

SURVIVING AN ENERGY CRISIS

**HEAT PUMP TECHNOLOGY & APPLICATIONS TO
REDUCE OR ELIMINATE GAS USAGE**



Presenter: Travis McNeill, Director of Evo Energy Technologies & Evo Industries Australia



Started in 2006

2G Cogeneration systems – natural and biogas

Heat pump technologies

Heat recovery technologies



HEAT PUMP TECHNOLOGY HAS BEEN AROUND WELL OVER 100 YEARS



WORLD'S FIRST TAKE-HOME AIR CONDITIONER

...new PHILCO $\frac{3}{4}$ -hp Bantam 12—smallest room air conditioner made!



Here's the best hot-weather news you've ever heard!

Philco brings you an air conditioner so small you can carry it home—yet it's a giant in cooling capacity.

Install the $\frac{3}{4}$ -hp Philco Bantam 12 in only 15 minutes. You can even do it yourself! Then sit back and forget about heat and humidity.

There's never been anything like the Bantam 12. It does everything bulky, old-fashioned air conditioners can do. Yet all this comfort and convenience costs less than most ordinary $\frac{1}{2}$ -hp units.

Start being comfortable today! See or telephone your Philco dealer this very minute. Tell him you want a Philco Bantam 12 right away.

**TAKE IT HOME TODAY
BE COOL TONIGHT!**

You can install it yourself. Only four screws are needed to hold the Philco Bantam 12 in place. Everything you need comes in the box. (Don't need hand tools and you won't run on ordinary home voltage 115 volts, which has caused other "handies" to fail.)

**SEE
THESE
BEAUTIFUL**

**FEDDERS
ROOM
AIR
CONDITIONERS**

**IN
ACTION
TODAY!**

This is the Standard $\frac{1}{2}$ -ton capacity unit, ideal for medium-sized livingrooms. In Breeze Green.

The handsome Fedders $\frac{1}{2}$ -ton capacity Room Air Conditioner. Available in Ivory.

The popular $\frac{1}{2}$ -ton capacity unit comes in mellow Ivory and smart new Breeze Green.

The Deluxe $\frac{1}{2}$ -ton capacity Fedders. Also available in extra cool with Heat Pump. Breeze Green and Ivory.



TYPES OF HEAT PUMPS USED IN AUSTRALIA

ONLY 2% OF WATER HEATING MARKET



HVAC



POOL HEATING



HOT WATER



TYPES OF HEAT PUMPS USED IN EUROPE

THREE MAJOR TRENDS:

- AIR
- SANITARY HOT WATER
- LARGER COMMERCIAL, INDUSTRIAL & DISTRICT HEATING APPLICATIONS

EU-21 Total

\$

1 000k ^(12%) heat pumps sold in 2016 contributed:

33.2 ^(11%)	16.2 ^(13%)	10.2 ^(12%)	6 ^(13%)	2.6 ^(12%)	13.1 ^(12%)
GW storage capacity	TWh heat produced	TWh renewable energy	TWh electricity used	Mt CO2 saved	TWh energy saved



The heat pump stock of 9.5m ^(11%) units in 2016 contributed:

333 ^(11%)	165 ^(11%)	106 ^(10%)	59.3 ^(11%)	27.1 ^(10%)	135 ^(10%)
GW storage capacity	TWh heat produced	TWh renewable energy	TWh electricity used	Mt CO2 saved	TWh energy saved



TYPES OF HEAT PUMPS



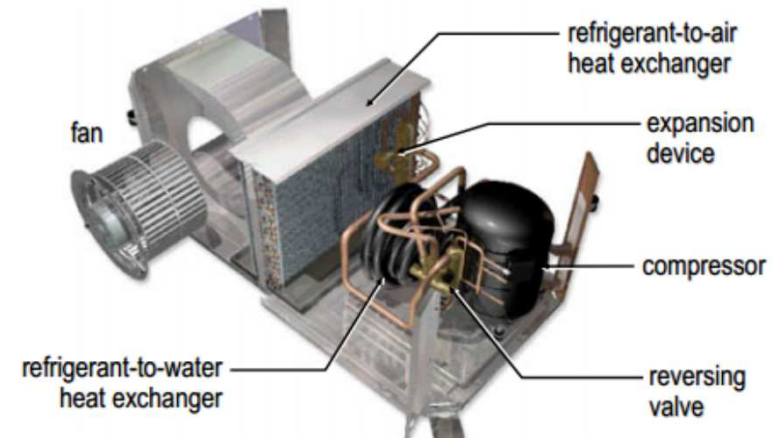
Air to Water Heat Pump



Water to Water Heat Pump



Air to Air Heat Pump



Water to Air Heat Pump

ADVANTAGES



**HIGHER
EFFICIENCY**

- 1kW electricity > 3 to 7kW thermal
- Increased efficiency
- Reliable proven technology
- Flexible applications
- Lower OPEX
- Can operate between -25 and +45 degrees
- Integrates with PV & other renewables



DISADVANTAGES

- Higher CAPEX than gas boilers or element heating
- 50 degree max differential optimal
- Heating to temperatures over 80 degrees a challenge
- Steam not commercially available
- Heat Pump de-rate for varying ambients and water temps need to be considered



$$\text{COP} = \frac{\text{Energy Output}}{\text{Energy Input}}$$

Pool Heating – COP 5 to 7

Hot Water – COP 3 to 4

High Temp – COP 2 to 3

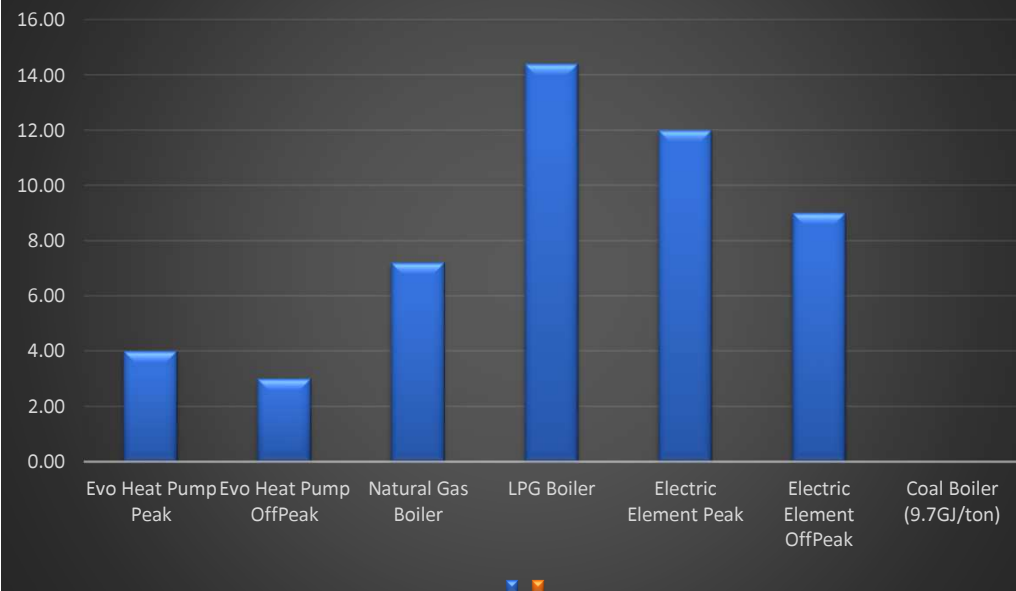
Varies with temperature

COMPARISON

FUEL COSTS & EFFICIENCY
COMPARISON



Running Cost c/kWh thermal



Energy Costs

Electricity Cost Peak	12	c/kWh
Electricity Cost OffPeak	9	c/kWh
Natural Gas Costs	1.6	c/MJ
LPG Costs	80	c/Litre
Coal Boiler		\$/ton

Efficiency

Evo Heat Pump	3	COP
Natural Gas Boiler	80	%
LPG Boiler	80	%
Electric Element	1	COP
Coal Boiler	50	%

Running Cost c/kWh thermal

Evo Heat Pump Peak	4.00	c/kWh thermal
Evo Heat Pump OffPeak	3.00	c/kWh thermal
Natural Gas Boiler	7.20	c/kWh thermal
LPG Boiler	14.40	c/kWh thermal
Electric Element Peak	12.00	c/kWh thermal
Electric Element OffPeak	9.00	c/kWh thermal
Coal Boiler (9.7GJ/ton)	0.00	c/kWh thermal

COMPARISON

FUEL COSTS & EFFICIENCY COMPARISON



THE PERFECT MATCH

HEAT PUMPS & RENEWABLES



BIOGAS

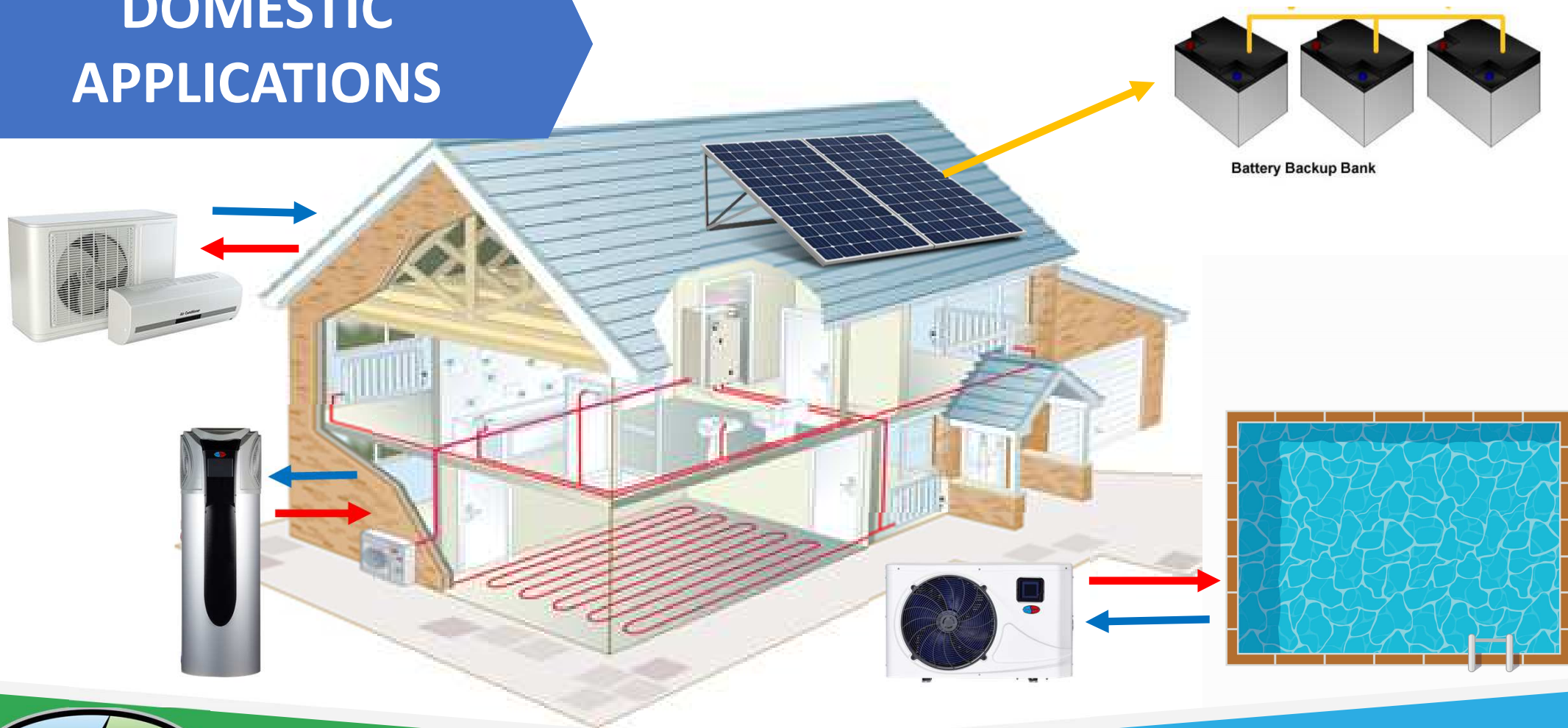
- Onsite generation of electricity is common and cost effective
- Onsite generation of gas is very uncommon and can be uneconomic
- Electrification of any building or facility allows de-risking of energy prices



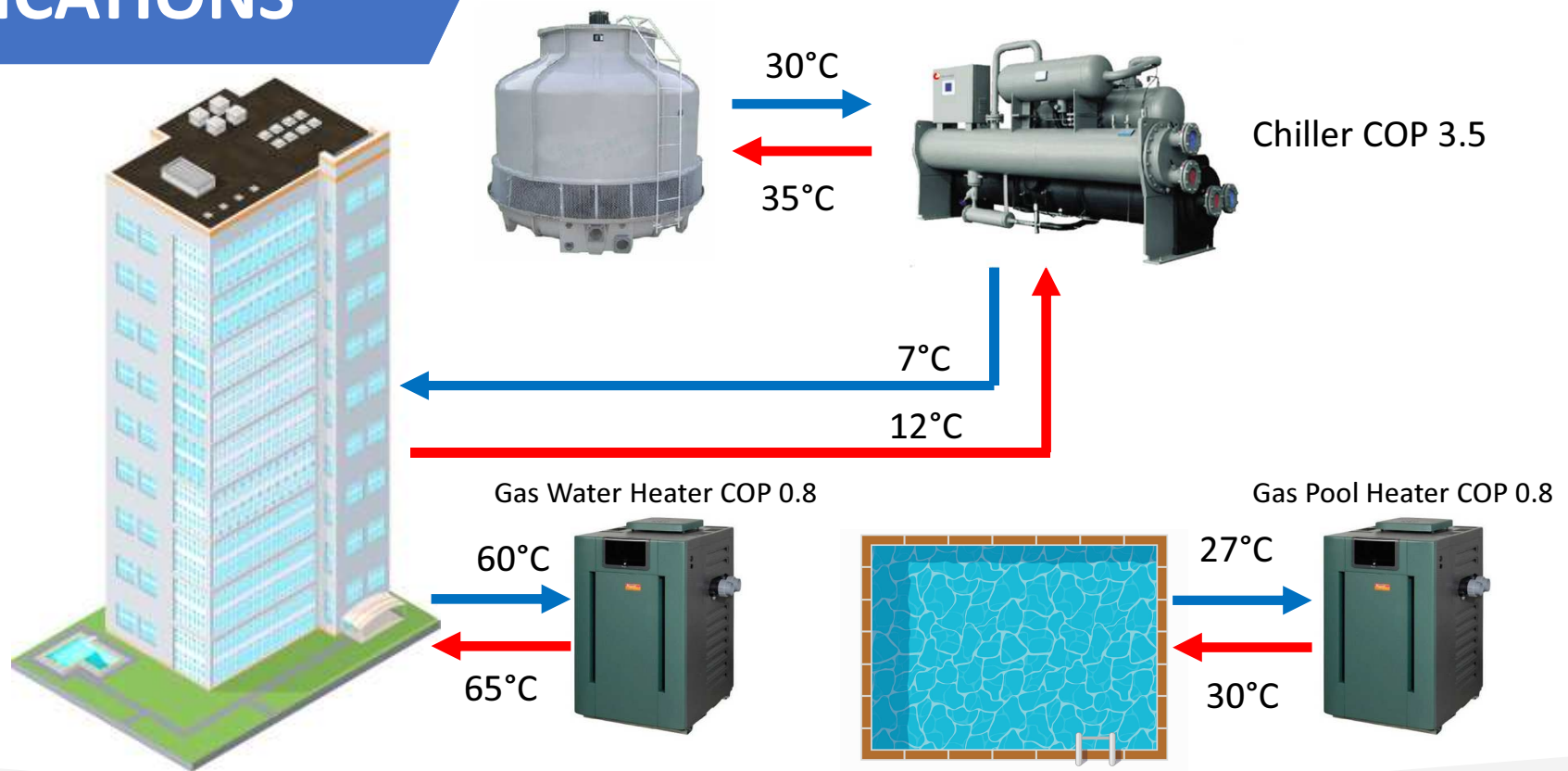
DOMESTIC APPLICATIONS



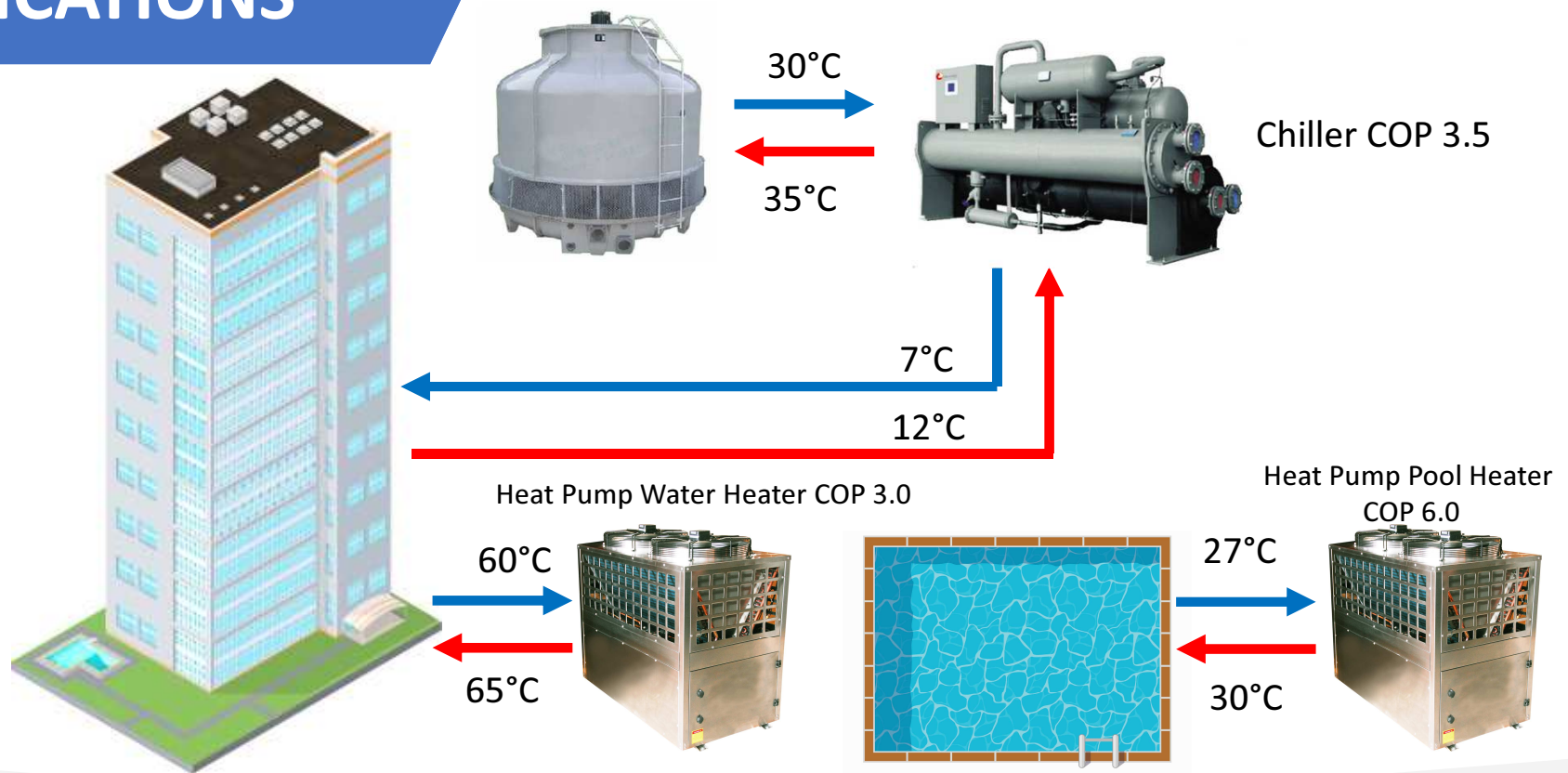
DOMESTIC APPLICATIONS



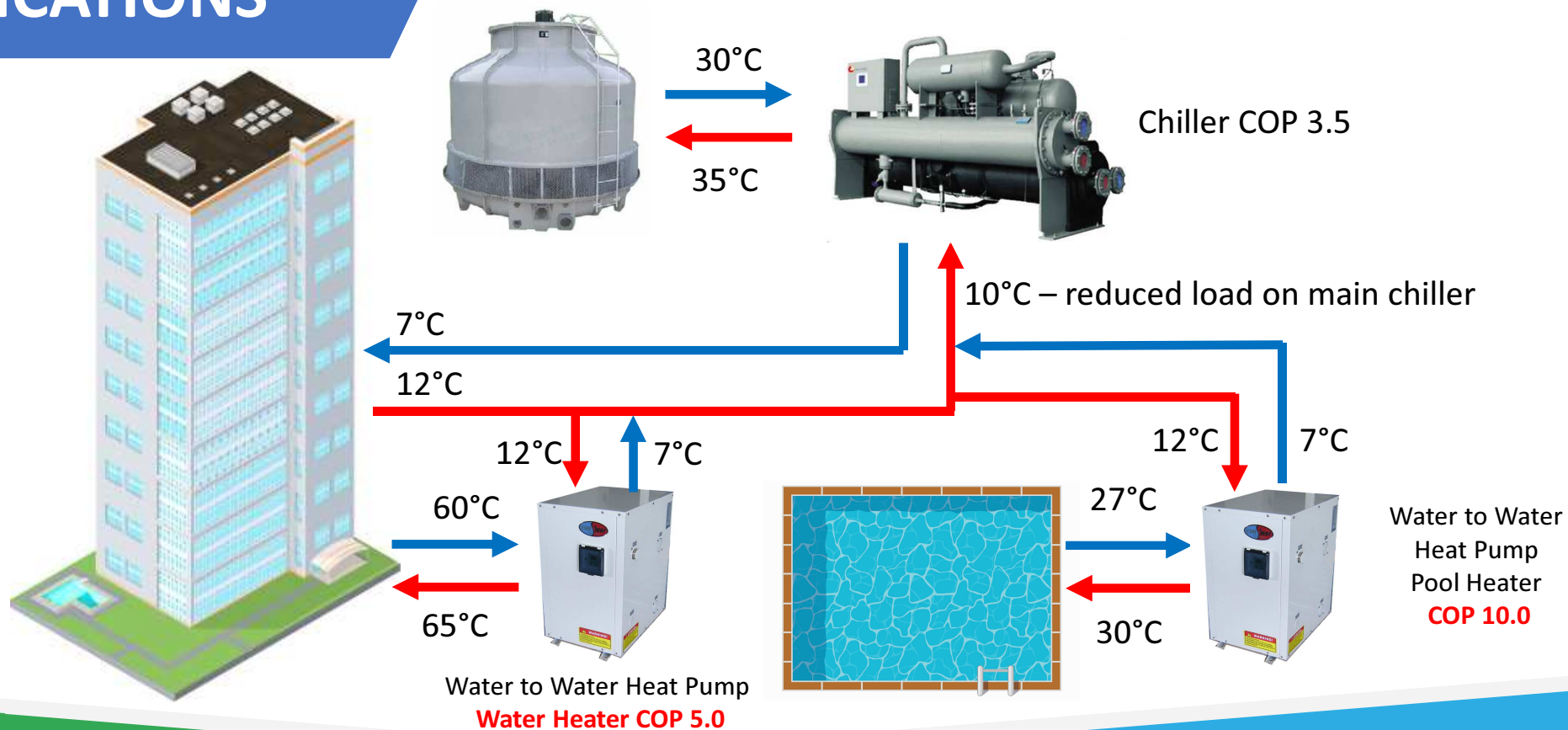
COMMERCIAL APPLICATIONS



COMMERCIAL APPLICATIONS

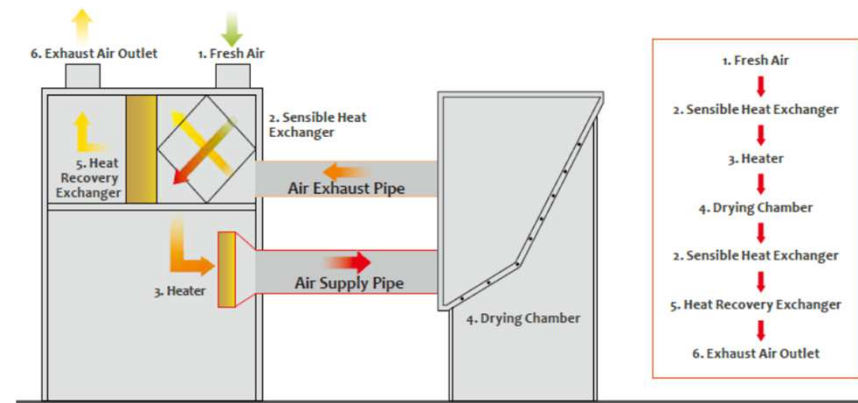
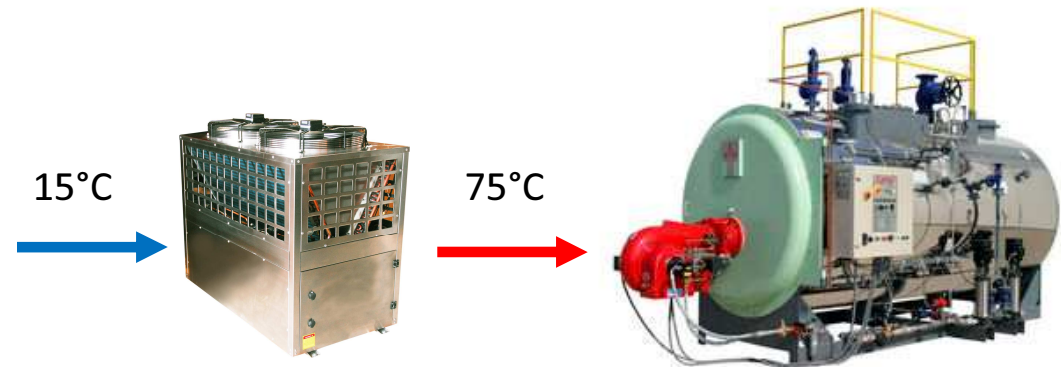


COMMERCIAL APPLICATIONS



INDUSTRY APPLICATIONS

- Steam Boiler feedwater preheat
- Hot Water Boiler preheat/replacement
- Heat Pump Heat Recovery Dryers
- Other Heat Recovery applications



CASE STUDY

19 EvoHeat
CS200 – GEN2
Heat Pumps
installed

Providing up to
3,800kW heating



HEATING 30 RIDES, SLIDES, POOLS



CASE STUDY

Reduction in
running costs of
over 70%

Reduction in in
carbon emissions
by over 35%



CASE STUDY

4MW LPG steam boiler

80,000 litres of feedwater
per day

Boiler Efficiency 80%

Boiler Feedwater Preheat

80,000L/day

Temp Difference 50°C

Thermal Required 4,656kWh



Existing LPG Boiler

80% Efficiency

838 Litres required

\$0.86/Litre

Cost Per Day \$720.68



Air Source Heat Pump

Average COP 3.0

1,552kWh Electrical

\$0.15/kWh

Cost Per Day \$232.80

Savings per day \$487.88

% Savings 68%



NEXT STEPS

1. **Contact a Professional Energy Auditor or Solution Provider**
2. **Develop an Efficiency Upgrade Plan**
3. **Attain buy-in from all key decision makers**
4. **TAKE ACTION!!!!**





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