
| Ventilation | ERV | - | | |
| | FAU | - | | |
| | DOAS | - | | |

System Diagram




■ **System Component** consists of four pages(Proposed, Alt 1, Alt 2, and Alt 3). The system name selected by the user is displayed, and when multiple models are selected, the representative system is displayed.

■ The table shows selected total capacity of the Heat source, Air side, and Ventilation.

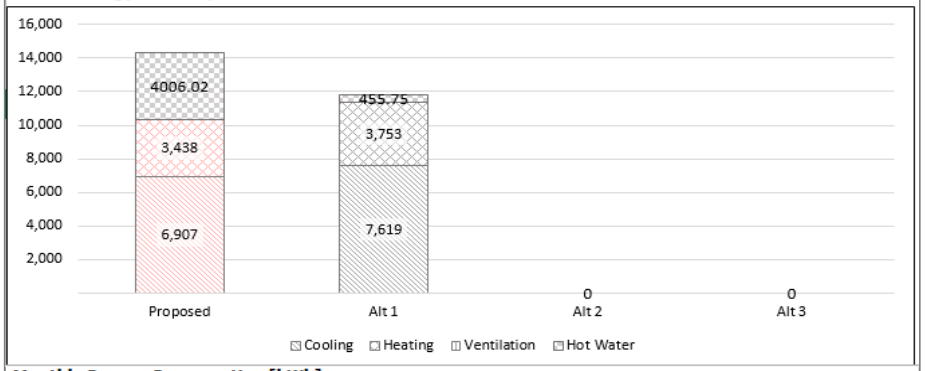
■ **System Diagram** that matches the system name selected by the user is displayed.

* Diagram type consists of air-cooled VRF, water-cooled VRF, VRF_mini, multi split, single split, single package(rooftop), air-cooled chiller and water-cooled chiller.

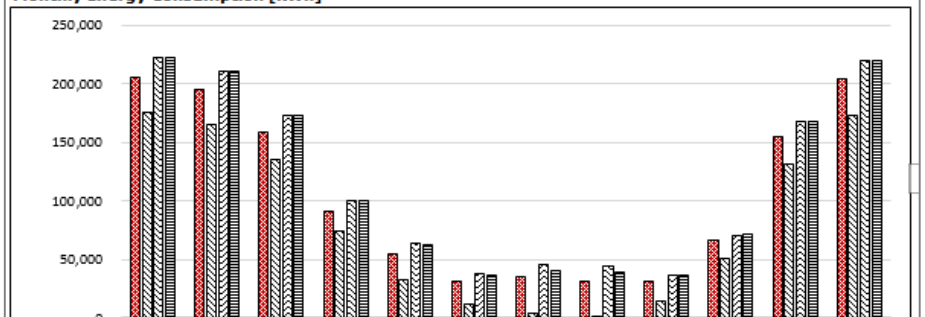
■ **Annual Energy Consumption**

| | | | Proposed | Alt 1 | Alt 2 | Alt 3 |
|---|---|---|---|---|---|---|
| System Type | | Unit | Air_cooled VRF | Air_cooled VRF | | |
| Cooling | Electricity | kwh | 6,907 | 7,619 | - | - |
| Heating | Electricity | kwh | 3,438 | 3,753 | - | - |
| | Gas | kwh | | | | |
| Ventilation | Electricity | kwh | | | - | - |
| | Gas | kwh | | | | |
| Hot Water | Electricity | kwh | 4,006 | | | |
| | Gas | kwh | - | 456 | - | - |
| Total | Electricity | kwh | 14,351 | 11,372 | | |
| | Gas | kwh | | 456 | | |

**Annual Energy Consumption [kWh]**




**Monthly Energy Consumption [kWh]**




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Proposed | 205,480 | 194,542 | 159,297 | 91,825 | 54,913 | 31,584 | 35,359 | 31,783 | 31,436 | 66,112 | 154,687 | 203,628 |
| Alt 1 | 174,981 | 165,710 | 134,806 | 73,743 | 32,822 | 11,722 | 3,836 | 1,812 | 14,706 | 51,152 | 131,502 | 172,636 |
| Alt 2 | 222,021 | 210,050 | 172,441 | 100,701 | 63,600 | 38,054 | 46,054 | 44,402 | 36,811 | 70,946 | 168,074 | 219,156 |
| Alt 3 | 222,021 | 210,050 | 172,665 | 100,829 | 62,486 | 37,270 | 40,895 | 38,989 | 37,231 | 72,261 | 168,074 | 219,156 |

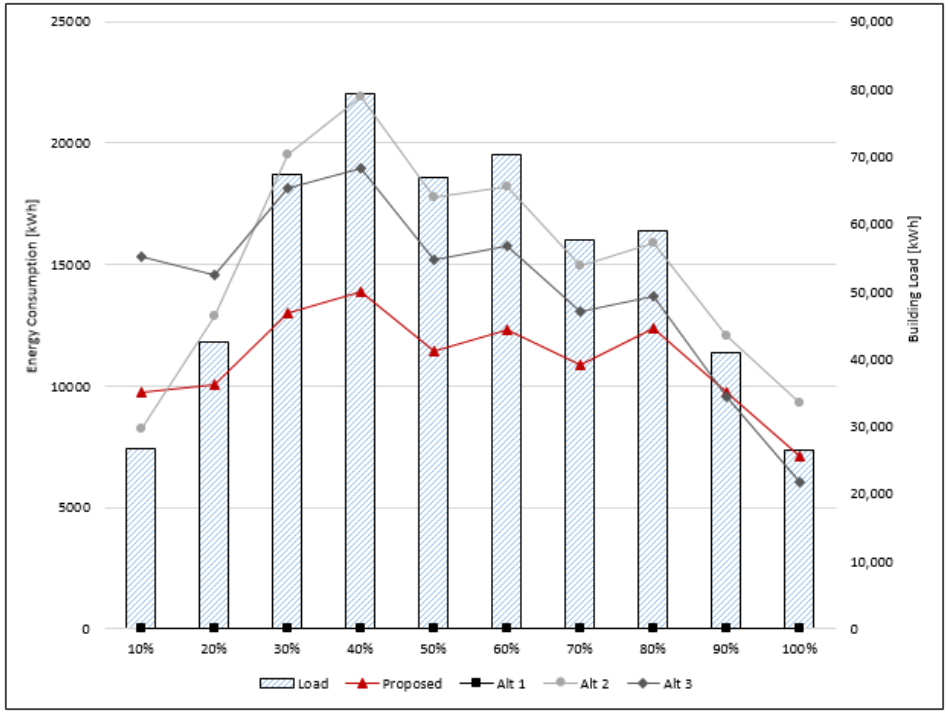
■ **Annual energy consumption** shows System Type, Cooling, Heating(electricity, gas), Ventilation(electricity, gas), Hot water(electricity, gas) energy each Proposed and Baselines. Energy unit is 'kwh'.

■ Below the graph shows the figures in the table for easy understanding. The graph of the red color is proposed system.

■ The graph and table at the bottom are expressed as **monthly energy consumption** to determine which season uses the most energy.

**Cooling Energy Consumption at Partial condition [kWh]**

| Building Load | | OA Temp | Occurence | Total Load | Proposed | | Alt 1 | | Alt 2 | | Alt 3 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| % | kW | ℃ | hours | kWh | kWh | EER | kWh | EER | kWh | EER | kWh | EER |
| 10 | 106 | 16.7 | 253 | 26,692 | 9,718 | 2.7 | 0 | 0.0 | 8,262 | 3.2 | 15,340 | 1.7 |
| 20 | 211 | 18.1 | 202 | 42,622 | 10,073 | 4.2 | 0 | 0.0 | 12,891 | 3.3 | 14,576 | 2.9 |
| 30 | 317 | 19.6 | 213 | 67,415 | 12,999 | 5.2 | 0 | 0.0 | 19,542 | 3.4 | 18,164 | 3.7 |
| 40 | 422 | 21.0 | 188 | 79,336 | 13,892 | 5.7 | 0 | 0.0 | 21,927 | 3.6 | 18,956 | 4.2 |
| 50 | 528 | 22.4 | 127 | 66,993 | 11,420 | 5.9 | 0 | 0.0 | 17,770 | 3.8 | 15,176 | 4.4 |
| 60 | 633 | 23.9 | 111 | 70,263 | 12,305 | 5.7 | 0 | 0.0 | 18,181 | 3.9 | 15,742 | 4.5 |
| 70 | 739 | 25.3 | 78 | 57,603 | 10,842 | 5.3 | 0 | 0.0 | 14,919 | 3.9 | 13,086 | 4.4 |
| 80 | 844 | 26.7 | 70 | 59,080 | 12,400 | 4.8 | 0 | 0.0 | 15,891 | 3.7 | 13,715 | 4.3 |
| 90 | 950 | 28.2 | 43 | 40,829 | 9,763 | 4.2 | 0 | 0.0 | 12,038 | 3.4 | 9,564 | 4.3 |
| 100 | 1,055 | 29.6 | 25 | 26,375 | 7,112 | 3.7 | 0 | 0.0 | 9,307 | 2.8 | 6,025 | 4.4 |
| Total | | | 1,310 | 537,206 | 110,524 | 4.9 | 0 | ### | 150,728 | 3.6 | 140,344 | 3.8 |



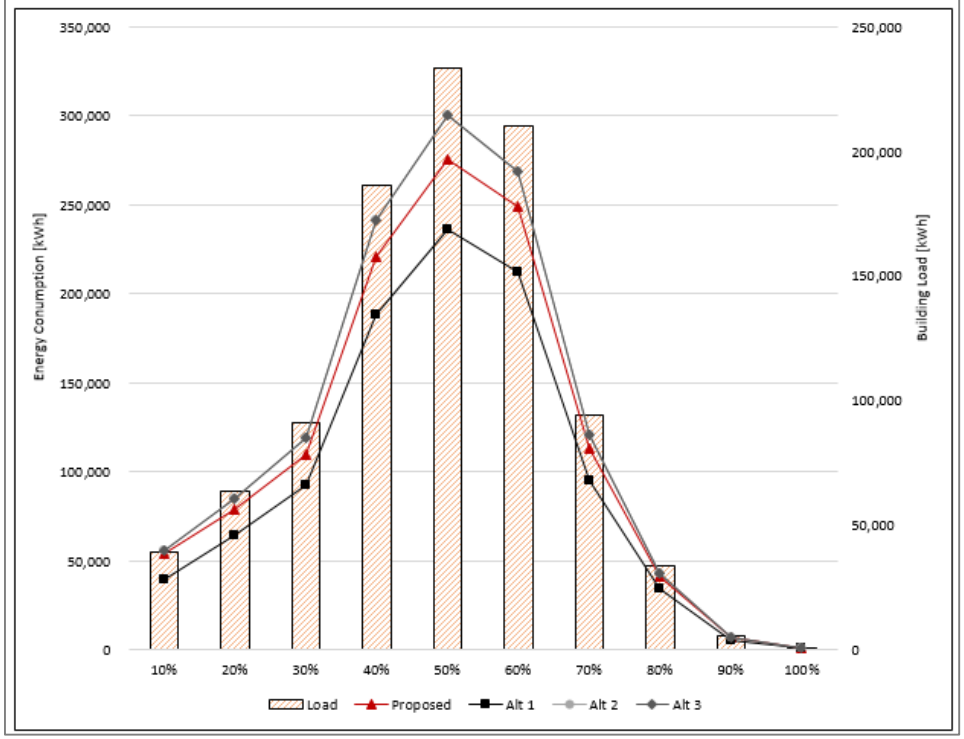

■ **Cooling energy consumption at partial condition** table shows building load, outdoor air temperature, occurrence, total load, energy consumption, and EER at partial condition.

■ Below the graph is energy consumption and building load graph. It is easy to see which partial load condition is dominant in the selected city and design conditions.

- Bar Graph : Building Load [kWh],
- Line Graph : Energy consumption[kWh]

**Cooling Energy Consumption at Partial condition [kWh]**

| Building Load | | OA Temp | Occurence | Total Load | Proposed | | Alt 1 | | Alt 2 | | Alt 3 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| % | kW | ℃ | hours | kWh | kWh | EER | kWh | EER | kWh | EER | kWh | EER |
| 10 | 106 | 14.8 | 373 | 39,352 | 53,806 | 0.7 | 39,749 | 1.0 | 55,829 | 0.7 | 55,829 | 0.7 |
| 20 | 211 | 12.3 | 301 | 63,511 | 78,893 | 0.8 | 64,153 | 1.0 | 84,747 | 0.7 | 84,747 | 0.7 |
| 30 | 317 | 9.9 | 289 | 91,469 | 109,717 | 0.8 | 92,393 | 1.0 | 119,481 | 0.8 | 119,481 | 0.8 |
| 40 | 422 | 7.4 | 442 | 186,524 | 220,545 | 0.8 | 188,409 | 1.0 | 241,023 | 0.8 | 241,023 | 0.8 |
| 50 | 528 | 4.9 | 443 | 233,683 | 275,380 | 0.8 | 236,043 | 1.0 | 299,989 | 0.8 | 299,989 | 0.8 |
| 60 | 633 | 2.5 | 332 | 210,156 | 248,813 | 0.8 | 212,279 | 1.0 | 268,605 | 0.8 | 268,605 | 0.8 |
| 70 | 739 | 0.0 | 128 | 94,528 | 113,259 | 0.8 | 95,483 | 1.0 | 120,439 | 0.8 | 120,439 | 0.8 |
| 80 | 844 | -2.5 | 40 | 33,760 | 41,230 | 0.8 | 34,102 | 1.0 | 42,912 | 0.8 | 42,912 | 0.8 |
| 90 | 950 | -4.9 | 6 | 5,697 | 7,134 | 0.8 | 5,755 | 1.0 | 7,228 | 0.8 | 7,228 | 0.8 |
| 100 | 1,055 | -7.4 | 1 | 1,055 | 1,356 | 0.8 | 1,066 | 1.0 | 1,337 | 0.8 | 1,337 | 0.8 |
| Total | | | 2,355 | 959,734 | 1,150,131 | 0.8 | 969,432 | 1.0 | 1,241,590 | 0.8 | 1,241,590 | 0.8 |




■ **Heating energy consumption at partial condition** table shows building load, outdoor air temperature, occurrence, total load, energy consumption, and EER at partial condition.

Energy consumption of heating includes electricity consumption and gas consumption by converting energy consumption from different unit to kWh unit.

■ Below the graph is energy consumption and building load graph. It is easy to see which partial load condition is dominant in the selected city and design conditions.

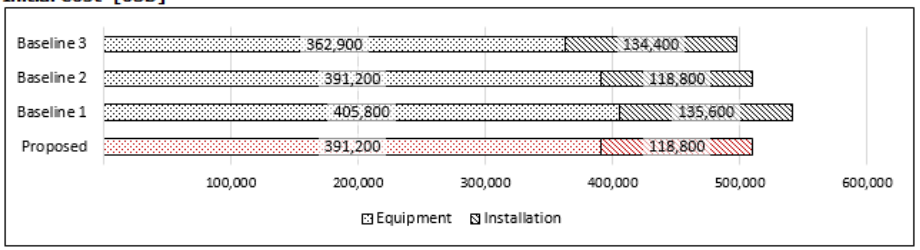
- Bar Graph : Building Load [kWh],
- Line Graph : Energy consumption[kWh]

■ **Life Cycle Cost Analysis**

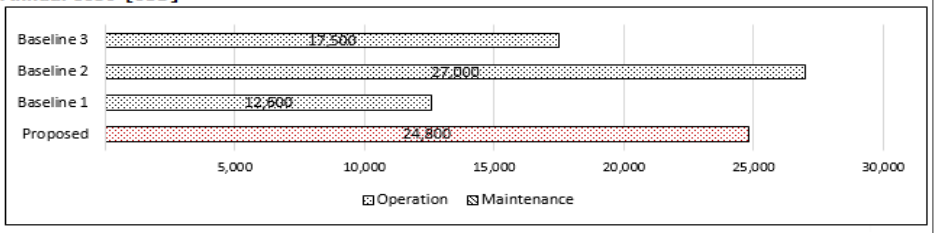
Life Cycle Cost can be divided into Initial, Operation, and Maintenance cost. Unit : USD

| | | Proposed | Baseline 1 | Baseline 2 | Baseline 3 |
|---|---|---|---|---|---|
| System Type | | Air_cooled VRF | Water_cooled VRF | Air_cooled VRF | Air_cooled Chiller |
| Initial Cost | Equipment | 391,200 | 405,800 | 391,200 | 362,900 |
| | Installation | 118,800 | 135,600 | 118,800 | 134,400 |
| | Total | 510,000 | 541,400 | 510,000 | 497,300 |
| Cost Difference Ratio | | 100% | 106% | 100% | 98% |
| Operation, Maintenance | Operation | 24,800 | 12,600 | 27,000 | 17,500 |
| | Maintenance | | | | |
| | Total | 24,800 | 12,600 | 27,000 | 17,500 |
| Cost Difference Ratio | | 100% | 51% | 109% | 71% |
| 10 Years Life cycle Cost | | 758,000 | 667,400 | 780,000 | 672,300 |
| Cost Difference Ratio | | 100% | 88% | 103% | 89% |

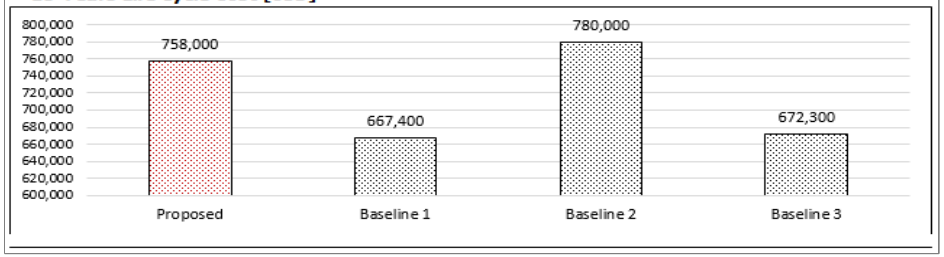
**Initial Cost [USD]**




**Annual Cost [USD]**




**10 Years Life cycle Cost [USD]**




■ **Life cycle cost analysis** consists of Initial cost and Operation & Maintenance cost. Additionally, it contains System type, Cost difference ratio based on proposed cost and 10, 15, or 20 years life cycle cost that users selected.

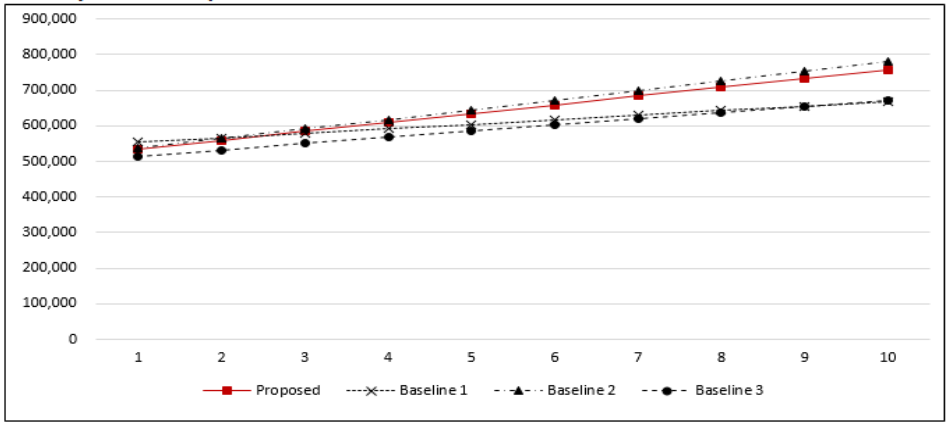
■ Below graphs are Initial cost and Annual cost. The red of the graph is the proposed system. Initial cost is divided into equipment and installation cost. Annual cost consists of operation and maintenance cost.

■ **10, 15, or 20 years life cycle cost** represents the cumulative amount after that years. Red color graph shows that proposed system.

■ **Payback Year**

| Based on Systems | Baseline 1 | Baseline 2 | Baseline 3 |
|---|---|---|---|
| Payback | 2Years 7Months | - | - |

■ **Life Cycle Cost Comparison [USD]**




| LCC Year | Commulated Total Cost | | | |
|---|---|---|---|---|
| | Proposed | Baseline 1 | Baseline 2 | Baseline 3 |
| 1 | 534,800 | 554,000 | 537,000 | 514,800 |
| 2 | 559,600 | 566,600 | 564,000 | 532,300 |
| 3 | 584,400 | 579,200 | 591,000 | 549,800 |
| 4 | 609,200 | 591,800 | 618,000 | 567,300 |
| 5 | 634,000 | 604,400 | 645,000 | 584,800 |
| 6 | 658,800 | 617,000 | 672,000 | 602,300 |
| 7 | 683,600 | 629,600 | 699,000 | 619,800 |
| 8 | 708,400 | 642,200 | 726,000 | 637,300 |
| 9 | 733,200 | 654,800 | 753,000 | 654,800 |
| 10 | 758,000 | 667,400 | 780,000 | 672,300 |
| 11 | - | - | - | - |
| 12 | - | - | - | - |
| 13 | - | - | - | - |
| 14 | - | - | - | - |
| 15 | - | - | - | - |
| 16 | - | - | - | - |
| 17 | - | - | - | - |
| 18 | - | - | - | - |
| 19 | - | - | - | - |
| 20 | - | - | - | - |

■ **10 Years Total CO2 Emission[kgCO2].**

| Item | Unit | Proposed | Baseline 1 | Baseline 2 | Baseline 3 |
|---|---|---|---|---|---|
| Emission of CO2 | kgCO2 | 255,085 | 396,554 | 294,542 | 405,598 |

■ **Payback Year** shows that payback year based on system Baseline 1, Baseline 2, and Baseline 3. Plus, users can see the payback period with each cumulative amount graph. If a payback year occurs, the payback year will be listed on the above table. Otherwise, payback year expressed as '-'.

■ **Life cycle cost comparison** shows comparison of the cumulative amount at each year. If you want to see graph in detail, please see the next page.

■ **CO2 emissions** show annual emission of CO2. Below graph is total CO2 emission at the end of 10, 15, or 20 years. Red color graph shows proposed system.

■ Reference

**1. Weather Data :**
The source of Weather data is TMY(Typical Meteorological Year) data. The weather data that LATS LCC uses are Typical Meteorological Year(TMY) data.
TMYs contain one year of hourly data that best represent weather conditions over multiple years period.
In order to apply a variety of time period, TMY data are used in energy simulation field since they represent typical rather than extreme conditions.
In other words, TMY data are not the same as a certain year's weather data.

**2. Climate zone:**
The eight zones are hot-humid, hot-dry, mixed-dry, mixed-humid, marine, cold, very cold, and subarctic.
These climate zones were first adopted in the 2004 IECC Supplement and the ASHRAE 90.1(2004) edition.

**3. CO2 Emission Factors are derived from following references:**
1) Carbon Footprint - Country specific electricity grid greenhouse gas emission factors(2019)
2) Technical Paper - Electricity-spcific emission factors for grid electricity(2011)

**4. Calculation of the Energy consumption :**
LATS LCC calculates energy consumptions based on whole year's hourly data, 8760 hours, of each selected city's weather data. Thus, the reult will be different from each city even users type in the same values.

**5. Chilled-Water Pump :**
Methodology of Chilled-water pump power is derived from the Chilled-Water Pumps-G3.1.3.10-ASHRAE 90.1(2010).
Chilled-water pump power is calculated by 349 kW/1,000 L/s, and pump type is contant flow.

**6. Condenser-Water Pump :**
Methodology of Condenser-water pump power is derived from the Heat Rejection(System 7 and 8)-G3.1.3.11-ASHRAE 90.1(2010).
Condenser-water pump power is calculated by 301 kW/1,000 L/s, and pump type is variable flow.

**7. Cooling Tower :**
Performance or fan power input of cooling tower is derived from TABLE 6.8.1G-ASHRAE 90.1(2010), which value is 3.23L/s.kW.
Cooling tower equipment type is propeller or axial fan open-circuit cooling towers.

**8. Hot Water Pumps :**
Hot water pump power is derived from Hot Water Pumps-G3.1.3.5-ASHRAE 90.1(2010).
Hot-water pump power is calculated by 301 kW/1000 L/s, and pump type is contant flow.

**9. Simple Mode - System EER & COP :**
Simpe mode provides default values of EER & COP according to the type of each system.
These default EER & COPs are calculated by average value of single unit model of LG's EU line-up. EER & COPs of the competitor's model are assumed the same as those of the LG model.
Additionally, EER of the Single Package is derived from heat pump model, and EER of rooftop is assumed the same as that of Single Package. The EER of the Single Split(Constant) model was assumed as 3.

While using the program, users can see the how LCC tool calculates energy consumption or where the default values are derived from.

■ **Reference** shows the summary of the source of the data referenced for calculation in the program and the values used as default values.


②

| A | B | C | D | E | F | G | ③ H | I | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | dd | tt | BELEMDB | BELEMWB | BRASILIAC | BRASILIAV | RECIFEDB | RECIFEWB | SAO PAULI | SAO PAULOWB | | | |
| 1 | 1 | 1 | 24.1 | 23.6826 | 19.200001 | 18.6307 | 25.9 | 24.81969 | 17 | 16.4405 | | | |
| 1 | 1 | 2 | 24.299999 | 23.8804 | 18.799999 | 18.3016 | 25.6 | 24.6011 | 16.6 | 16.1067 | | | |
| 1 | 1 | 3 | 24.299999 | 23.9178 | 18.299999 | 17.9371 | 25.4 | 24.47949 | 16.299999 | 15.8409 | | | |
| 1 | 1 | 4 | 24.200001 | 23.8189 | 17.9 | 17.6376 | 25.1 | 24.2598 | 16.1 | 15.6733 | | | |
| 1 | 1 | 5 | 24 | 23.6582 | 17.5 | 17.337 | 24.799999 | 24.0762 | 16 | 15.5746 | | | |
| 1 | 1 | 6 | 23.799999 | 23.46 | 17.299999 | 17.2024 | 24.4 | 23.7936 | 15.9 | 15.476 | | | |
| 1 | 1 | 7 | 24 | 24 | 18 | 17.6723 | 26 | 24.8436 | 17 | 16.3808 | | | |
| 1 | 1 | 8 | 25 | 24.6107 | 20 | 19.3184 | 29 | 26.63099 | 18.5 | 17.399 | | | |
| 1 | 1 | 9 | 27.4 | 26.23889 | 20 | 18.99729 | 30.700001 | 27.5157 | 20 | 18.4602 | | | |
| 1 | 1 | 10 | 28 | 26.4052 | 25 | 22.5004 | 32 | 28.0273 | 22 | 19.717 | | | |
| 1 | 1 | 11 | 29 | 26.991 | 27 | 23.142 | 33 | 28.9287 | 23 | 20.9479 | | | |
| 1 | 1 | 12 | 30.4 | 27.8372 | 29.5 | 25.2277 | 33 | 28.5962 | 24.200001 | 21.41539 | | | |
| 1 | 1 | 13 | 30 | 27.9403 | 30 | 25.2331 | 33 | 28.5962 | 24 | 21.583 | | | |
| 1 | 1 | 14 | 29 | 27.36449 | 21 | 19.9678 | 32 | 28.712 | 23 | 21.2575 | | | |
| 1 | 1 | 15 | 29.6 | 27.5979 | 21.6 | 20.48429 | 32 | 28.36329 | 22.200001 | 20.5896 | | | |
| 1 | 1 | 16 | 28 | 26.4052 | 25 | 23.148 | 31 | 27.79189 | 22 | 20.3062 | | | |
| 1 | 1 | 17 | 27 | 25.8132 | 27 | 23.4293 | 31 | 27.79189 | 21 | 19.6581 | ④ | | |
| 1 | 1 | 18 | 26.6 | 25.9576 | 26.6 | 23.0388 | 29 | 26.7019 | 20.1 | 18.9145 | | | |
| 1 | 1 | 19 | 26 | 25.21509 | 25 | 22.5004 | 28 | 26.0414 | 20 | 19.00349 | | | |
| 1 | 1 | 20 | 26 | 25.21509 | 24 | 21.8769 | 28 | 26.0414 | 19 | 18.3422 | | | |
| 1 | 1 | 21 | 26 | 25.4445 | 23.200001 | 21.4053 | 27.700001 | 25.8275 | 19 | 18.4057 | | | |
| 1 | 1 | 22 | 26 | 25.21509 | 23 | 21.5711 | 28 | 26.0414 | 19 | 18.4057 | | | |
| 1 | 1 | 23 | 26 | 25.21509 | 21 | 20.2986 | 28 | 26.0414 | 19 | 18.3739 | | | |
| 1 | 1 | 24 | 25.200001 | 24.8471 | 18.799999 | 18.39899 | 27.5 | 25.8525 | 19 | 18.3422 | | | |
| 1 | 2 | 1 | 25 | 24.6107 | 19 | 18.6625 | 27 | 25.4456 | 19 | 18.3422 | | | |
| 1 | 2 | 2 | 25 | 24.6107 | 18 | 18 | 27 | 25.0916 | 19 | 18.3422 | | | |
| 1 | 2 | 3 | 25 | 24.6107 | 18.200001 | 18.0007 | 26.5 | 24.9303 | 18.299999 | 17.6868 | | | |
| 1 | 2 | 4 | 24 | 24 | 18 | 17.6723 | 26 | 24.4859 | 18 | 17.3616 | | | |
| 1 | 2 | 5 | 24 | 24 | 18 | 18 | 25 | 24.2354 | 19 | 18.3422 | | | |
| 1 | 2 | 6 | 23.799999 | 23.6097 | 19 | 18.7289 | 25 | 24.6106 | 18.9 | 18.2757 | | | |
| 1 | 2 | 7 | 24 | 23.6209 | 19 | 19 | 26 | 25.215 | 18.9 | 18.4355 | | | |
| 1 | 2 | 8 | 26 | 25.6004 | 20 | 19.65259 | 27 | 25.3737 | 19 | 18.6646 | | | |
| 1 | 2 | 9 | 26.799999 | 26.0762 | 21.6 | 20.7842 | 28 | 25.691 | 20.1 | 19.5523 | | | |
| 1 | 2 | 10 | 29 | 27.36449 | 24.299999 | 22.3844 | 31 | 27.4523 | 20.5 | 19.8791 | | | |
| 1 | 2 | 11 | 30 | 27.9403 | 27 | 23.4293 | 31 | 26.8107 | 21 | 20.3028 | | | |
| 1 | 2 | 12 | 31.5 | 28.7929 | 27.799999 | 24.273 | ① 32 | 28.0273 | 21 | 20.3028 | | | |
| 1 | 2 | 13 | 32 | 29.0741 | 27 | 23.72829 | 33 | 28.9287 | 20 | 19.6547 | | | |

... ARGENTINA | NICARAGUA | MEXICO | GUATEMALA | ECUADOR | DOMINICAN REPUBLIC | COSTA RICA | COLOMBIA | BRAZIL | CHILE

If there is no weather data for the city you want, you can add to the weather data as shown below.
If you want to add weather data, you need dry bulb temperature and wet bulb temperature data.

You can check that the that the weather data is at the location where the LCC Tool is installed.
If you open the weather data file, you can see that there are weather data for each country and city as shown on the left.

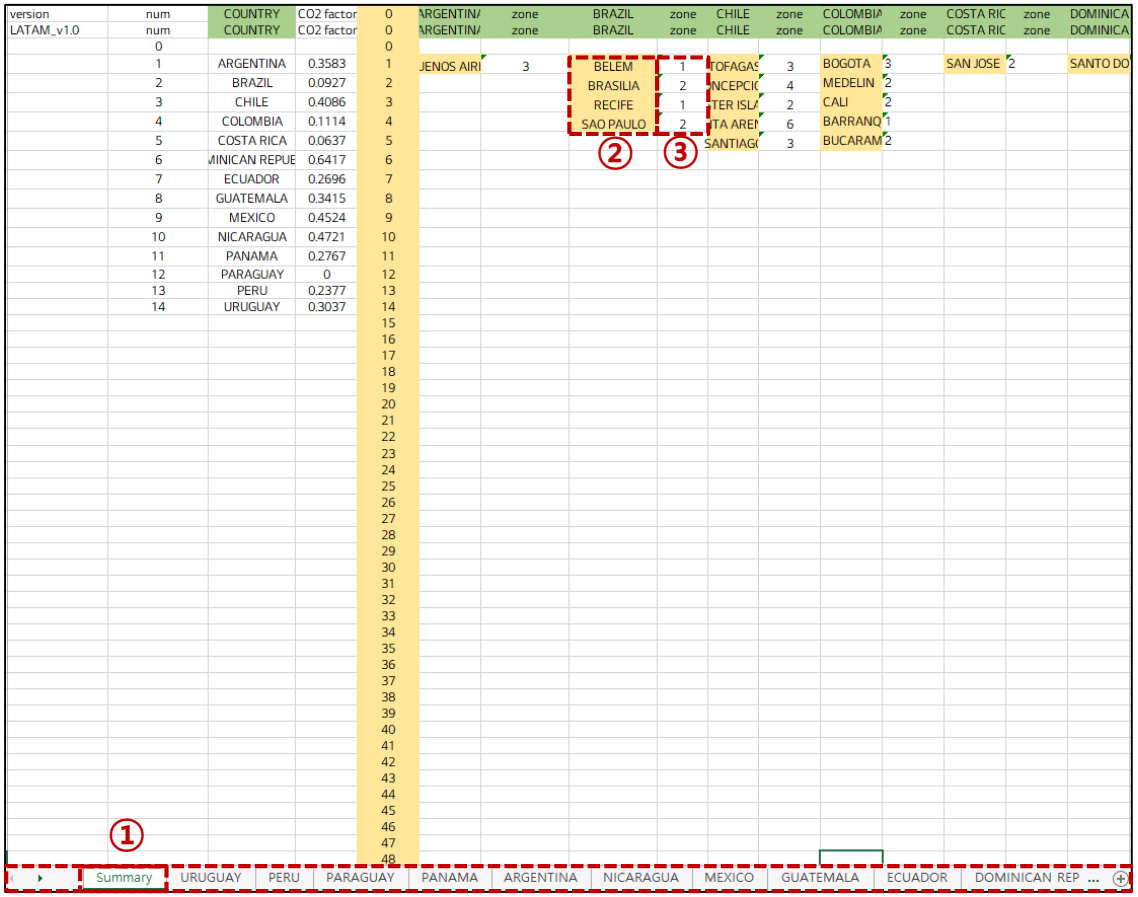
**Caution!**
You should not change the structure of your Excel data. When changing, an error occurs in the tool, so do not change the structure.
Please do not change weather data file name.

① Please click on the desired country at the bottom.

② Columns A, B and C should not be modified with the values entered to list 8760 hours of data.

③ **Please enter "DB" and "WB" after the city name** you want to enter in the same format as the city name above.

④ After that, **you can enter 8760 hours of data.**




① Among the sheets below, change the hidden **"Summary"** sheet to unhidden.

② If you have **added a city** afterwards, please enter the city name in capital letters at the bottom of the country.

③ You must **enter the zone of the city** you entered. If you don't know the zone, you can enter the same zone as the zone in a city with a similar weather zone in your country.

Please be sure to **save** after entering all values.

**Caution!**
You should not change the structure of your Excel data. When changing, an error occurs in the tool, so do not change the structure.


| | |
|---|---|
| **Location** | Panama (Panama city) |
| **Climate Zone** | Zone 1 |
| **Use** | Shopping Mall |
| **Gross Area** | 3,800 ㎡ |
| **Scale** | 7 floors |
| **Proposed System** | Single Package (20RT × 30ea) |
| **Baseline System** | Rooftop (20RT × 30ea) |

## Analysis Conditions

1. Proposed : LG Single Package(Cooling Only)
2. Baseline : Rooftop(Cooling Only)
3. Total Equipment Capacity : 725 HP
4. Maximum Cooling Load : 580 RT
5. Operating Mode : Cooling
6. Daily Operating Time : 11 Hours (9AM~ 20PM)
7. Operating Month : Jan. ~ Dec.
8. Yearly Operating Time : 12 Months / Year (Total 4,378 hours / year)

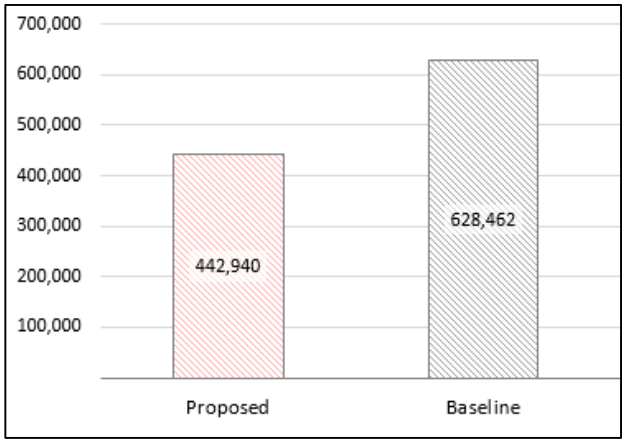
## HVAC Systems

| | **Baseline** | **Proposed** |
|---|---|---|
| | **Rooftop (20RT)** | **Single Package (20RT)** |
| **Cooling(Btu/h)** | 10.0 EER / 12 IEER | 12.2 EER / 19 IEER |
| **Heating** | None | None |
| **Air handler** | 8,000 CFM, 7.5 hp | 8,000 CFM, 5.0hp |

| Proposed | Single Package(Cooling Only) |
|---|---|
| Baseline | Rooftop(Cooling Only) |

## ■ Energy Comparison

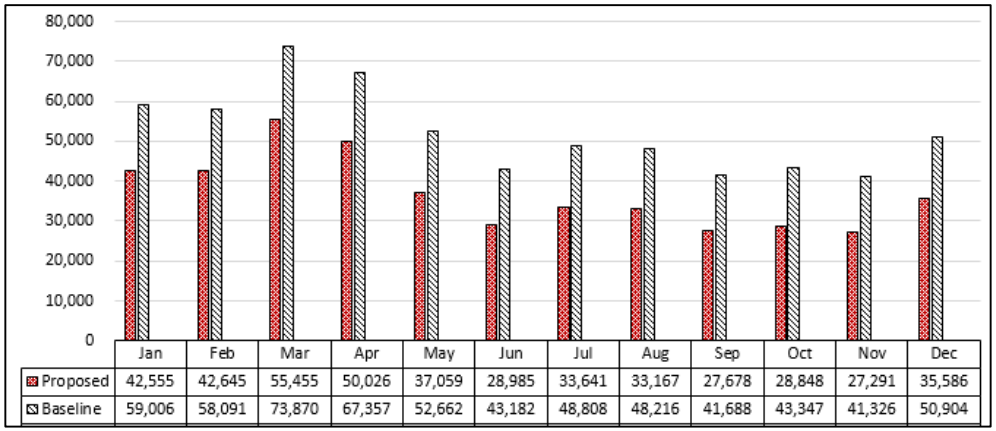
### ① Annual Energy Consumption [kWh]




| Proposed | 442,940 |
|---|---|
| Baseline | 628,462 |

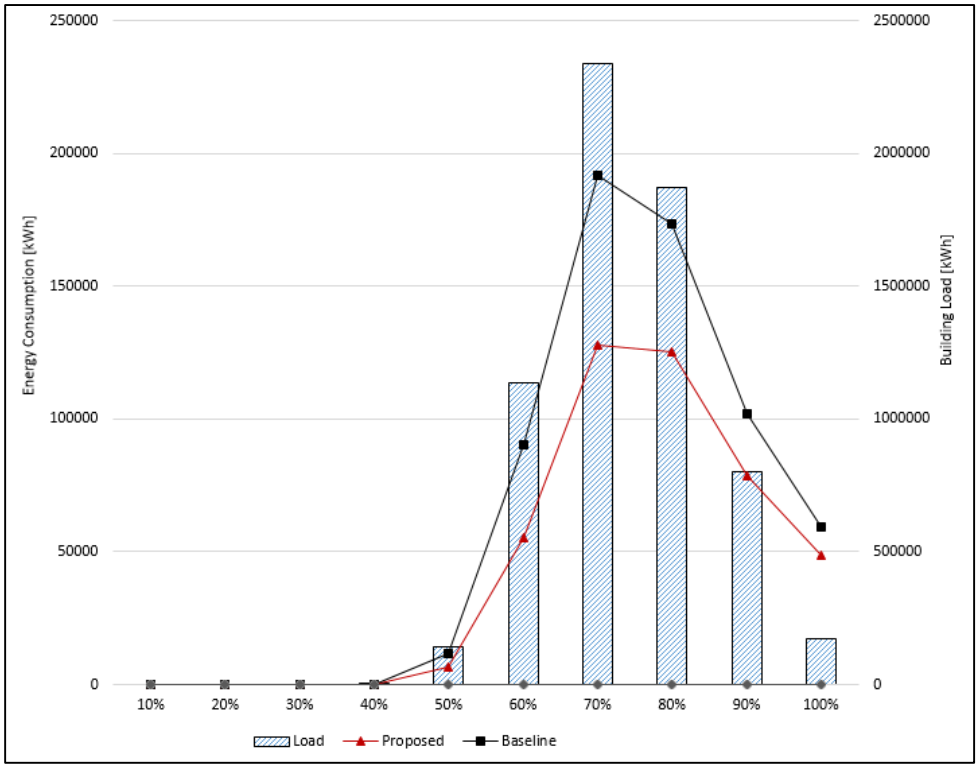
**Annual Energy Savings : 30%**

### ② Monthly Energy Consumption [kWh]




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Proposed | 42,555 | 42,645 | 55,455 | 50,026 | 37,059 | 28,985 | 33,641 | 33,167 | 27,678 | 28,848 | 27,291 | 35,586 |
| Baseline | 59,006 | 58,091 | 73,870 | 67,357 | 52,662 | 43,182 | 48,808 | 48,216 | 41,688 | 43,347 | 41,326 | 50,904 |

### ③ Cooling Energy Consumption at Partial condition [kWh]






LG Business Solutions

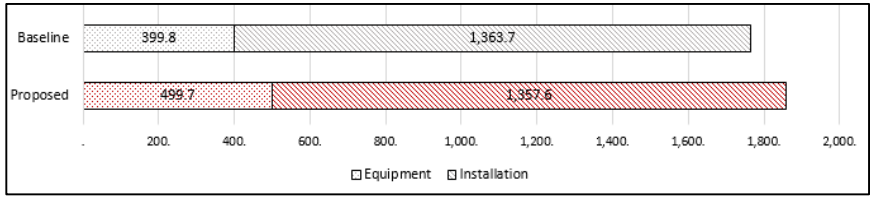
| Proposed | Single Package(Cooling Only) |
|---|---|
| Baseline | Rooftop(Cooling Only) |

## ■ Life Cycle Cost(LCC) Comparison

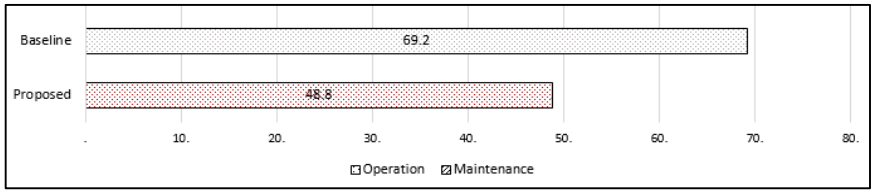
### ① Life Cycle Cost(LCC) Analysis [USD×1,000]

| | | Proposed | Baseline |
|---|---|---|---|
| System Type | | S.Package(Rooftop) | S.Package(Rooftop) |
| Initial Cost | Equipment | 499.7 | 399.8 |
| | Installation | 1,357.6 | 1,363.7 |
| | Total | 1,857.3 | 1,763.5 |
| Cost Difference Ratio | | 100% | 95% |
| Operation, Maintenance | Operation | 48.8 | 69.2 |
| | Maintenance | . | . |
| | Total | 48.8 | 69.2 |
| Cost Difference Ratio | | 100% | 142% |
| 15 Years Life cycle Cost | | 2,589.3 | 2,801.5 |
| Cost Difference Ratio | | 100% | 108% |

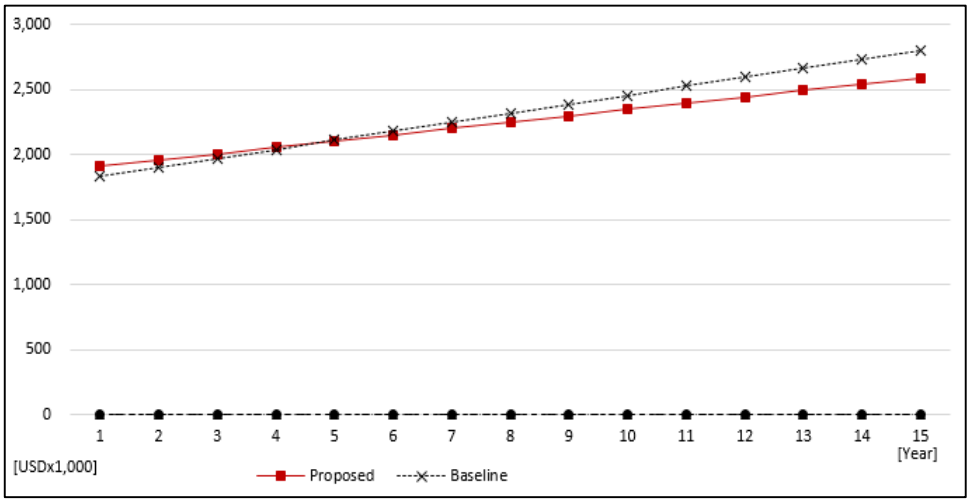
- Initial Cost [USD×1,000]



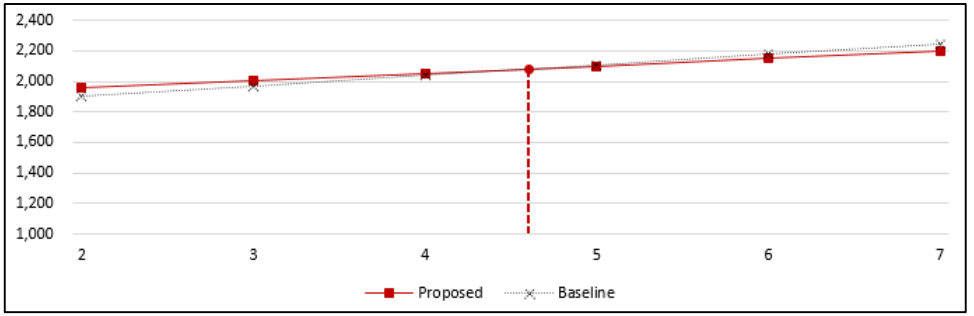

- Annual Cost [USD×1,000]




### ② 15 Years Life Cycle Cost [USD×1,000]




### ③ Payback Year




**Payback Year : 4Years 8 Months**

| | |
|---|---|
| **Location** | Saudi Arabia (Arar) |
| **Climate Zone** | Zone 1 |
| **Use** | Office |
| **Gross Area** | 62,100 ㎡ |
| **Scale** | 8 floors |
| **Proposed System** | LG Multi V 5(140kW × 58ea)<br>+ IDU(High Static Duct) |
| **Baseline System** | Air cooled VRF(140kW × 58ea)<br>+ IDU (High Static Duct) |

## Analysis Condition

1. Proposed : LG Multi V 5 + Indoor unit
2. Baseline : Air-cooled VRF + Indoor unit
3. Total Equipment Capacity : 2,890 HP
4. Maximum Cooling Load : 8,000 kW
5. Operating Mode : Cooling
6. Daily Operating Time : 11 Hours (9AM~ 20PM)
7. Operating Month : Jan. ~ Dec.
8. Yearly Operating Time : 12 Months / Year (Total 6,570 hours / year)

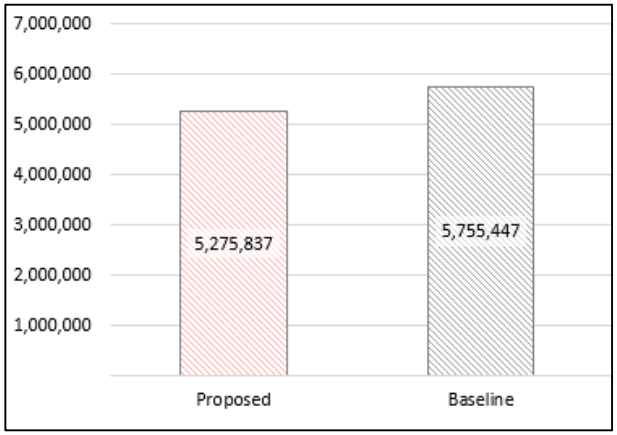
## HVAC Systems

| | **Baseline** | **Proposed** |
|---|---|---|
| | **Air-cooled VRF (140kW)** | **LG Multi V 5 (140kW)** |
| **Cooling** | 3.59 EER | 3.59 EER |
| **Heating** | None | None |
| **Air handler** | High Static Duct(15.8kW) | High Static Duct(15.8kW) |

| Proposed | LG Multi V 5 |
|---|---|
| Baseline | Air-cooled VRF |

## ■ Energy Comparison

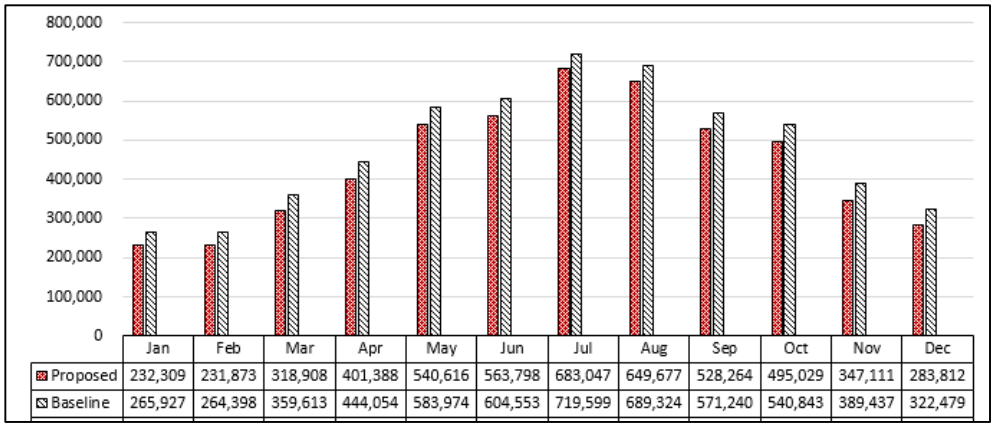
### ① Annual Energy Consumption [kWh]




| Proposed | 5,275,837 |
|---|---|
| Baseline | 5,755,447 |

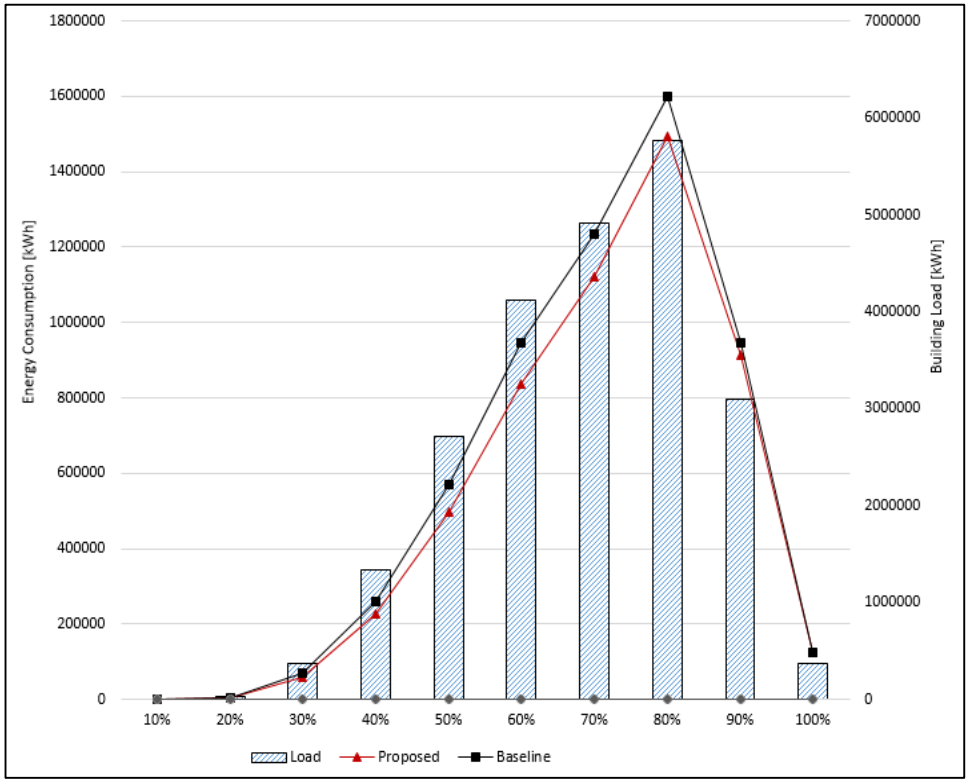
**Annual Energy Savings : 8%**

### ② Monthly Energy Consumption [kWh]




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Proposed | 232,309 | 231,873 | 318,908 | 401,388 | 540,616 | 563,798 | 683,047 | 649,677 | 528,264 | 495,029 | 347,111 | 283,812 |
| Baseline | 265,927 | 264,398 | 359,613 | 444,054 | 583,974 | 604,553 | 719,599 | 689,324 | 571,240 | 540,843 | 389,437 | 322,479 |

### ③ Cooling Energy Consumption at Partial condition [kWh]






LG Business Solutions

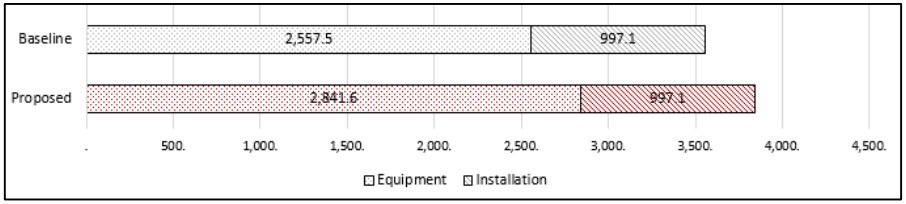
| Proposed | LG Multi V 5 |
|---|---|
| Baseline | Air-cooled VRF |

## ■ Life Cycle Cost(LCC) Comparison

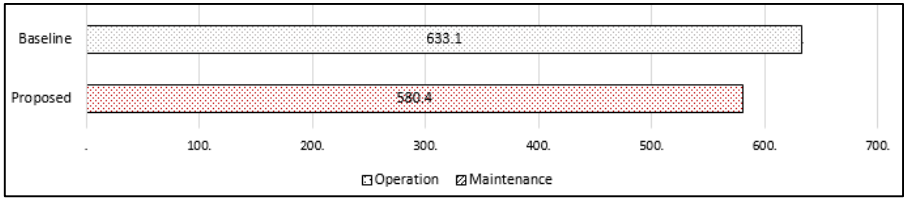
### ① Life Cycle Cost(LCC) Analysis [USD×1,000]

| | | Proposed | Baseline |
|---|---|---|---|
| System Type | | Air_cooled VRF | Air_cooled VRF |
| Initial Cost | Equipment | 2,841.6 | 2,557.5 |
| | Installation | 997.1 | 997.1 |
| | Total | 3,838.7 | 3,554.6 |
| Cost Difference Ratio | | 100% | 93% |
| Operation, Maintenance | Operation | 580.4 | 633.1 |
| | Maintenance | . | . |
| | Total | 580.4 | 633.1 |
| Cost Difference Ratio | | 100% | 109% |
| 15 Years Life cycle Cost | | 12,544.7 | 13,051.1 |
| Cost Difference Ratio | | 100% | 104% |

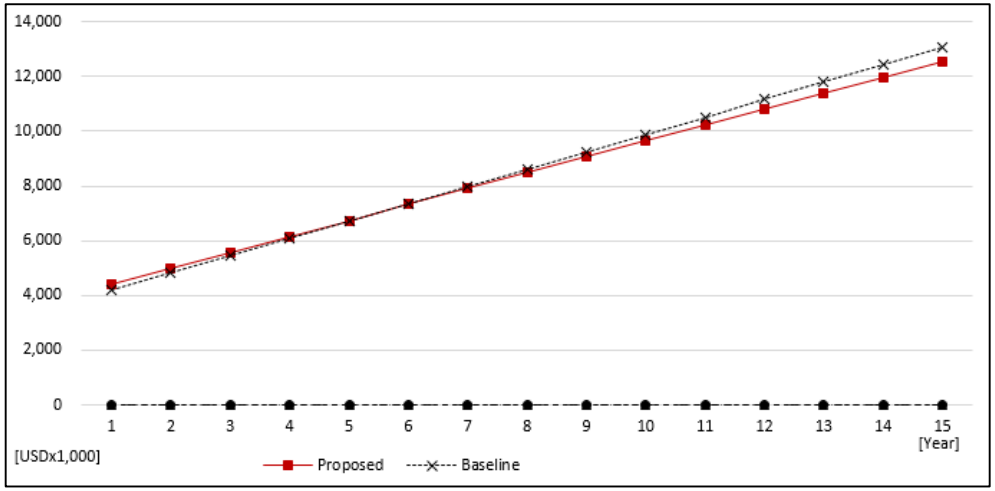
- Initial Cost [USD×1,000]



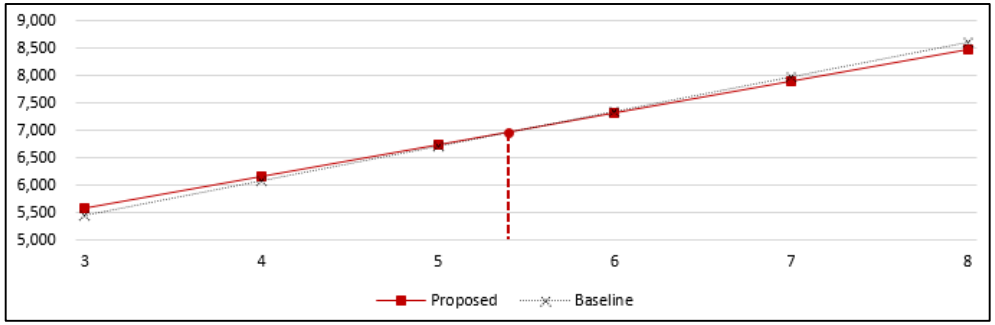

- Annual Cost [USD×1,000]




### ② 15 Years Life Cycle Cost [USD×1,000]




### ③ Payback Year




**Payback Year : 5Years 5Months**

| | |
|---|---|
| **Location** | Vietnam (Danang) |
| **Climate Zone** | Zone 1 |
| **Use** | Complex Building |
| **Gross Area** | 13,300 ㎡ |
| **Scale** | 7 floors |
| **Proposed System** | LG Multi V S(28kW × 250ea)<br>+ IDU(Low Static Duct) |
| **Baseline System** | Multi Split(28kW × 180ea) +<br>Single Split(5kW × 500ea) |

## Analysis Condition

1. Proposed : LG Multi V S + Indoor unit
2. Baseline : Multi Split + Single Split + Indoor unit
3. Total Equipment Capacity : 2,500 HP
4. Maximum Cooling Load : 7,000 kW
5. Operating Mode : Cooling
6. Daily Operating Time : 14 Hours (6AM~ 20PM)
7. Operating Month : Jan. ~ Dec.
8. Yearly Operating Time : 12 Months / Year (Total 5,469 hours / year)

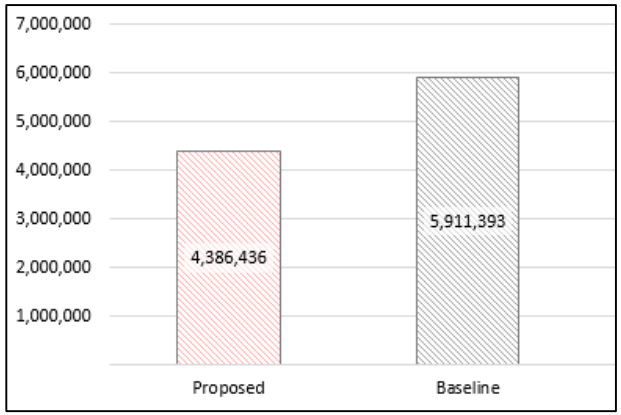
## HVAC Systems

| | **Baseline** | **Proposed** |
|---|---|---|
| | **Multi Split + Single Split** | **LG Multi V S (28kW)** |
| **Cooling** | 3.95 + 3.01 EER | 3.95 EER |
| **Heating** | None | None |
| **Air handler** | Low Static Duct(4.5kW) | Low Static Duct(4.5kW) |

| Proposed | LG Multi V S |
|---|---|
| Baseline | Multi Split + Single Split |

## ■ Energy Comparison

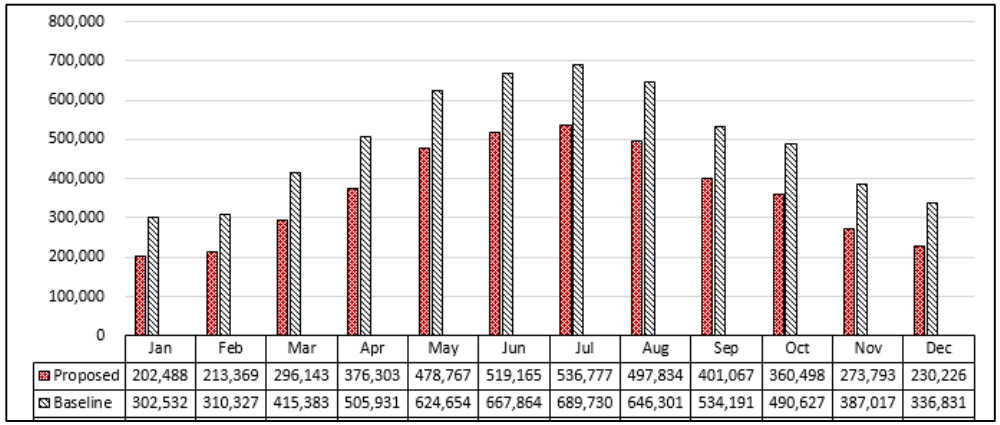
### ① Annual Energy Consumption [kWh]




| Proposed | 4,386,436 |
|---|---|
| Baseline | 5,911,393 |

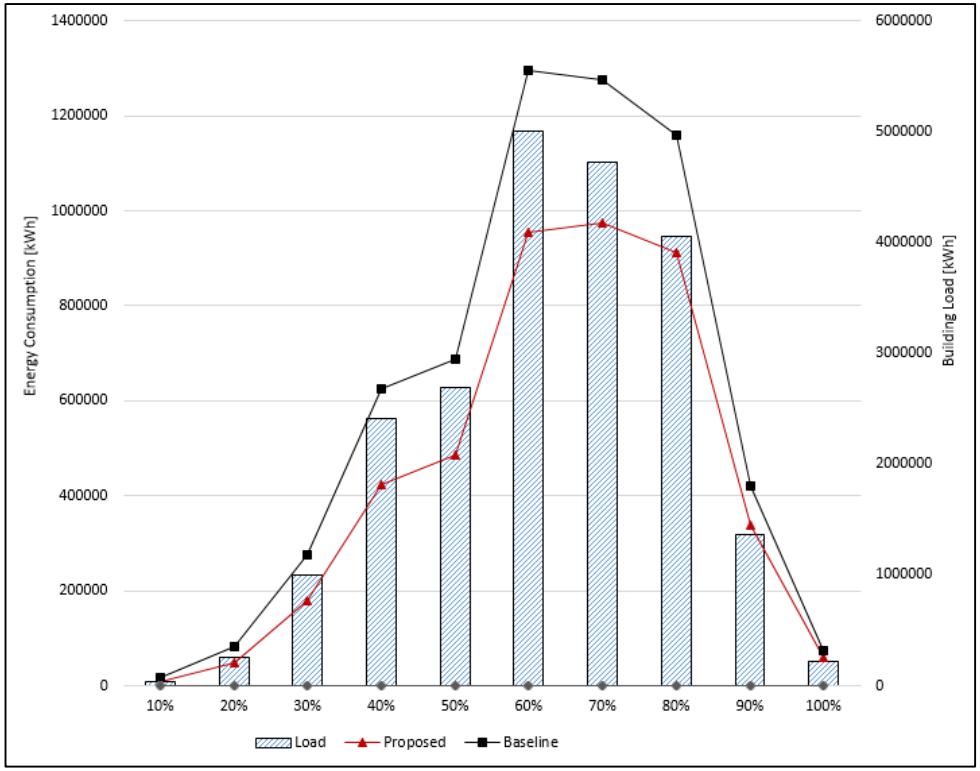
**Annual Energy Savings : 26%**

### ② Monthly Energy Consumption [kWh]




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Proposed | 202,488 | 213,369 | 296,143 | 376,303 | 478,767 | 519,165 | 536,777 | 497,834 | 401,067 | 360,498 | 273,793 | 230,226 |
| Baseline | 302,532 | 310,327 | 415,383 | 505,931 | 624,654 | 667,864 | 689,730 | 646,301 | 534,191 | 490,627 | 387,017 | 336,831 |

### ③ Cooling Energy Consumption at Partial condition [kWh]



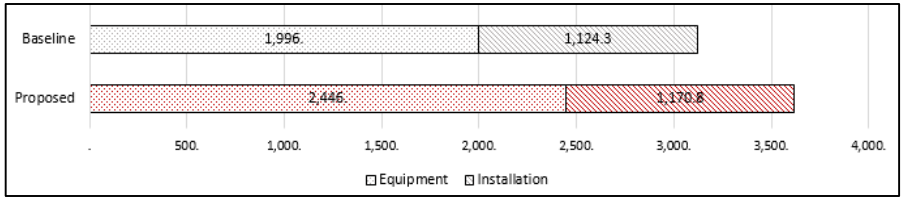
| Proposed | LG Multi V S |
|---|---|
| Baseline | Multi Split + Single Split |

## ■ Life Cycle Cost(LCC) Comparison

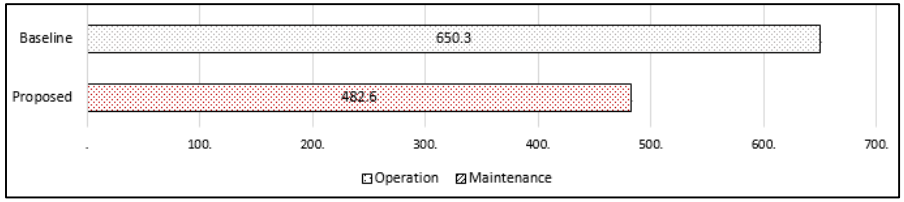
### ① Life Cycle Cost(LCC) Analysis [USD×1,000]

| | | Proposed | Baseline |
|---|---|---|---|
| System Type | | VRF_Mini | Multi Split |
| Initial Cost | Equipment | 2,446. | 1,996. |
| | Installation | 1,170.8 | 1,124.3 |
| | Total | 3,616.8 | 3,120.3 |
| Cost Difference Ratio | | 100% | 86% |
| Operation, Maintenance | Operation | 482.6 | 650.3 |
| | Maintenance | . | . |
| | Total | 482.6 | 650.3 |
| Cost Difference Ratio | | 100% | 135% |
| 15 Years Life cycle Cost | | 10,855.8 | 12,874.8 |
| Cost Difference Ratio | | 100% | 119% |

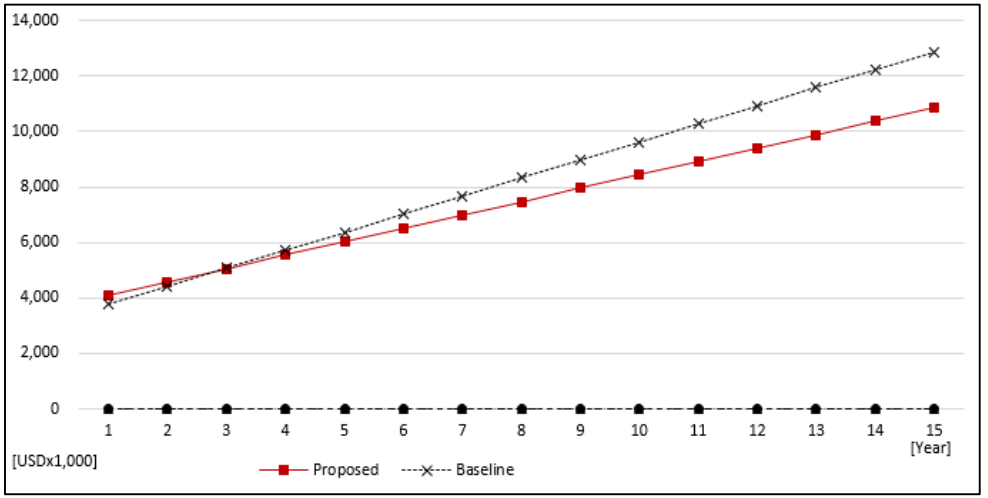
- Initial Cost [USD×1,000]



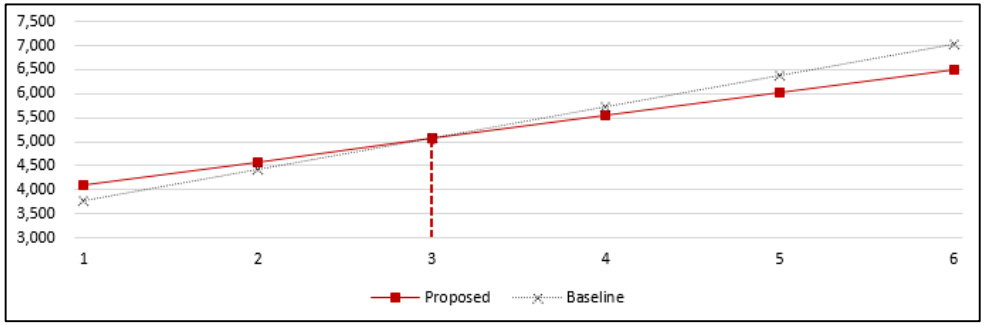

- Annual Cost [USD×1,000]




### ② 15 Years Life Cycle Cost [USD×1,000]




### ③ Payback Year




**Payback Year : 3Years**



LG Business Solutions

| | |
|---|---|
| **Location** | France (Paris) |
| **Climate Zone** | Zone 4 |
| **Use** | Hospital |
| **Gross Area** | 16,100 ㎡ |
| **Scale** | 6 floors |
| **Proposed System** | LG Multi V Water Ⅳ (173.6kW × 50ea)<br>+ IDU(High Static Duct) |
| **Baseline System** | Water-cooled Chiller(200RT × 13ea) |

## Analysis Condition

1. Proposed : LG Multi V Water Ⅳ + Indoor unit
2. Baseline : Water-cooled Chiller + Indoor unit
3. Total Equipment Capacity : 3,040 HP
4. Maximum Cooling Load : 8,500 kW
5. Operating Mode : Cooling + Heating
6. Daily Operating Time : 24 Hours (6AM~ 5AM)
7. Operating Month : Jan. ~ Dec.
8. Yearly Operating Time : 12 Months / Year (Total 4,745 hours / year)

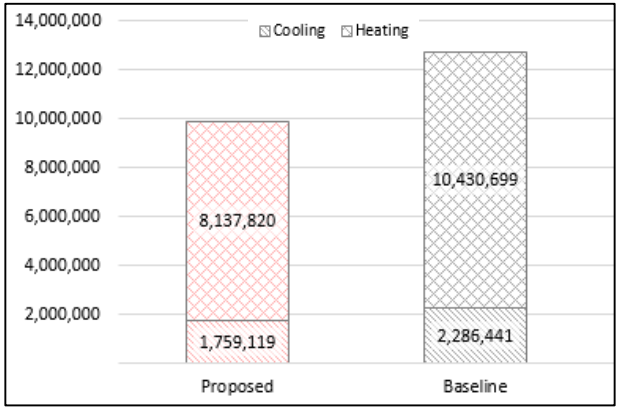
## HVAC Systems

| | **Baseline** | **Proposed** |
|---|---|---|
| | **Water-cooled Chiller (200RT)** | **LG Multi V Water Ⅳ (173.6kW)** |
| **Cooling** | 6.1 COP | 5.1 EER |
| **Heating** | 80% efficiency boiler | 5.5 COP<br>+ 80% efficiency boiler |
| **Air handler** | High Static Duct(28kW) | Ducted type FCU(28kW) |

| Proposed | LG Multi V Water IV |
|---|---|
| Baseline | Water-cooled Chiller |

## ■ Energy Comparison

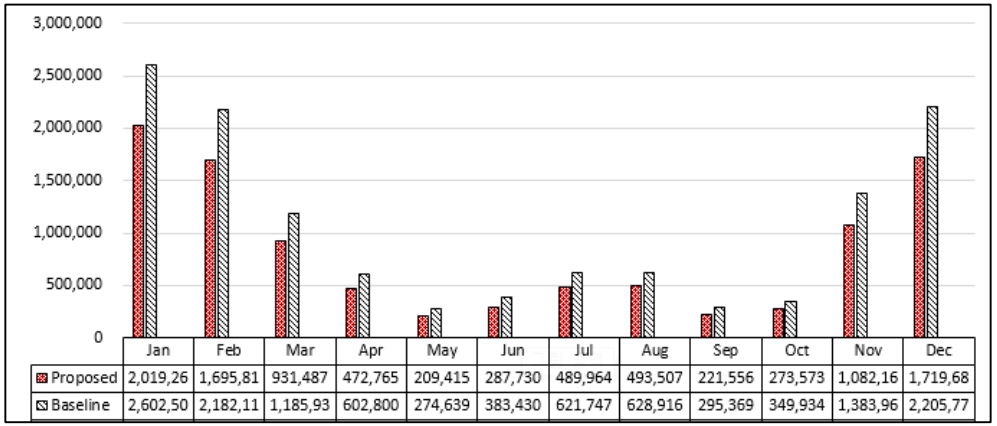
### ① Annual Energy Consumption [kWh]




| Proposed | 9,896,939 |
|---|---|
| Baseline | 12,717,140 |

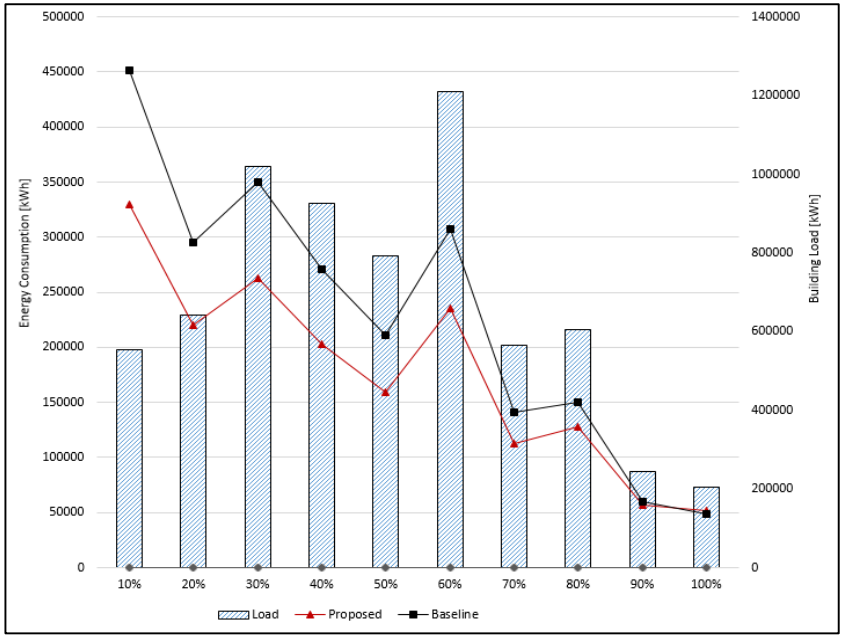
**Annual Energy Savings : 22%**

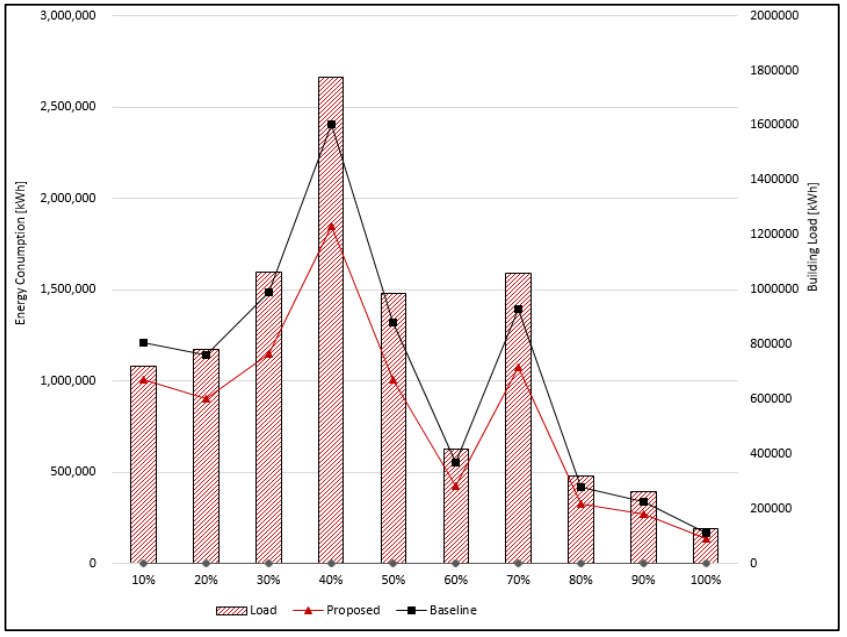
### ② Monthly Energy Consumption [kWh]




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Proposed | 2,019,26 | 1,695,81 | 931,487 | 472,765 | 209,415 | 287,730 | 489,964 | 493,507 | 221,556 | 273,573 | 1,082,16 | 1,719,68 |
| Baseline | 2,602,50 | 2,182,11 | 1,185,93 | 602,800 | 274,639 | 383,430 | 621,747 | 628,916 | 295,369 | 349,934 | 1,383,96 | 2,205,77 |

### ③ Cooling/Heating Energy Consumption at Partial condition [kWh]



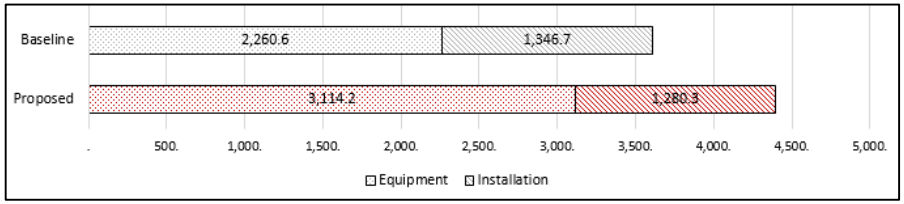
| Proposed | LG Multi V Water IV |
|---|---|
| Baseline | Water-cooled Chiller |

## ■ Life Cycle Cost(LCC) Comparison

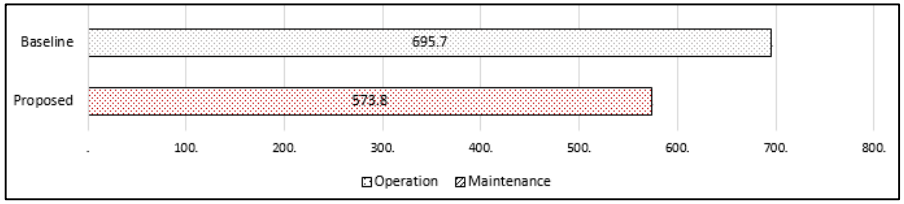
### ① Life Cycle Cost(LCC) Analysis [USD×1,000]

| | | Proposed | Baseline |
|---|---|---|---|
| System Type | | Water_cooled VRF | Water_cooled Chiller |
| Initial Cost | Equipment | 3,114.2 | 2,260.6 |
| | Installation | 1,280.3 | 1,346.7 |
| | Total | 4,394.5 | 3,607.3 |
| Cost Difference Ratio | | 100% | 82% |
| Operation, Maintenance | Operation | 573.8 | 695.7 |
| | Maintenance | - | - |
| | Total | 573.8 | 695.7 |
| Cost Difference Ratio | | 100% | 121% |
| 15 Years Life cycle Cost | | 13,001.5 | 14,042.8 |
| Cost Difference Ratio | | 100% | 108% |

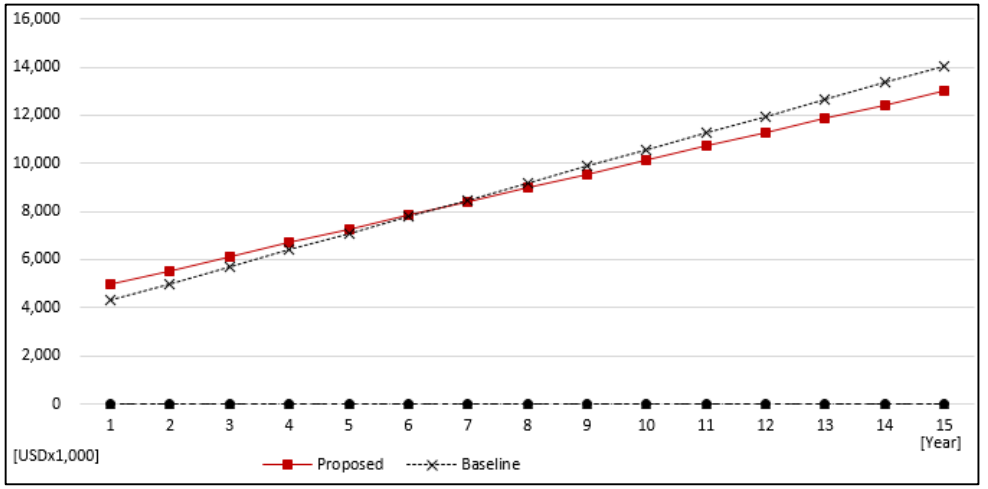
- Initial Cost [USD×1,000]



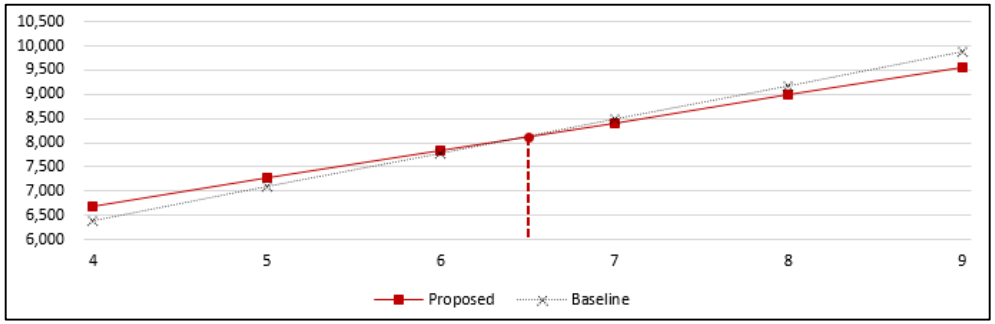

- Annual Cost [USD×1,000]




### ② 15 Years Life Cycle Cost [USD×1,000]




### ③ Payback Year




**Payback Year : 6Years 6Months**



LG Business Solutions