The Renewable Solutions Provider

Making a World of Difference

Heating

Air Source Heat Pumps

MITSUBISHI ELECTRIC

LIVING ENVIRONMENTAL SYSTEMS

Air Conditioning | Heating

Ventilation | Controls

ecodan®

Renewable Heating Technology

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

Contents

What is renewable?

European Union has defined “renewable” under a directive/ law:

“The Renewable Energy Source Directive” (RES)

It is European law that allows all 27 member states to contribute towards worldwide agreed targets by choosing which technology mix makes sense to them

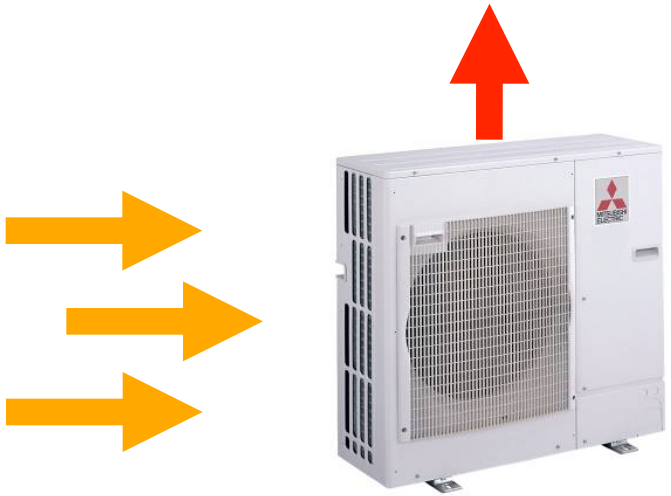
What is renewable?

“Heat pumps enabling the use of aerothermal, geothermal or hydrothermal heat at a useful temperature level need electricity or other auxiliary energy to function. The energy used to drive heat pumps should therefore be deducted from the total usable heat. Only heat pumps with an output that significantly exceeds the primary energy needed to drive it should be taken into account.”

What is a Heat Pump?

*A **heat pump** is a device that moves heat from one location (the 'source') at a lower temperature to another location (heat sink) at a higher temperature*

High temp heat output



Air Source Heat Pumps

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

- An air source heat pump extracts heat from the outside air in the same way that a fridge extracts heat from its inside. It can get heat from the air even when the temperature is as low as -20ºC.
- Heat pumps have some impact on the environment as they need electricity to run, but the heat they extract from the ground, air or water is constantly being renewed naturally

Understanding Refrigerant

What is water's boiling point?

100ºC

What is R410A refrigerant's boiling point?

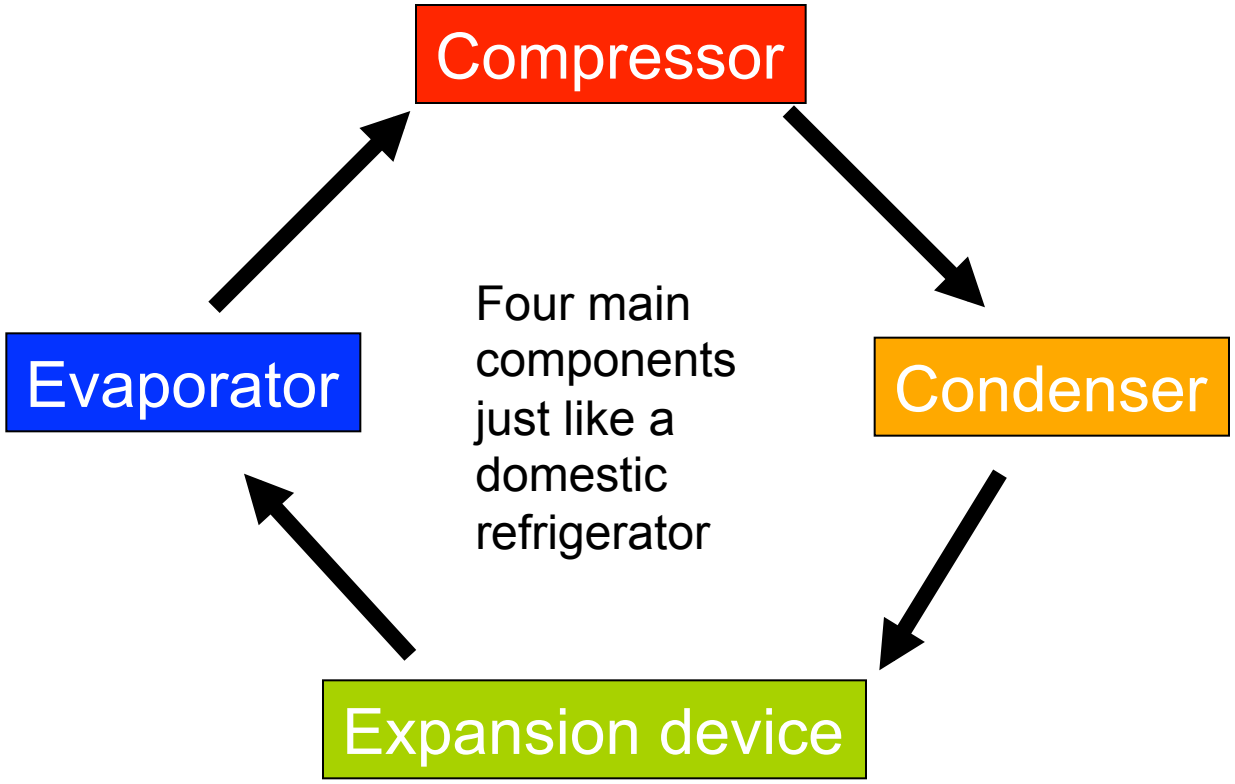
-50 ºC

This allows the heat pump to generate heat, even when the outside temperature is in minus temperatures

Technology

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

Heat Pump Components

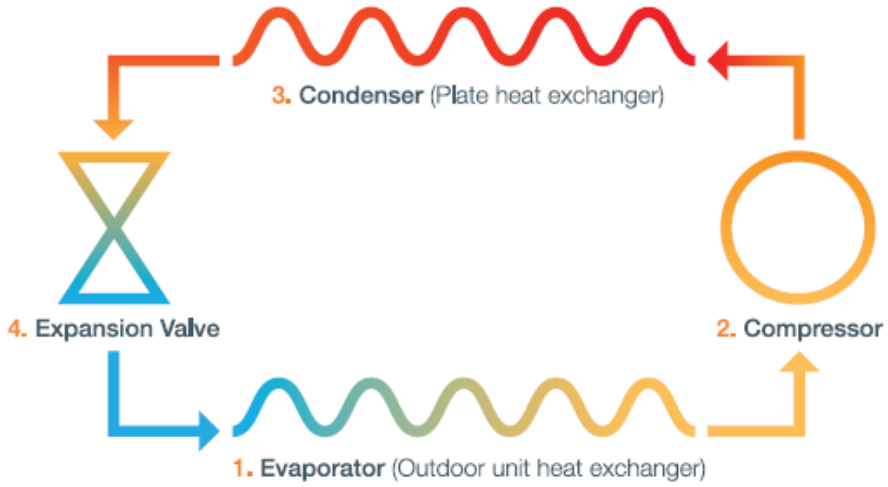


How a Heat Pump Works

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

STEP 1. Evaporator (Outdoor unit heat exchanger)

- Cool low pressure liquid refrigerant passes into the evaporator
- Heat energy from outside air passes over the evaporator via a fan
- This causes the refrigerant to increase in pressure and change to a warm vapour

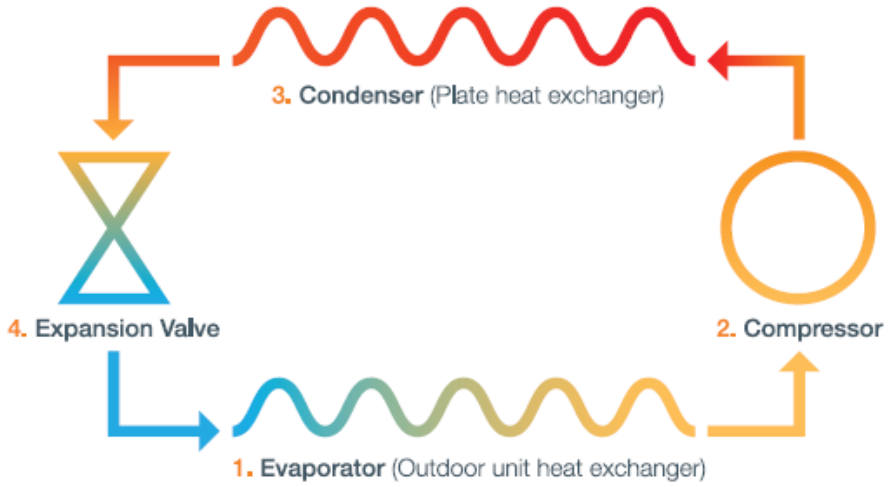


How a Heat Pump Works

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

STEP 2. Compressor

- The warm vapour enters the compressor
- The compressor squeezes the refrigerant and increases the pressure further changing it to a hot high pressure gas
- The temperature increases typically to 60°C as a result of the compression process

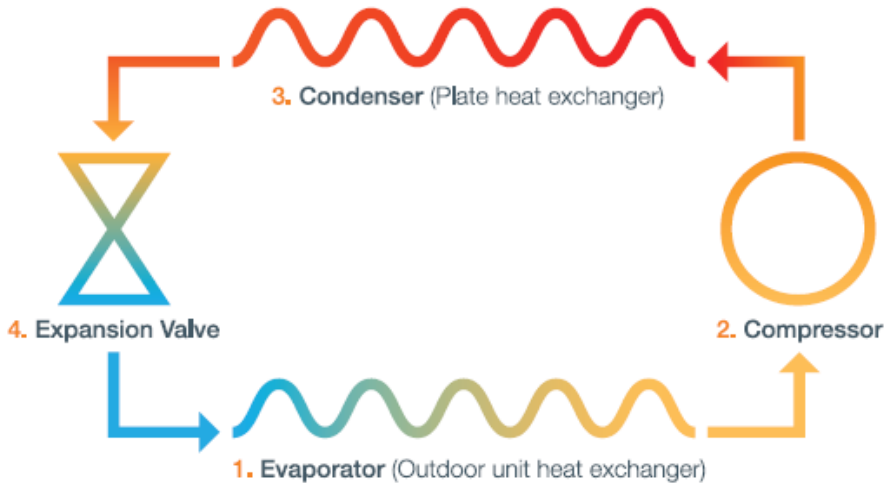


How a Heat Pump Works

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

STEP 3. Condenser (Plate heat exchanger)

- The hot refrigerant gas condenses as it passes through the plate heat exchanger
- Heat is transferred to the cooler water side of the plate heat exchanger and into the primary water circuit
- As it condenses the refrigerant cools and changes from a gas back into a cool vapour

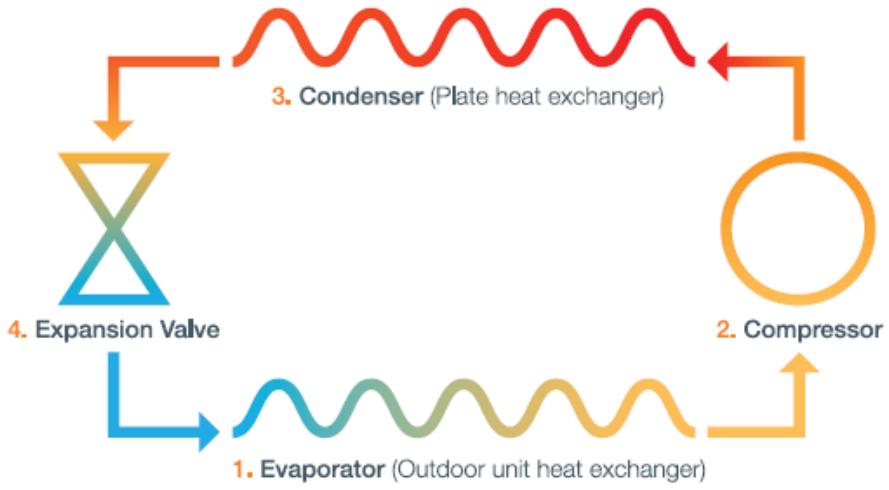


How a Heat Pump Works

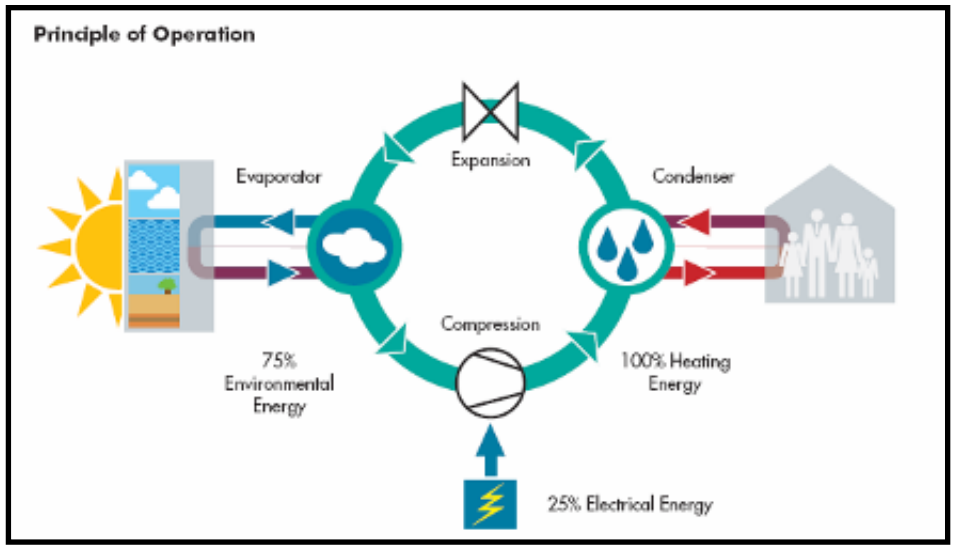
MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

STEP 4. Expansion Valve

- The cool vapour refrigerant must lower in pressure
- The refrigerant passes through an expansion valve to reduce the pressure
- As the pressure drops a further drop in temperature occurs, returning refrigerant to its initial state of a cool low pressure liquid



How does a Heat Pump work?



Conventional refrigeration technology

Large volume of low grade heat from the environment converted to a higher grade heat

¾ environmental energy

+

¼ electrical energy

1kWh electrical energy in = 3-4kWh heating energy out

300-400% efficiency

Coefficient of Performance

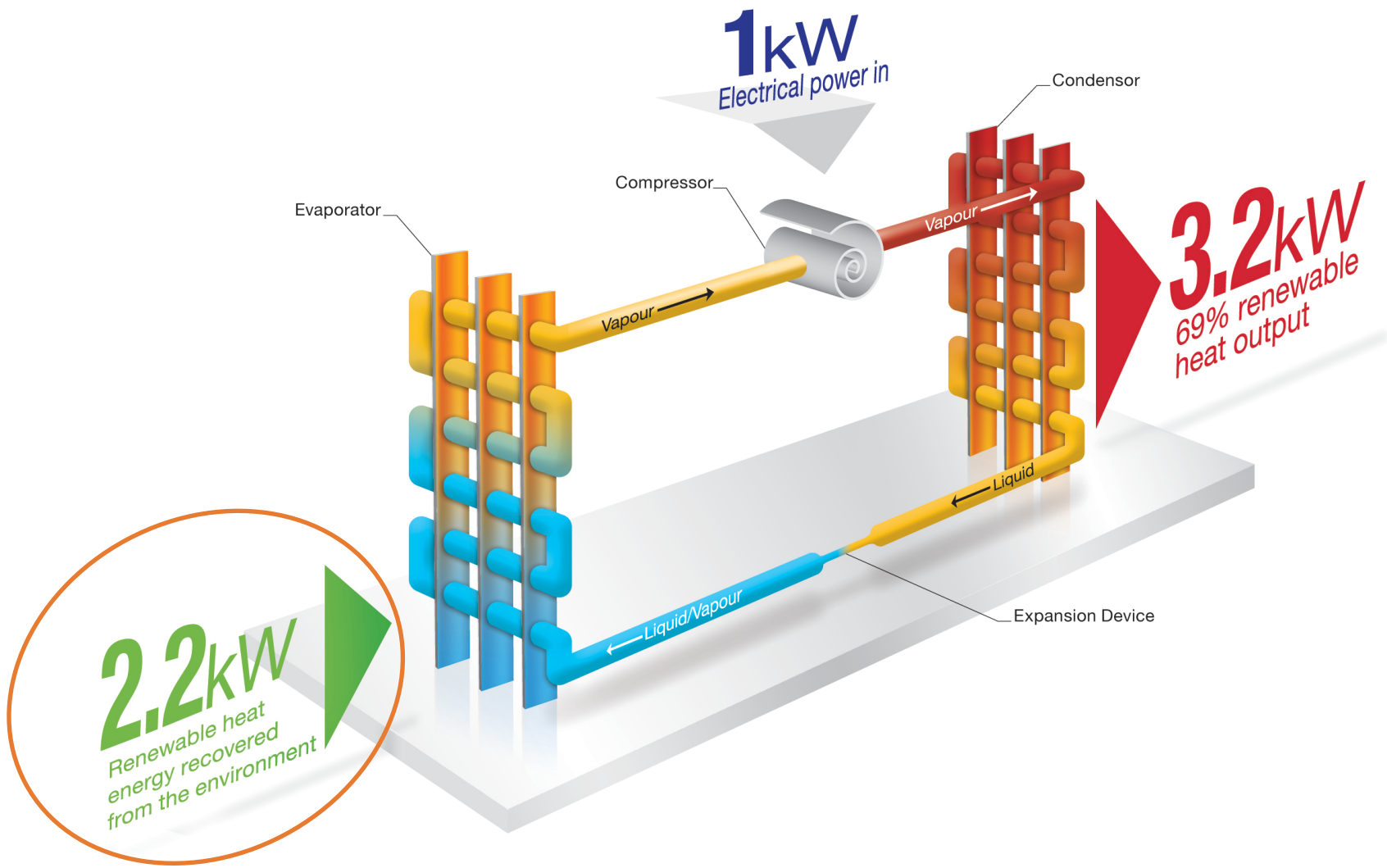
COP - Expression of heat pump efficiency

Ratio between electrical energy used and heat delivered

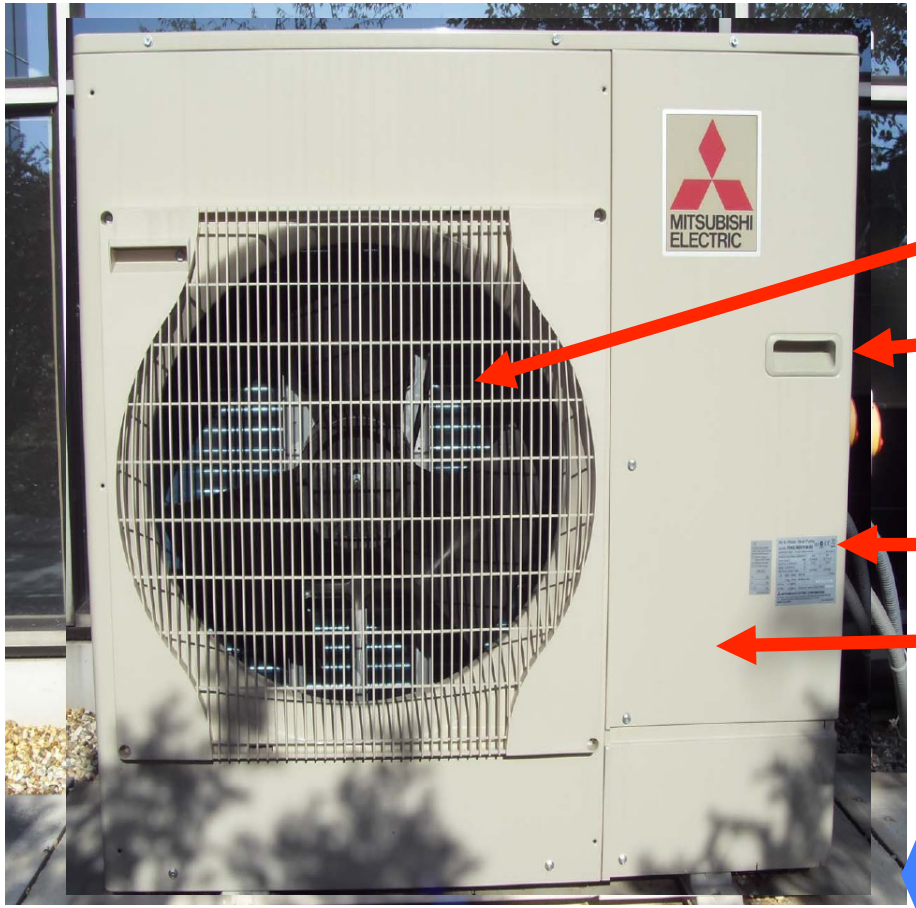
= CoP of 4 (100% heating energy)

‘Free’ Renewable Heat Energy

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS



Packaged Unit Heat Pump Components



Air Source Heat Pump

Evaporator

Expansion Valve

Plate heat exchanger

Condenser

Compressor

Water return

Water flow

Types of Heat Pumps

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

Ground Source

Uses a collector buried in the ground to absorb heat

- Collector can be mounted horizontally (requires large land area)

Air Source

Collects heat from the ambient air

No expensive collectors to install (collector integrated into heat pump)

Ground Source Heat Pumps

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

Usually give a slightly higher CoP in colder climates (due consistent heat source temperatures)

More expensive to install

Considerations

- Ensure collector is sized and designed correctly
- Ensure the ground collector is installed correctly

Types of collector

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

Installation horizontal collector:

Installation vertical collector:

Air Source

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

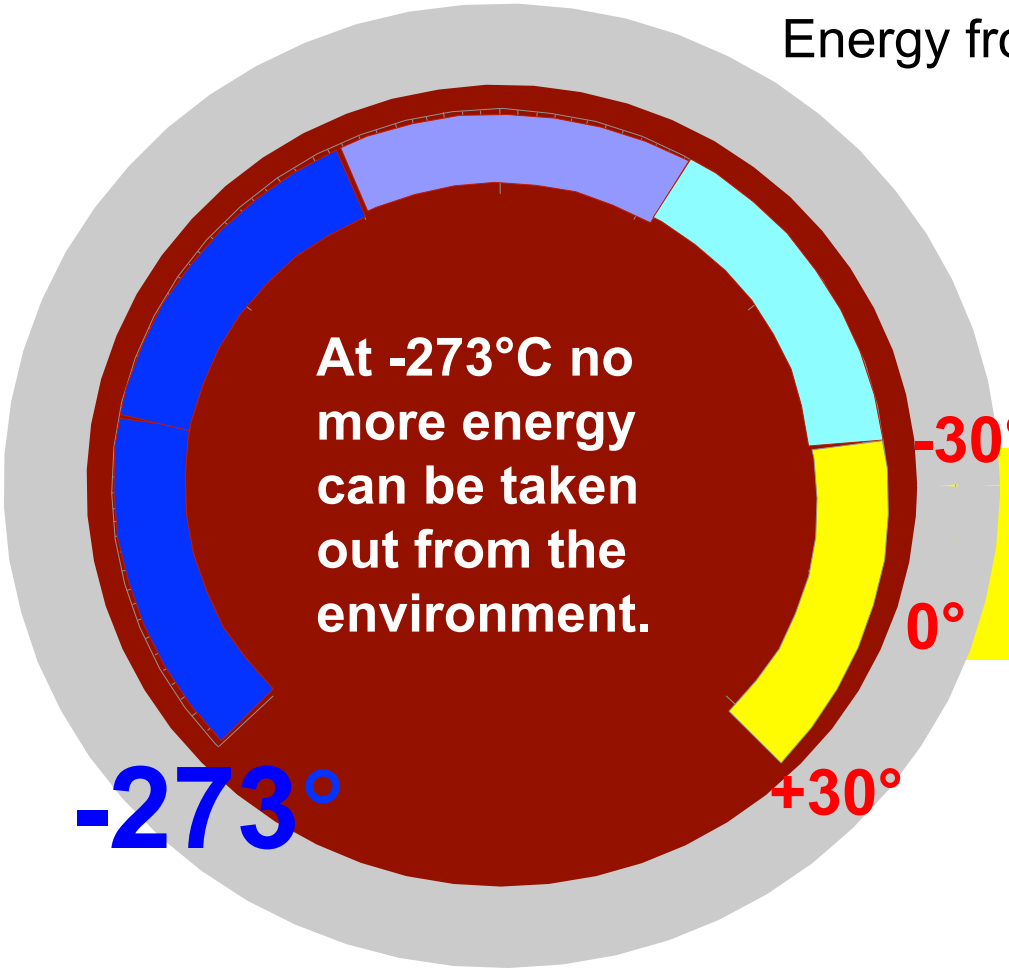
- Lower installation costs (Easier to fit)
- No need for large area or expensive boreholes
- Easier to retrofit
- Good CoP's achieved in Ireland due to relatively high ambient air temperatures +6ºC (compared to central Europe)
- Operate in efficiently even in temperatures as low as -20ºC

Air Source Heat Pumps

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

Energy from the air at low temperatures

- Absolute zero = -273°C
- = 0 K



air is full of energy

Monobloc / Split Comparison

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

EHPX-VM2B

2 x 1” Water connections

Water

PUHZ-W85VHA2
Monobloc

EHSC-VM2B

Refrigerant

2 x Refrigerant connections

SW40 ½” & ¼”
SW75 ⅜” & ⅝”
SW120 ⅜” & ⅝”

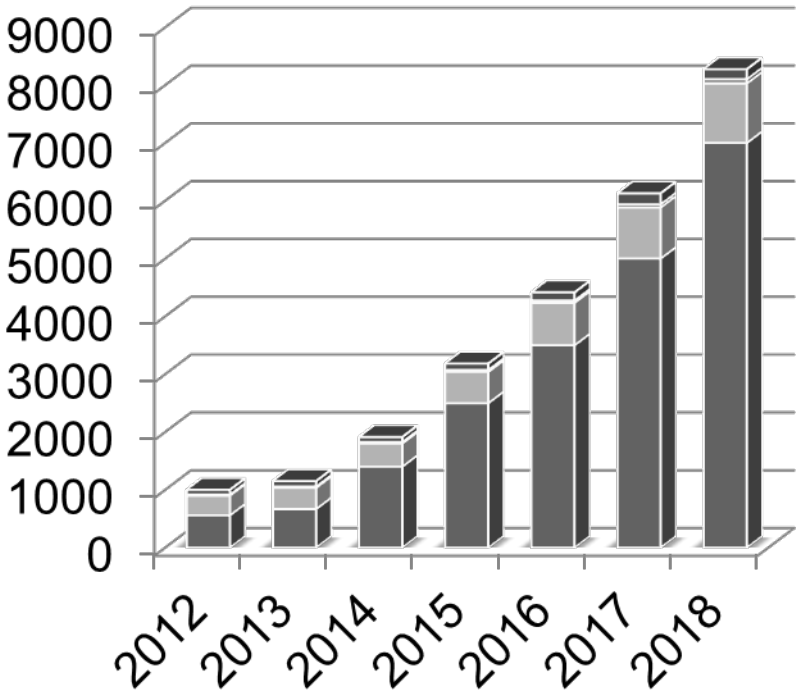
PUHZ-SW75VHA
Split

Market Drivers

- Climate Change
- Fuel Poverty (escalating costs)
- Security of Supply
- New Building regulations (Part L)

Heat Pump Market

- Was traditionally the one off Self-builder market
- Was usually larger heat pumps to suit larger houses
- Peaked 2007 with over 4000 units (75% Geothermal 25% Air source)
- Trend now going towards smaller better insulated houses – leading to an increased demand for smaller ASHP.
- Market starting to expand driven by Building regulations (Part L)
- Strong growth in the retrofit sector



Part L background

- 2008 revision 40% improvement on 2005 regulations
- 2011 revision 60% improvement
- Renewable energy requirement 10 W/m²
- EPC reduced to 0.4 (Energy Performance coefficient)
- CPC reduced to 0.46 (Carbon Performance coefficient)
- Heat Pumps can help achieve the new targets

2005 Compliance

Oil

or

Gas

= Compliance

2005 Compliance easy with an oil or Gas boiler

2008 Compliance

or

+

= Compliance

- 40% improvement in Carbon and Energy performance over 2005 regulations
- Compliance by adding solar panels

2011 Compliance

or

+

= Compliance

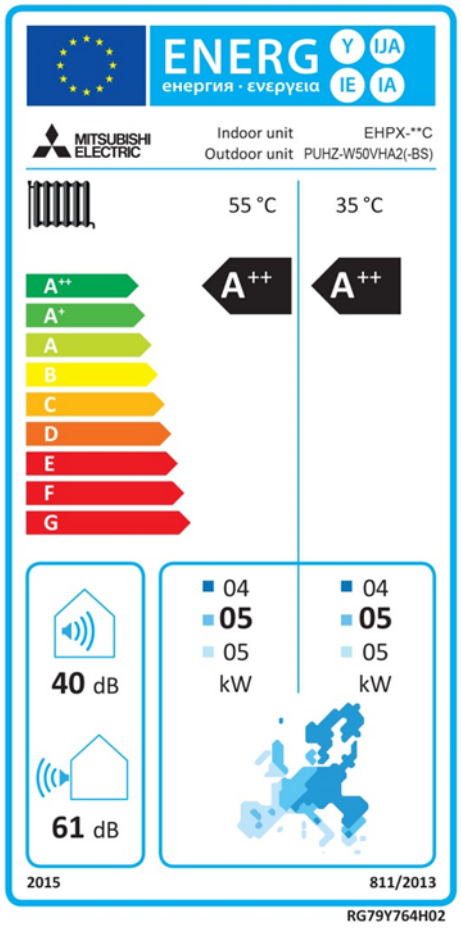
60% improvement in Carbon & Energy performance over 2005 regulations
Even more solar needed

2016 Compliance the Smarter Way

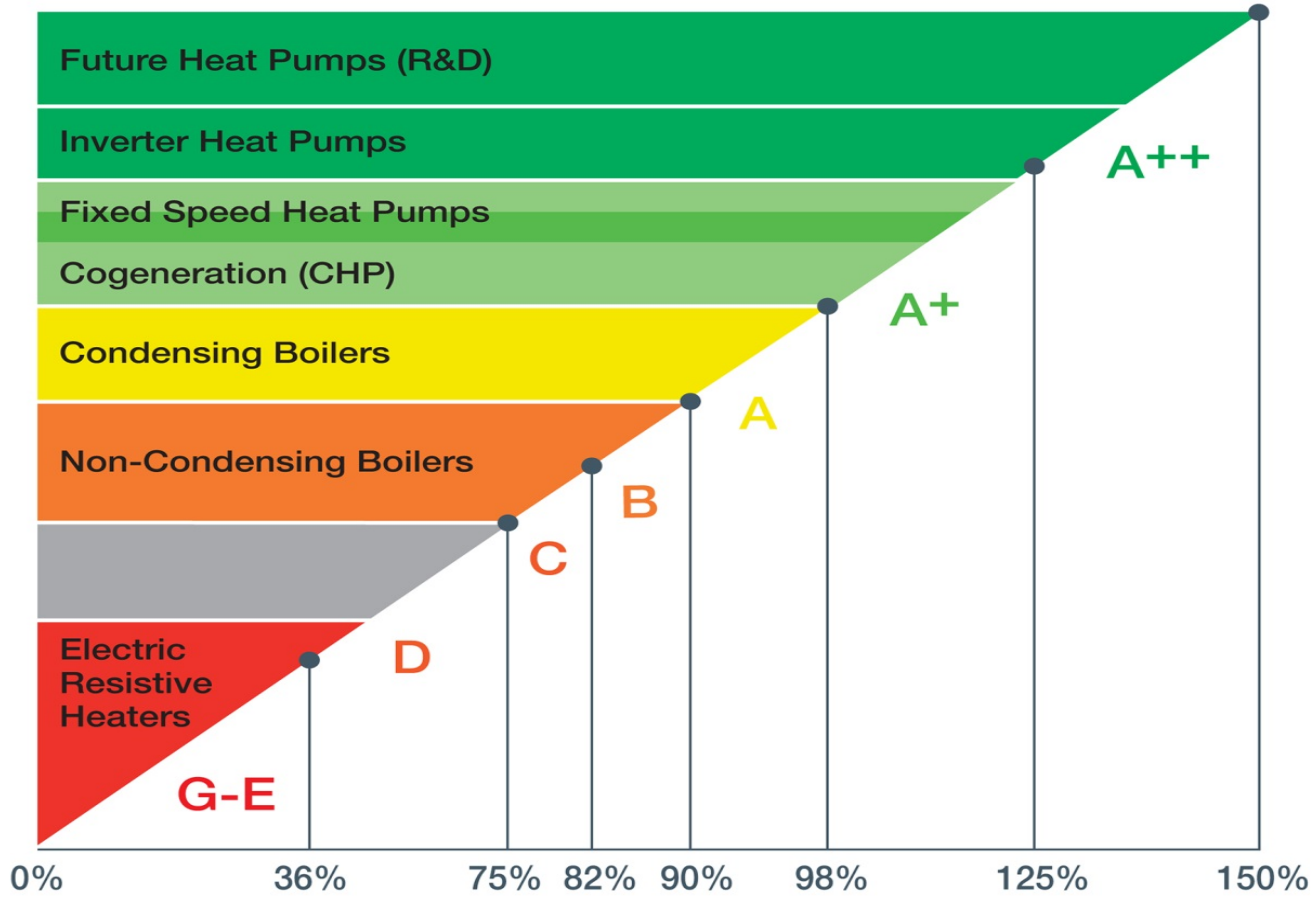
MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

- DEAP now recognised as Part L compliance tool.
- SEAI Launch new Heat Pump Calculator for DEAP
- New ErP Labeling for Heat Pumps
- A++ Highest Rating
- Compliance now with Heat Pump only

ErP A++



Using labels to compare technologies



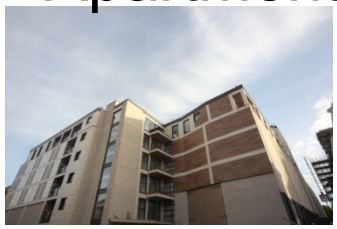
MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

Applications

New Housing

Schools

Apartments



Agricultural

Hotels

Leisure

Nursing Homes

NHI nursinghomesireland

Retrofit

Summary - Heat Pump Benefits

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS

- Cost effective way to meet Part L
- Low carbon heating solution
- Lower running cost than conventional heating systems
- Lower maintenance charges
- Provide 100% of heating & DHW demand
- Lower impact from fuel cost increases
- Proven Technology

Thank you

MITSUBISHI ELECTRIC
LIVING ENVIRONMENTAL SYSTEMS