

# SHC Task 53 - 5th Experts Meeting

April 11-13, 2016 - Madrid, Spain

New Generation of Solar thermal Cooling with Yazaki

Wei Zheng  
Yazaki Energy System Corporation  
Beijing Office  
2016. 4. 11



- 1 . Company Introduction
- 2 . Yazaki's Absorption Chiller in SHC
- 3 . Yazaki-SHC Development Consideration
- 4 . SHC in a passive house of China
- 5 . New Absorption Chiller Concept

- **Founded in 1929 by Mr. Sadami Yazaki**
- **Established as YAZAKI Corporation in 1941**
- **Today the company operates globally**
- **Privately owned**

Chairman: Mr. Yasuhiko Yazaki

President: Mr. Shinji Yazaki



Chairman:  
Mr. Yasuhiko Yazaki



President:  
Mr. Shinji Yazaki



Wiring Harness Production  
1958 in Numazu, Japan

## Locations



**World Headquarters**  
Y-City, 1500 Mishuku,  
Susono-City, Shizuoka  
410-1194, Japan



**Tokyo Headquarters**  
17<sup>th</sup> floor, Mita-Kokusai Bdg.,  
1-4-28 Mita, Minato-Ku, Tokyo  
108-8333, Japan

- **ENERGY SYSTEMS**



Absorption & Solar Thermal Technology  
Electrical Wires  
Gas Equipment  
General Transportation Systems



- **AUTOMOTIVE**



Electrical Distribution Systems  
Components  
Electronics & Instrumentation  
High Voltage



- **NEW BUSINESS**



Recycling  
Nursing Care



# 1. Company Introduction: Group global footprint



	<b>AMERICAS</b>	<b>EUROPE / AFRICA</b>	<b>ASIA / OCEANIA</b>	<b>JAPAN</b>
Countries	10	22	12	1
Affiliates	31	26	49	64
Locations	101	56	87	232
Employees	76.200	45.200	136.900	21.500

**TOTAL**  
45 Countries · 170 Affiliates · 476 Locations · 279.800 Employees

US HQ Canton,  
Michigan

EU HQ Cologne, Germany

WHQ Susono, Japan

**YAZAKI WORKS IN 45 COUNTRIES ·  
AND 476 LOCATIONS TODAY**

As of 06.2015

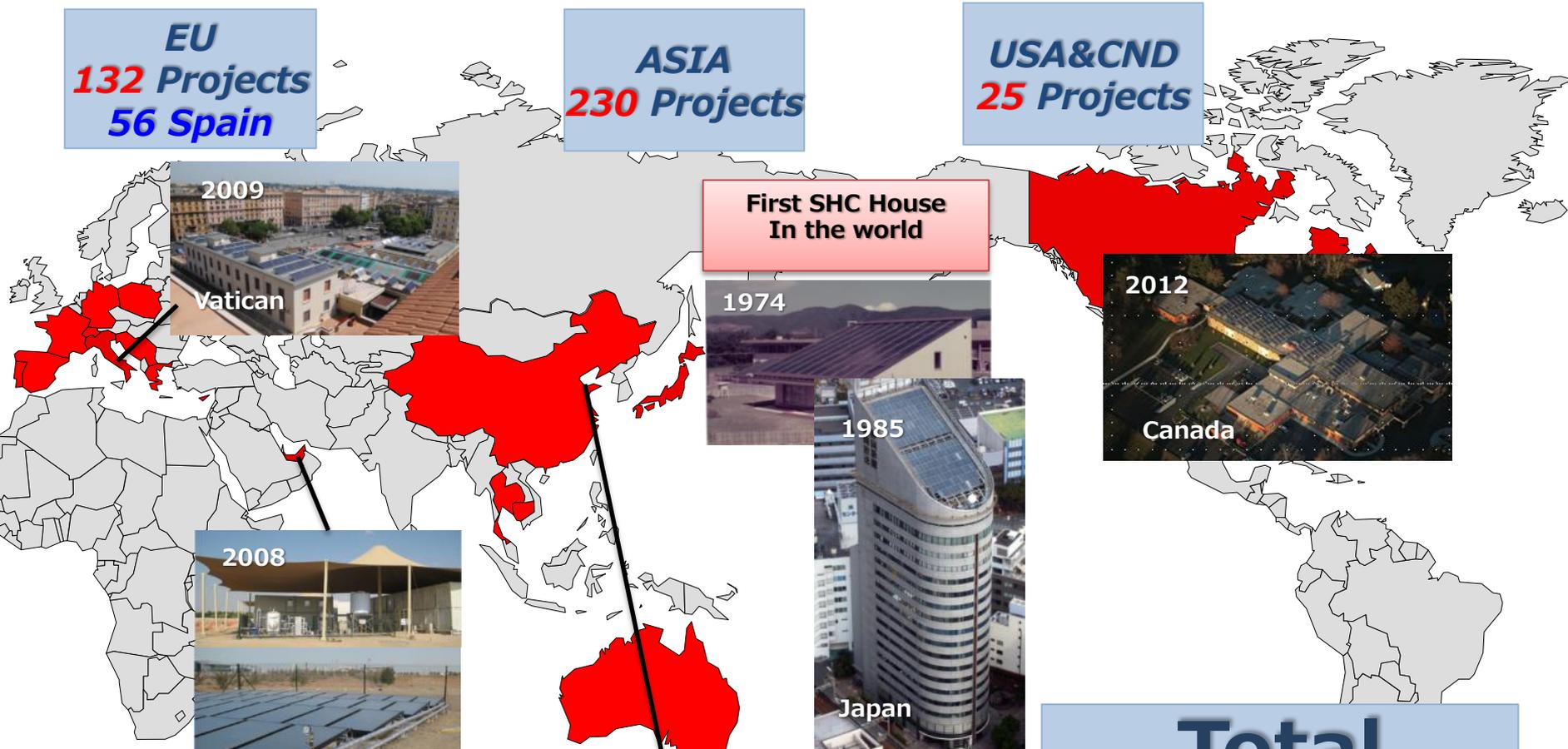
# 2. Yazaki's Absorption Chiller in SHC



**EU**  
**132 Projects**  
**56 Spain**

**ASIA**  
**230 Projects**

**USA&CND**  
**25 Projects**



First SHC House  
In the world



**Total**  
**387 Projects**

# 3. Yazaki-SHC Development Consideration



**SHC 1.0 (2016-17)**

**Energy Efficiency + Renewables**

**Focus: supply**

Solar thermal

Heat pump

to heat pump

to solar collector

saturated sand ring

Electrical heat pump

**SHC 2.0 (2018)**

**Energy Efficiency + Renewables + Passive Architecture 1.0**

**Focus: supply + demand**

solar thermal collector [ optional ]

triple pane double low-e glazing

**Yazaki Thermal Concepts**

**Energy Efficiency + Renewables + Passive Architecture 2.0**

**Focus: supply + demand + grid**

Whistler Athletes' Village Low-Temperature District Energy-Sharing System

## Passive House Project

Conceptual Diagram of Emergency Control Center

Automatic shutter

Vacuum tube type solar collector 159.69m<sup>2</sup>

### low energy consumption building and green building in Shandong Province, 2015

- ① Energy consumption for air-conditioning (<30kWh/m<sup>2</sup>y)
- ② Proportion of renewable energy (>12%)

Facade heat insulation

Surface of radiation panel

PV power unit

Fresh air: CO<sub>2</sub> sensor control

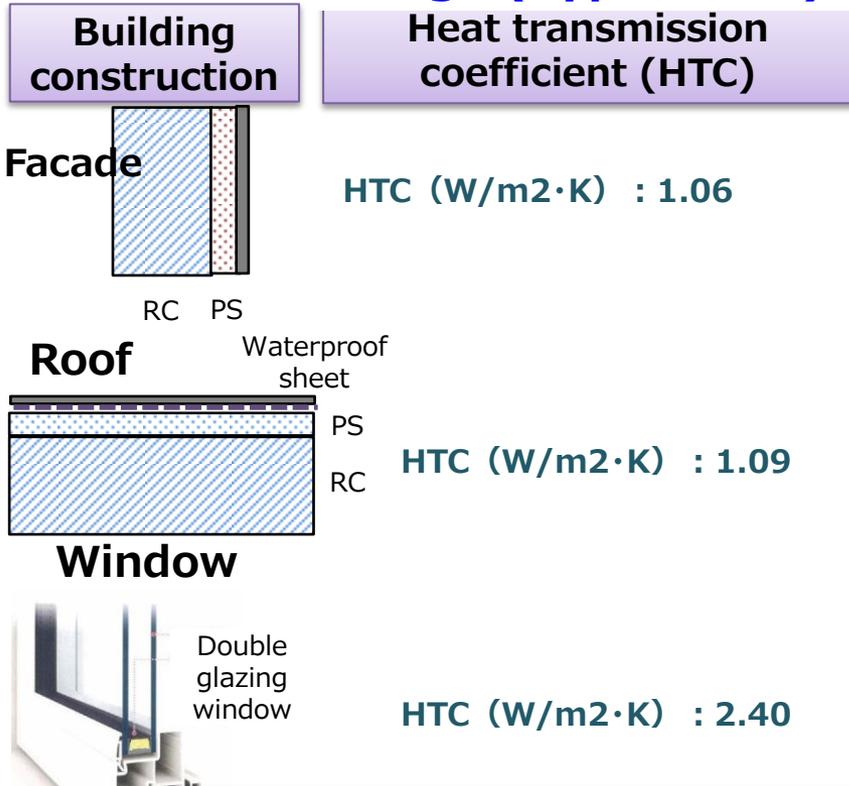
Radiation panel for cooling and heating

Back of radiation panel

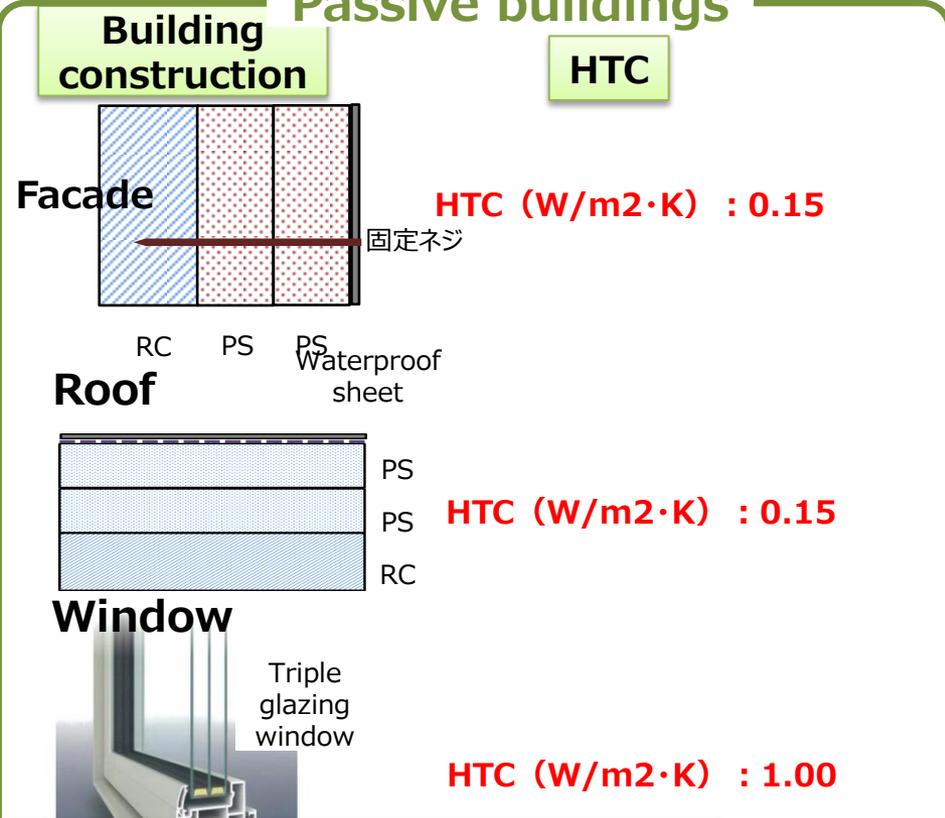
## Passive House Project

Comparison between general buildings and passive buildings

### General buildings (hypothesis)



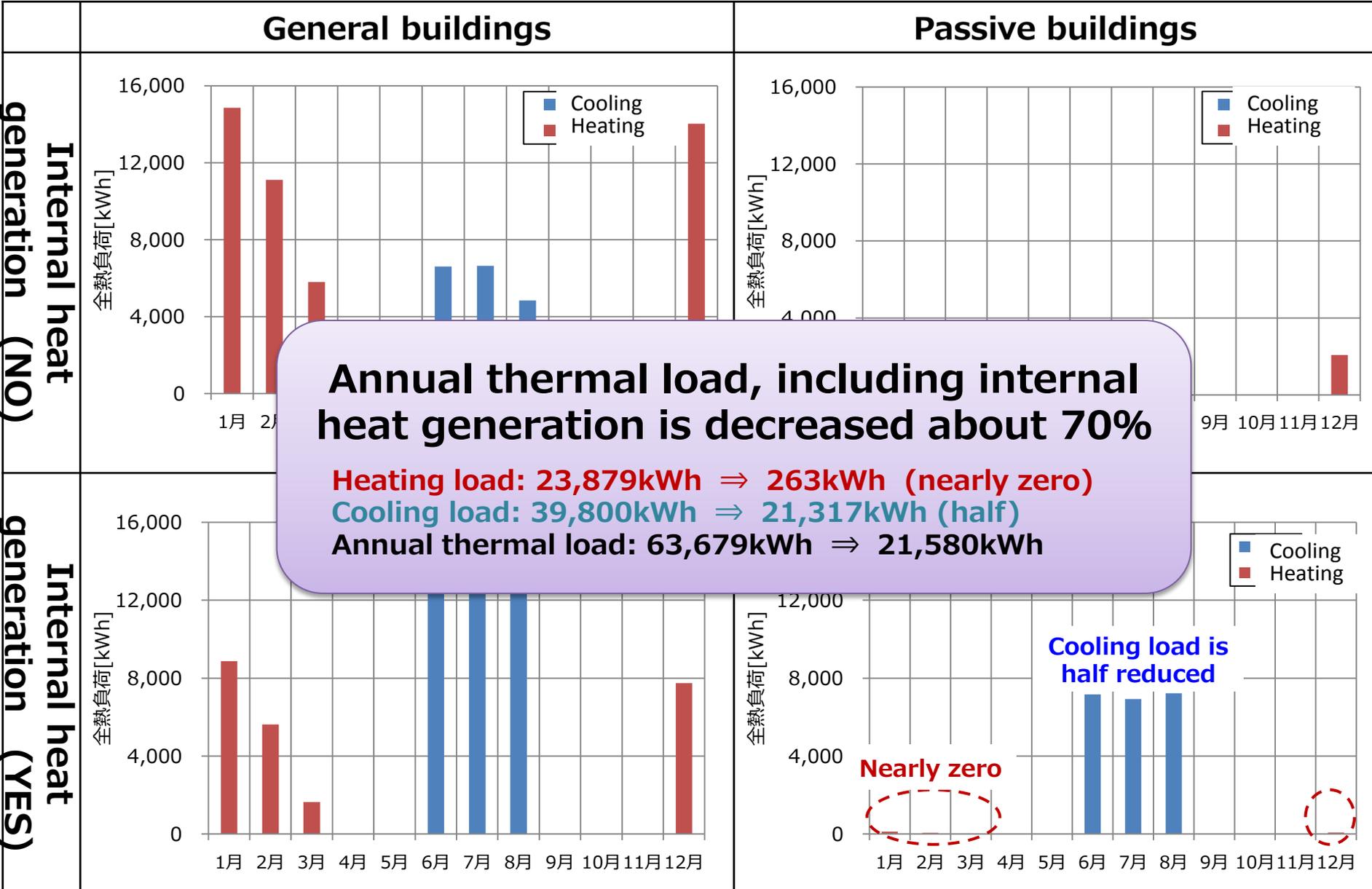
### Passive buildings



Based on passive house,

- HTC of facades and roof achieves an 85% reduction.
- HTC of the window is decreased about 60%.

# 4. SHC in a passive house of China

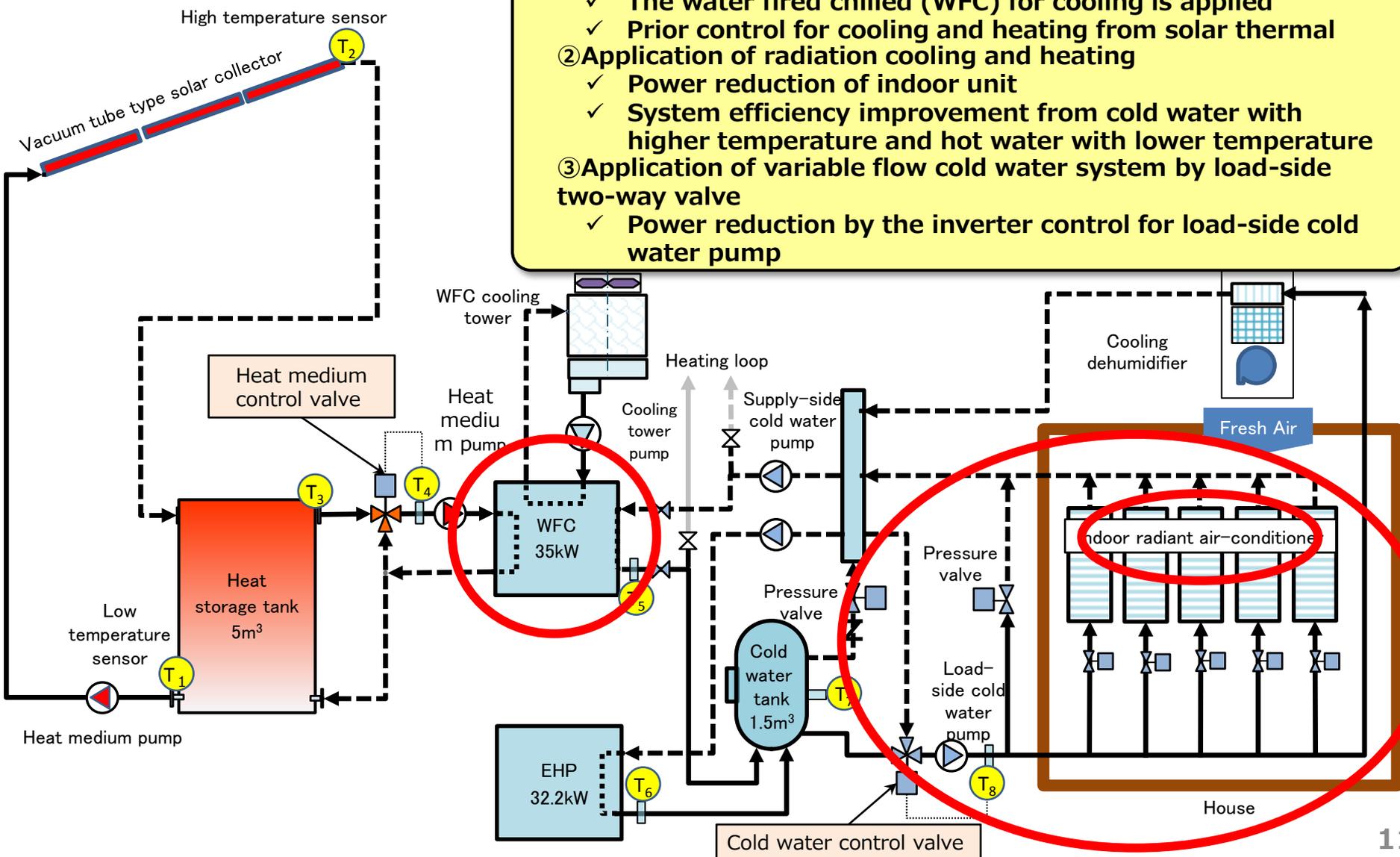


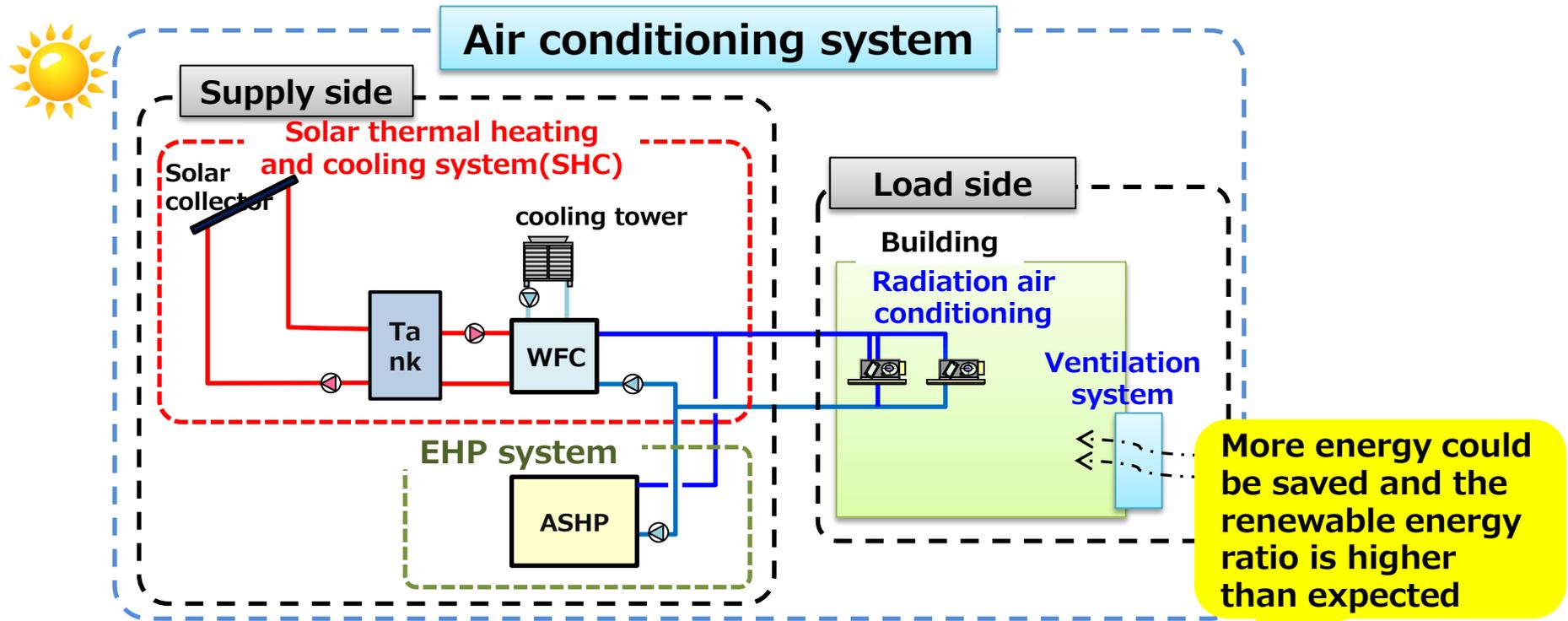
# 4. SHC in a passive house of China:

## Example: passive buildings in Shandong, China

### <System concept>

- ① Primary energy reduction due to solar thermal
  - ✓ The water fired chilled (WFC) for cooling is applied
  - ✓ Prior control for cooling and heating from solar thermal
- ② Application of radiation cooling and heating
  - ✓ Power reduction of indoor unit
  - ✓ System efficiency improvement from cold water with higher temperature and hot water with lower temperature
- ③ Application of variable flow cold water system by load-side two-way valve
  - ✓ Power reduction by the inverter control for load-side cold water pump





## Requirements

low energy consumption building and green building in Shandong Province, 2015

- ① Energy consumption for air-conditioning (<math><30\text{kWh/m}^2\text{y}</math>)
- ② Proportion of renewable energy (>12%)

Energy saving assessment [supply-side only] (kWh/m <sup>2</sup> )			Energy consumption prediction for yearly air conditioning system including load side (※1) (kWh/m <sup>2</sup> )	Renewable energy ratio (※2) (%)
Cooling	Heating	Annual		
5.15	4.28	9.4	18.9	33.6

※ 1 Energy consumption ratio of supply side and load side is 50:50

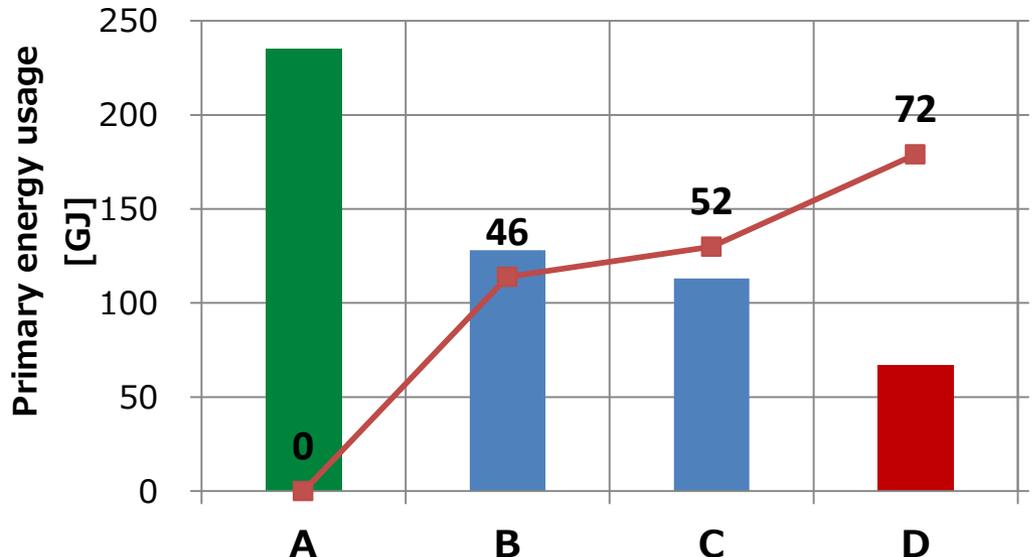
※ 2 Renewable energy ratio = output of SHC / (output of SHC + output of EHP)

# 4. SHC in a passive house of china: PE reduction



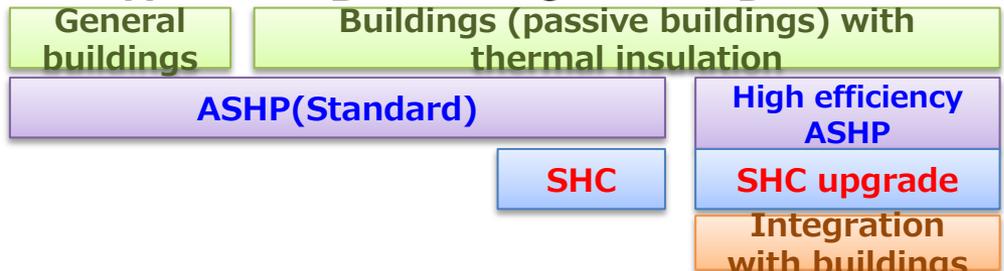
	Buildings	Supply side air-conditioning device	Aperture area [m <sup>2</sup> ]	Primary energy	
				Usage[GJ]	Reduction[%]
A	General	Air source Heat pump(ASHP)	-	235	-
B	High thermal insulation	ASHP	-	128	45.5
C	High thermal insulation	ASHP+SHC	100	113	51.9
D	High thermal insulation	High efficiency ASHP+SHC upgrade + Integration with buildings	356	67	71.6

※ASHP(cooling COP 2.84, heating COP 3.87)  
 High efficiency ASHP(cooling COP 4.80, heating COP 4.80)



**SHC upgrade tech**

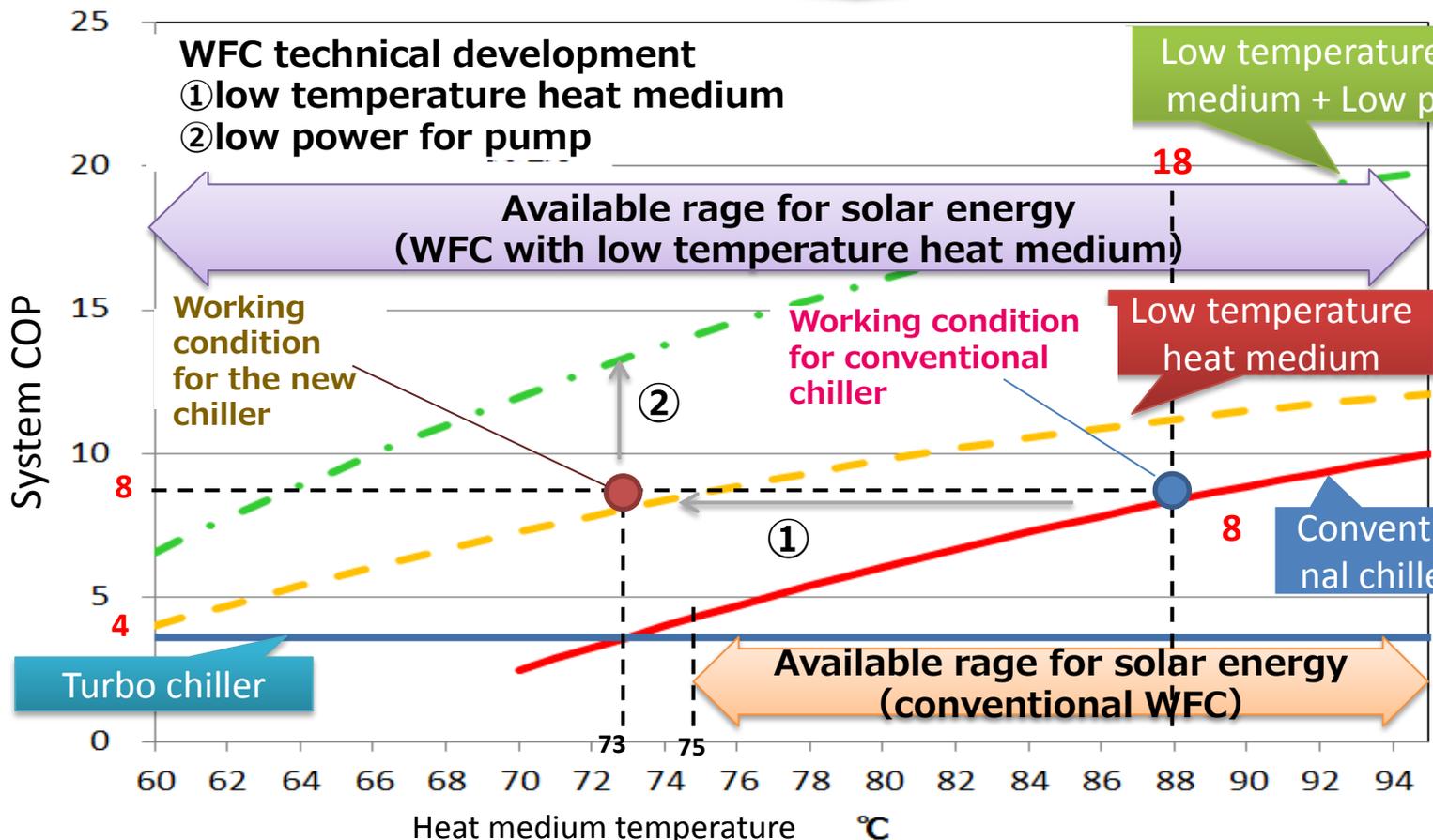
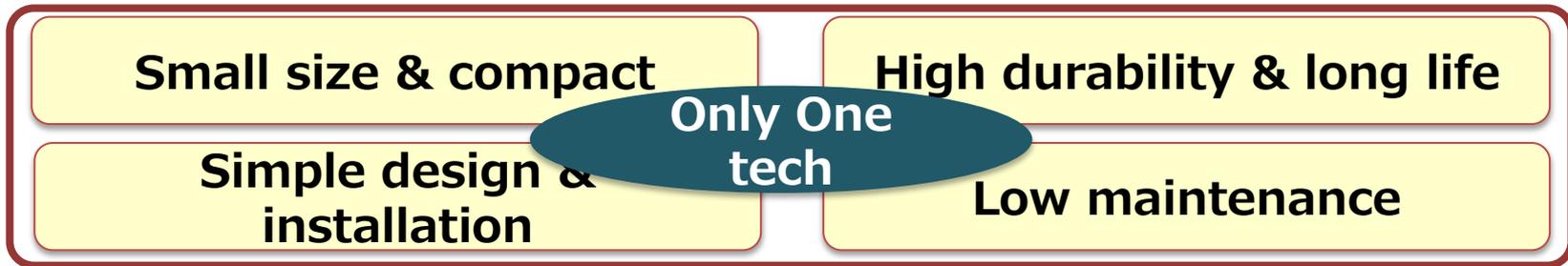
- High efficiency collector
- Thermal stratified tank
- Power reduction of pump
- Low temperature driven chiller
- System optimal control



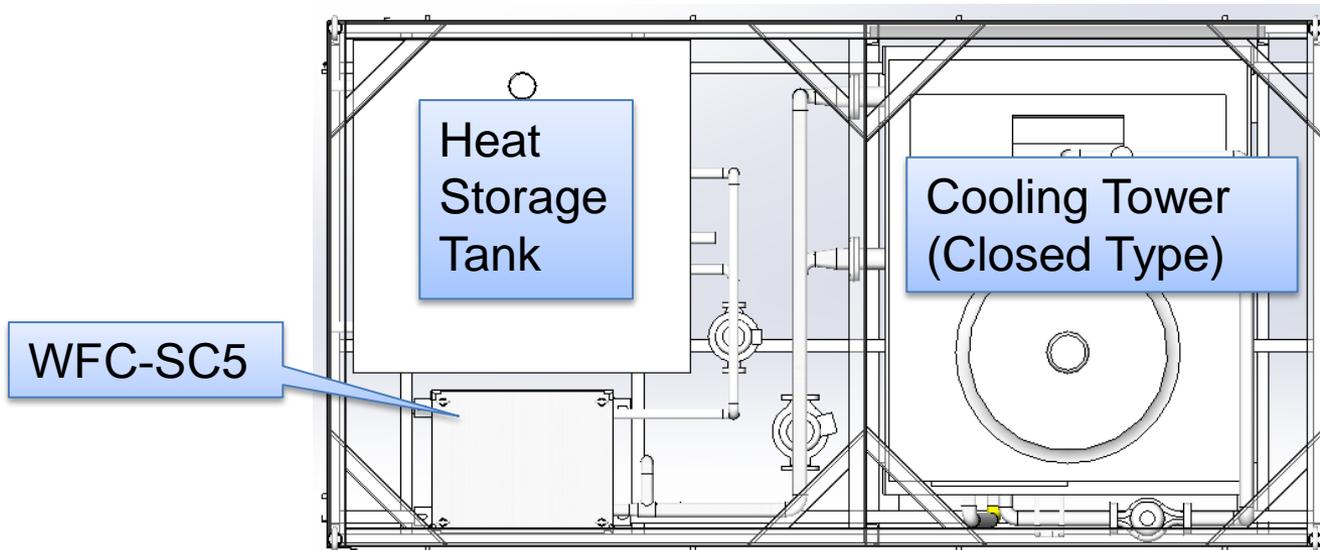
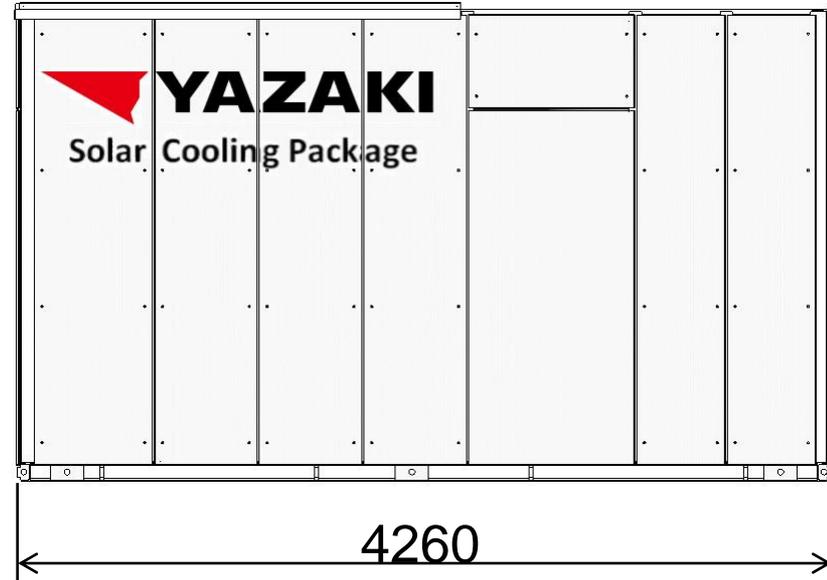
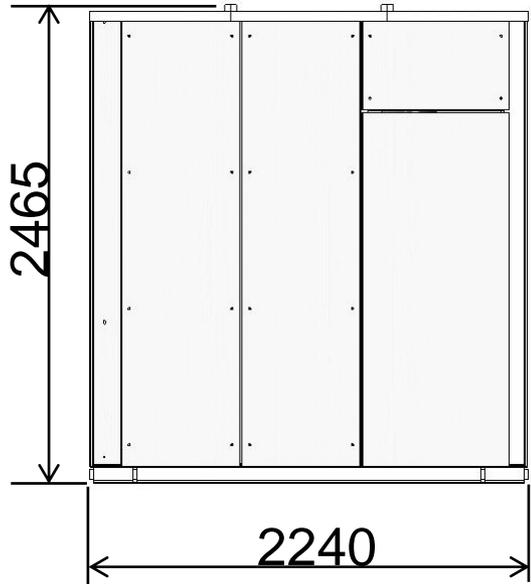
# 5. New Absorption Chiller Concept



technology & initiatives for low temperature driven of YAZAKI WFC



## Yazaki's new package SHC system (Plug-in system)



# SHC Task 53 - 5th Experts Meeting

April 11-13, 2016 - Madrid, Spain

Thank you for your attention!

Wei Zheng  
[wei.zheng@yazaki-china.com](mailto:wei.zheng@yazaki-china.com)