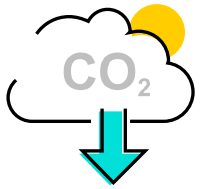
Decarbonization in industry

Theodoros Venetis
TRANE Ελλάς

TRANE TECHNOLOGIES

KEY TERMINOLOGY



De-carbonization

Any process that removes carbon in the atmosphere or prevents carbon from being emitted

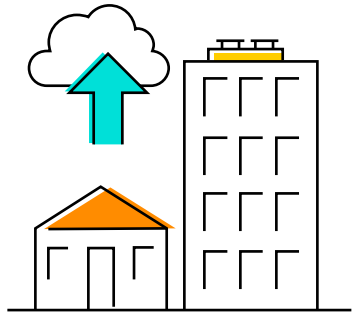
Carbon Neutral

GHG released into atmosphere

=

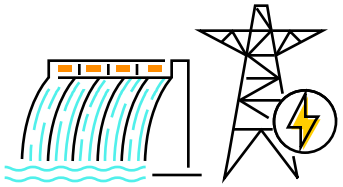
GHG removed from atmosphere

An Occupied Building's Emission Sources



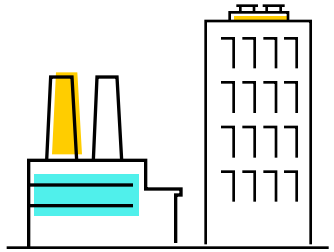
Direct (Scope 1):
Emissions related to on-site process
Fossil fuel used for heating | Refrigerant leak

Indirect (Scope 2):
Emissions related to off-site electricity production



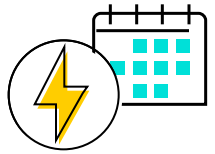
Electric Grid Supply Side

Sources of electricity that is transmitted to customer end users



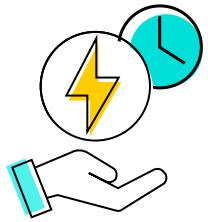
Electric Grid Demand Side

Everything connected to the electric grid that consumes electricity



Electricity Consumption

Amount of electricity used over a period of time (kWh/month)



Electricity Demand

Rate of electricity consumption at any single moment in time (kW)

Peak Demand = highest single rate during billing period

TRANE TECHNOLOGIES

BUILT ENVIRONMENT STATUS

Current State

- *Operating in a Carbon intense electric grid*
- *High use of fossil fuel*
- *Energy demanding buildings*
- *High GWP refrigerants*

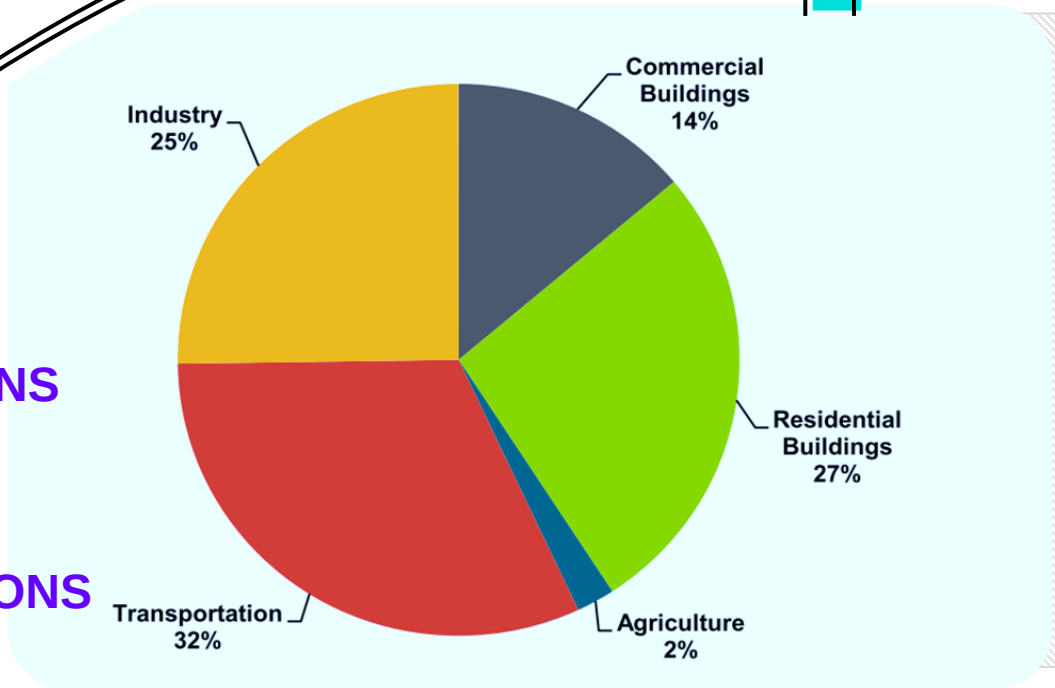
Ideal Future State : Carbon Neutral

- *Net zero carbon electric grid*
- ***Little to no fossil fuel use***
- ***Low GWP refrigerants***

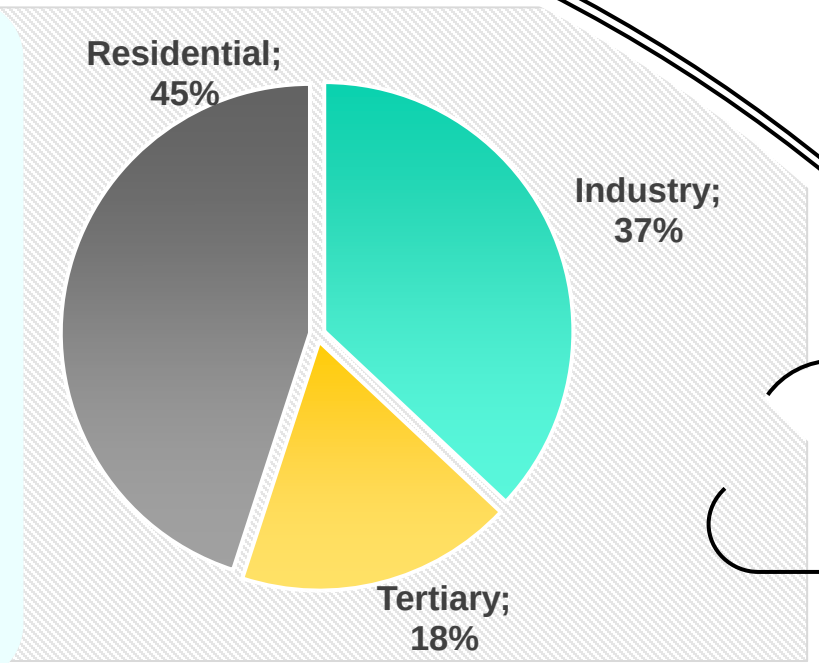
CO_2

DIRECT EMISSIONS

INDIRECT EMISSIONS



TOTAL ENERGY CONSUMPTION PER SECTOR IN EU



ENERGY CONSUMPTION FOR COOLING AND HEATING PER SECTOR IN EU

CO_2

TRANE TECHNOLOGIES

A/C HEATING

YTD 2024	MARKET QTY 2024			
	50-350kW	350-700kW	>700kW	Total
Czech Republic	81	25	0	106
France	1740	291	2	2033
Germany	1886	158	7	2051
Greece	387	65	4	456
Hungary	294	101	3	398
Italy	3992	461	62	4515
Netherlands	764	71	3	838
Poland	239	6	0	245
Russia	4	0	0	4
Spain	1752	279	15	2046
Sweden	58	1	0	59
United Kingdom	757	263	20	1040
Austria	295	19	0	314
Ceebr Distributors	569	74	10	653
Ireland	78	34	21	133
Israel	48	35	13	96
Portugal	257	37	1	295
Romania	96	19	1	116
Switzerland	103	7	1	111
Turkey	57	38	6	101
Belgium	362	96	4	462
Croatia	185	28	2	215
Slovakia	35	1	0	36
EUROPE	**14039**	**2109**	**175**	**16323**

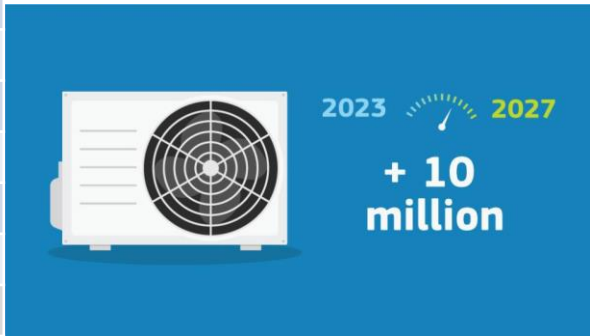
A/C Cooling

YTD 2024	MARKET QTY 2024			
	50-350kW	350-700kW	>700kW	Total
Czech Republic	84	40	25	149
France	1049	290	258	1597
Germany	1347	249	163	1759
Greece	132	45	33	210
Hungary	132	40	9	181
Italy	1477	384	226	2087
Netherlands	378	100	120	598
Poland	385	113	55	553
Spain	607	216	156	979
Sweden	208	39	24	271
United Kingdom	548	213	178	939
Austria	162	32	7	201
Ceebr Distributors	615	177	115	907
Ireland	68	34	55	157
Israel	146	150	114	410
Portugal	122	34	33	189
Romania	276	66	29	371
Switzerland	94	15	13	122
Turkey	165	188	307	660
Belgium	250	69	35	354
Croatia	61	12	8	81
Slovakia	46	18	6	70
EUROPE	**8367**	**2535**	**1986**	**12888**

Eurovent Europe 2024

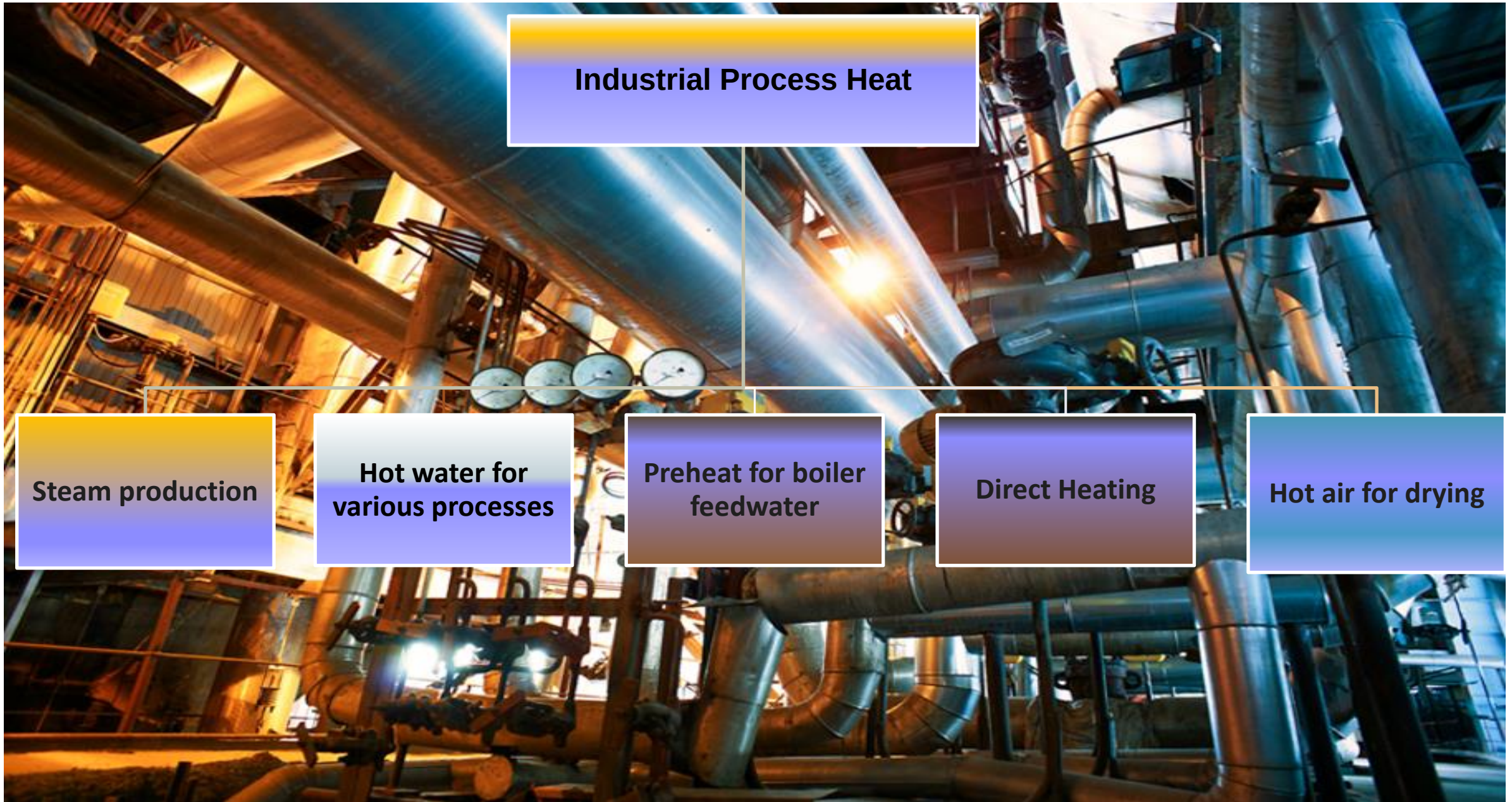
< 50 KW is $220M

750 000 more installers are needed and at least **50%** of existing installers will have to be reskilled to work with heat pumps.

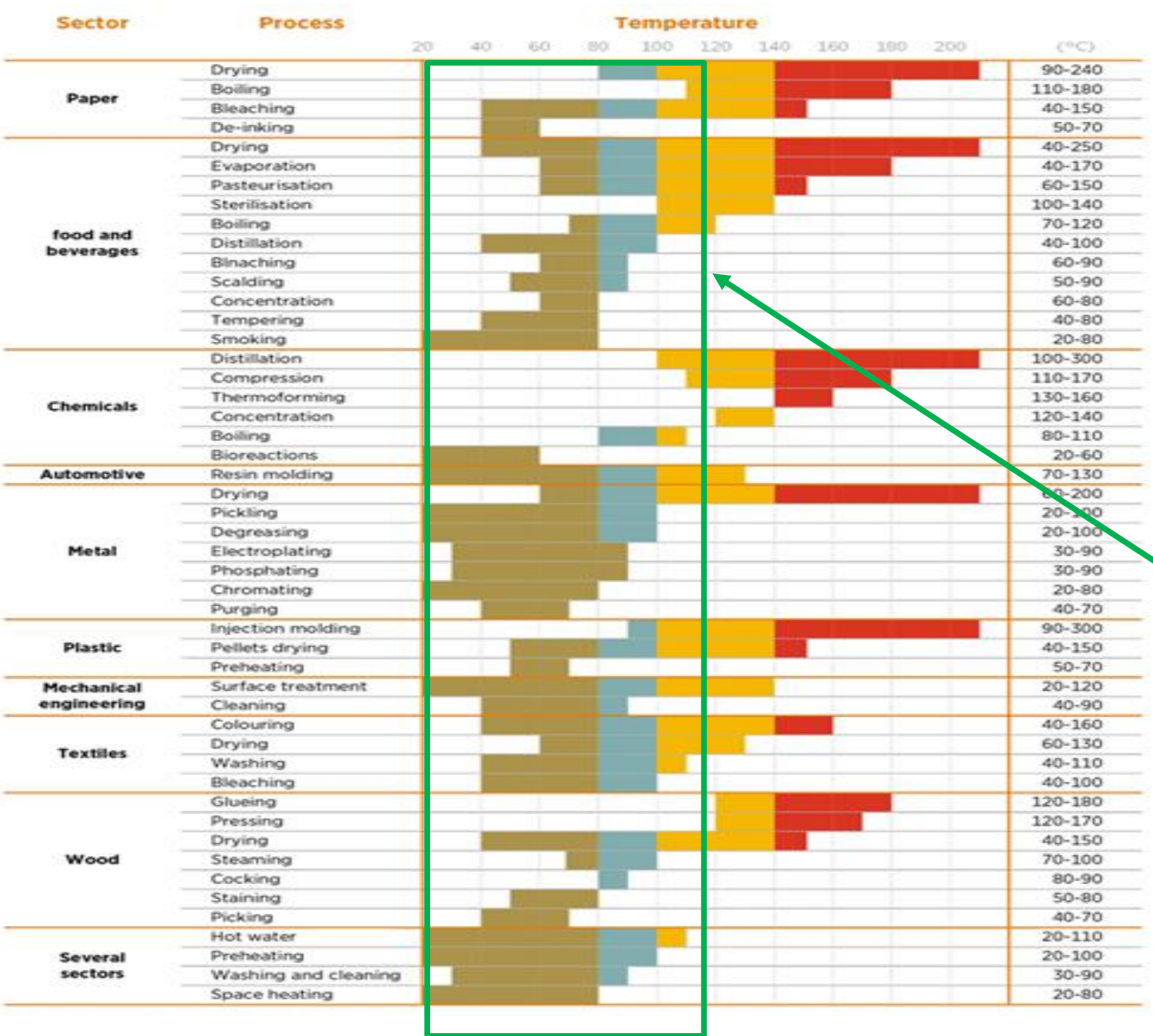


Industrial Process Heat Fundamentals

- **Industrial Process Heat**: thermal energy used to produce, treat, or alter manufactured goods



Process Heat Temperatures per Industry



Heat Pump application range

PROCESS HEAT REQUIREMENTS

- < 100 °C **: 9%**
- 100°C to 200°C : **21%**

INDUSTRIAL SECTORS

- Food & Beverage
- Pharmaceutical / Chemicals
- Paper & Wood
- Plastic
- Textile, Leather, Clothing

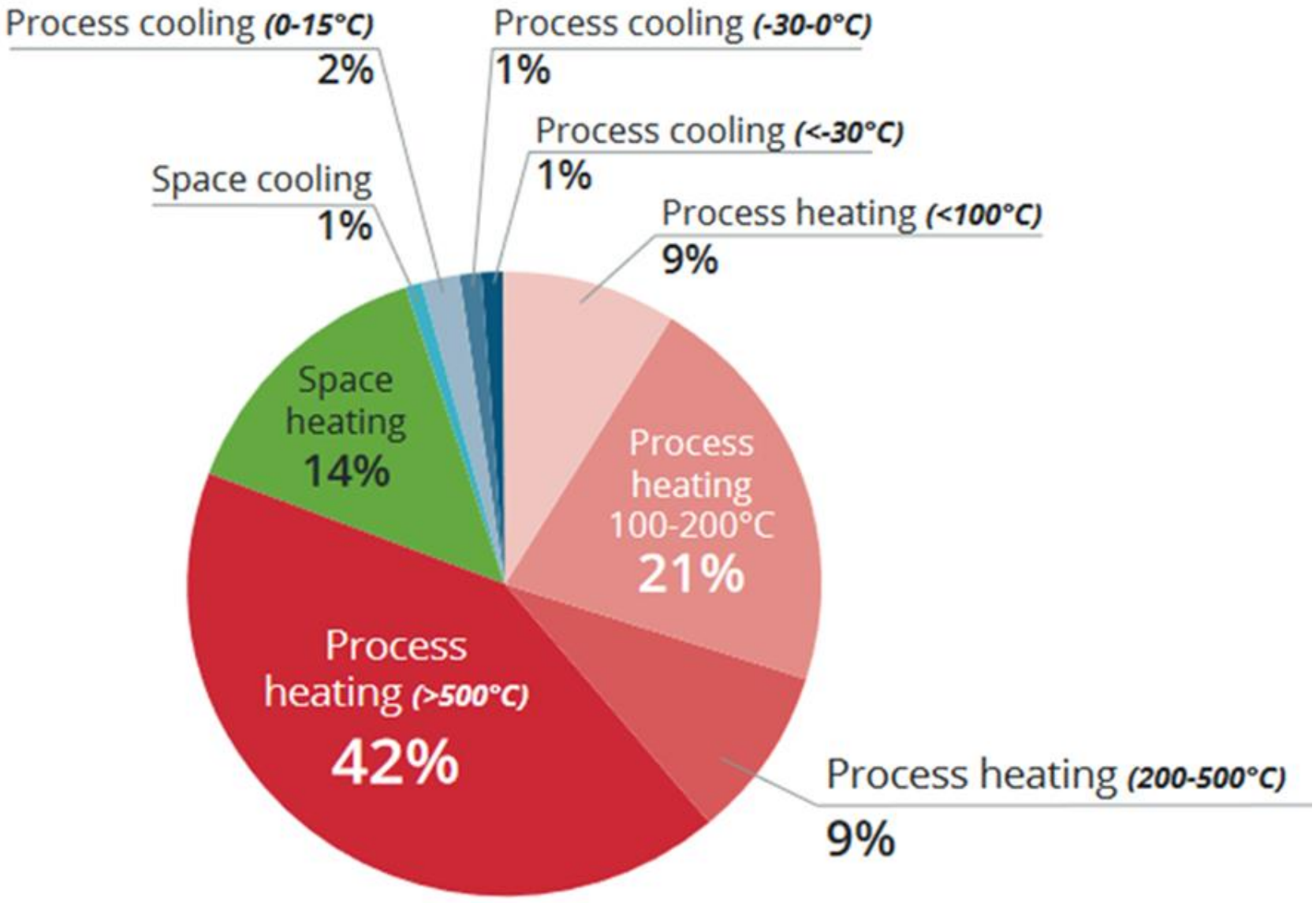
TRANE TECHNOLOGIES

EU Industrial Process Heat Facts

- **Demand :** 81% of the thermal energy demand is consumed for industrial process heating purposes

- **Source :** Mainly the process heating is produced by fossil fuels (coal, oil and gas)

- **Emissions** : accounting for around 552 Mt CO_2 emissions per year



Industry heating and cooling demands as analyzed by the Heat Roadmap Europe

TRANE TECHNOLOGIES

DE-CARBONIZATION PATH IN BUILT ENVIRONMENT

1

MINIMIZE INDIRECT EMISSIONS

BUILDING LEVEL

Building Envelope Improvement

Enhance entire building's thermal insulation

Install Building Automation System

Real-time responsive electricity demand management SMART BUILDING

2

ELIMINATE DIRECT EMISSIONS

PRODUCT LEVEL

Upgrade to High Efficiency Equipment

Maximize energy efficiency of components

Electrify Heating

Displace on-site fossil fuel use

On-site Renewable Generation

Reuse and Repurpose the thermal energy

Refrigerant Management

Low-GWP transition + Reduced Refrigerant mass in building

NET ZERO

CO_2

CARBON ECONOMY

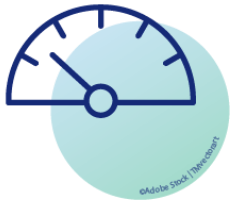
TRANE TECHNOLOGIES

REPowerEU at a glance

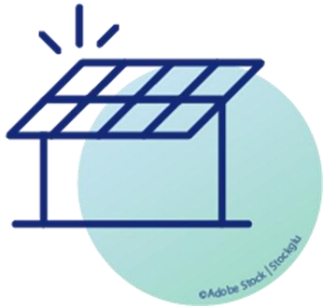
- save energy
- diversify energy supplies
- produce clean energy

Key achievements

Produced more electricity from wind and solar than from gas for the first time ever

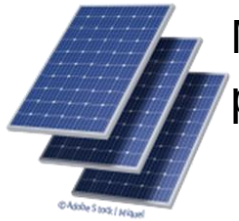


Reduced gas consumption by 18%



Rapidly increased renewable energy installation

Overcome our dependency on Russian fossil fuels

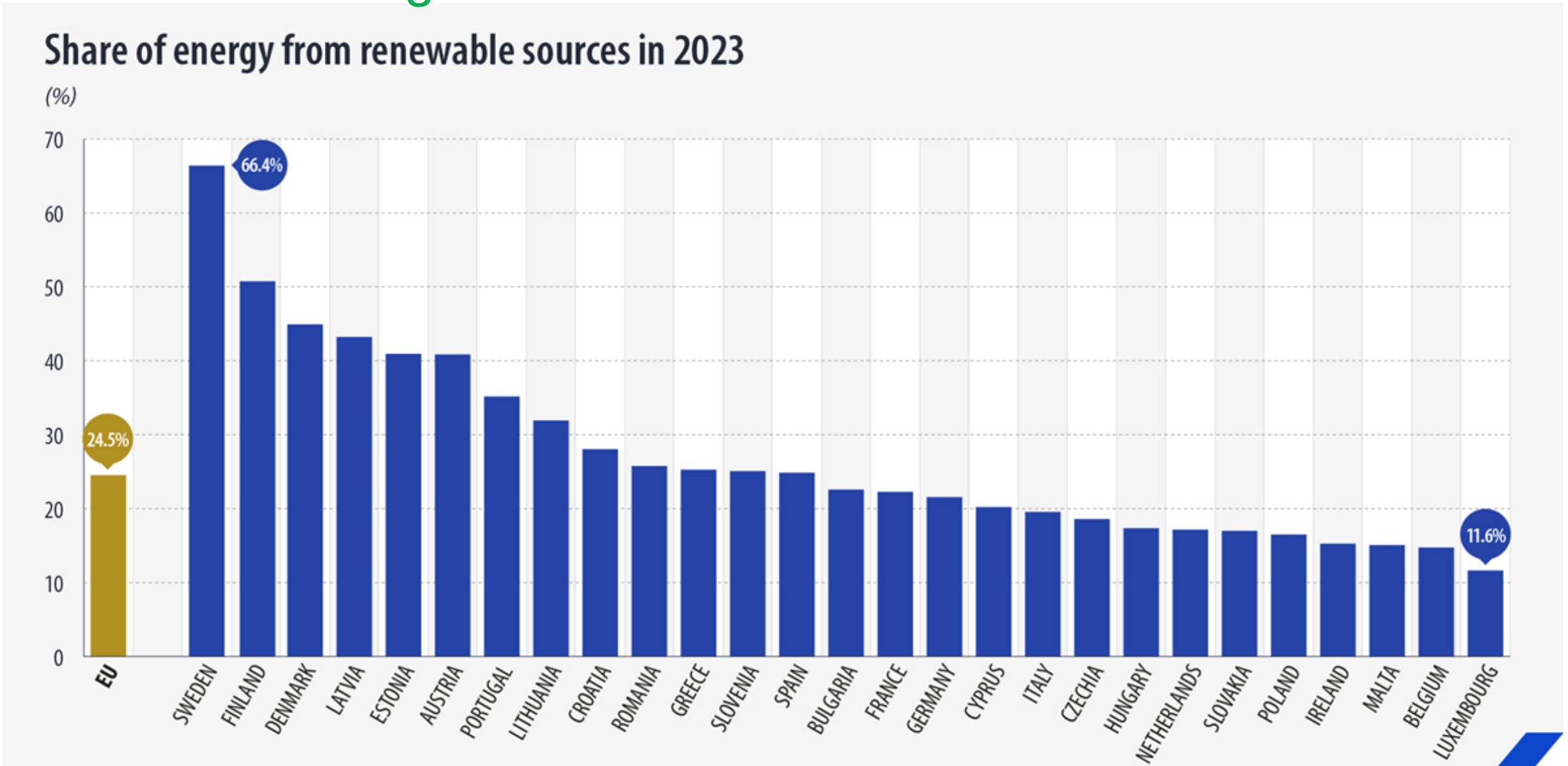


More than double the amount of solar energy produced since 2019

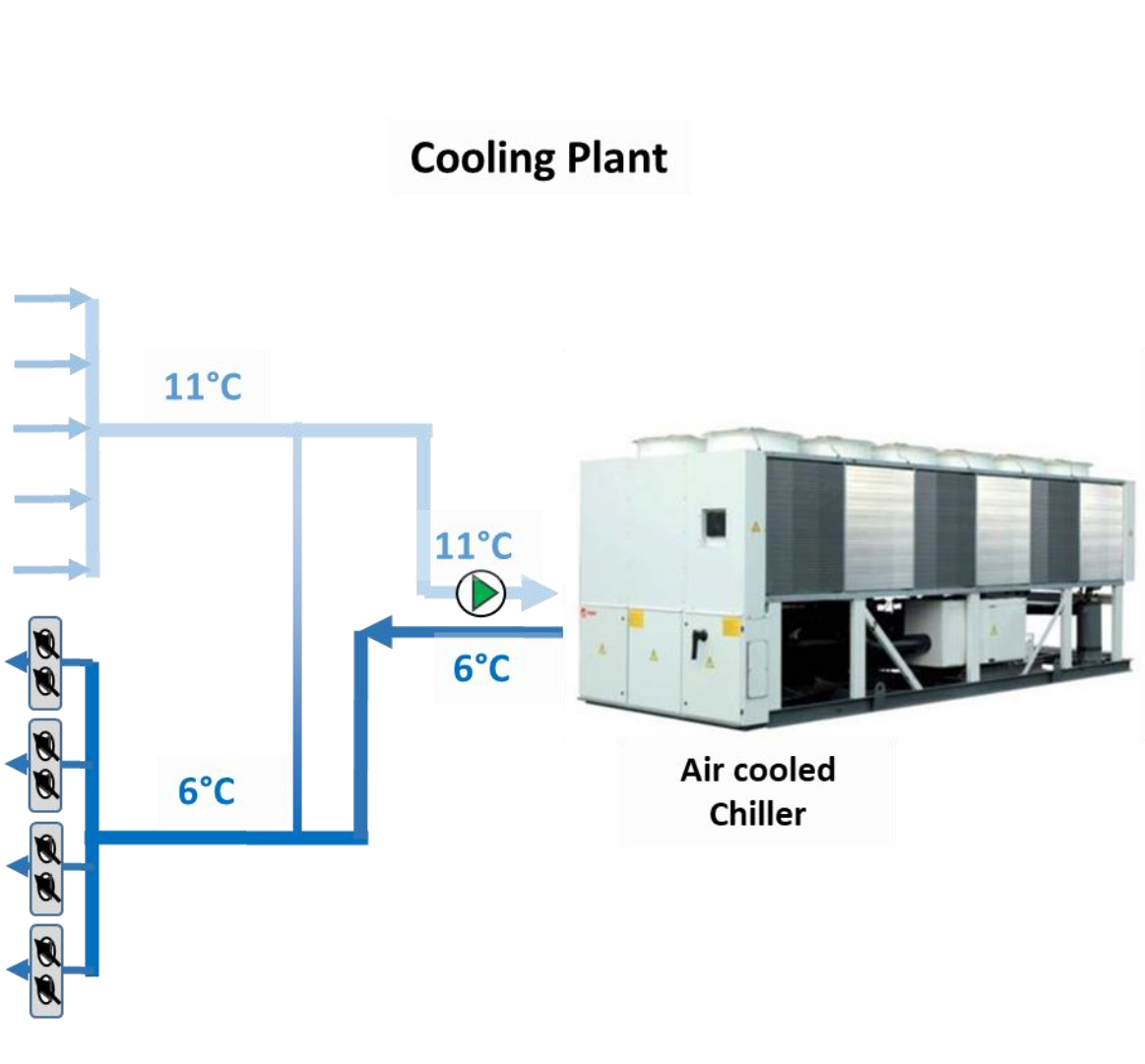
Ensured access to secure and affordable energy

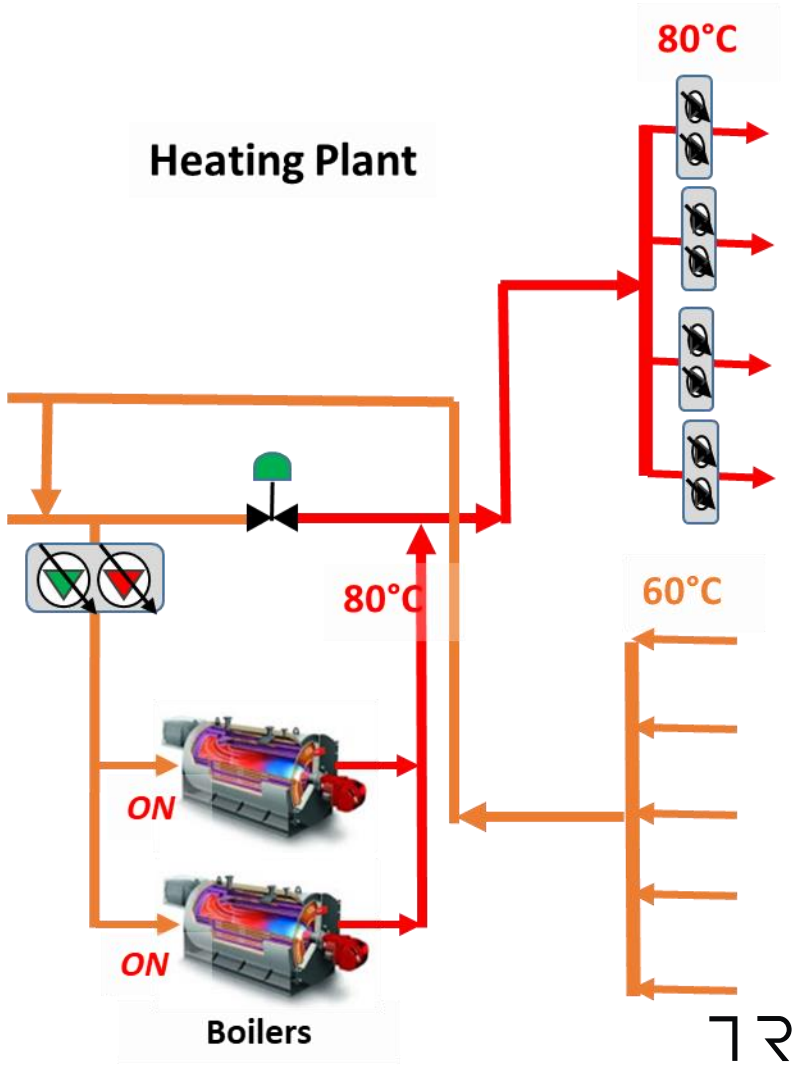
More electricity from renewables than gas produced for the first time in 2022

REPowerEU at a glance



ELIMINATE DIRECT EMISSIONS





TRANE
TECHNOLOGIES

ELIMINATE DIRECT EMISSIONS

Air Cooled Heat pumps

OR

Water to Water Heat pumps

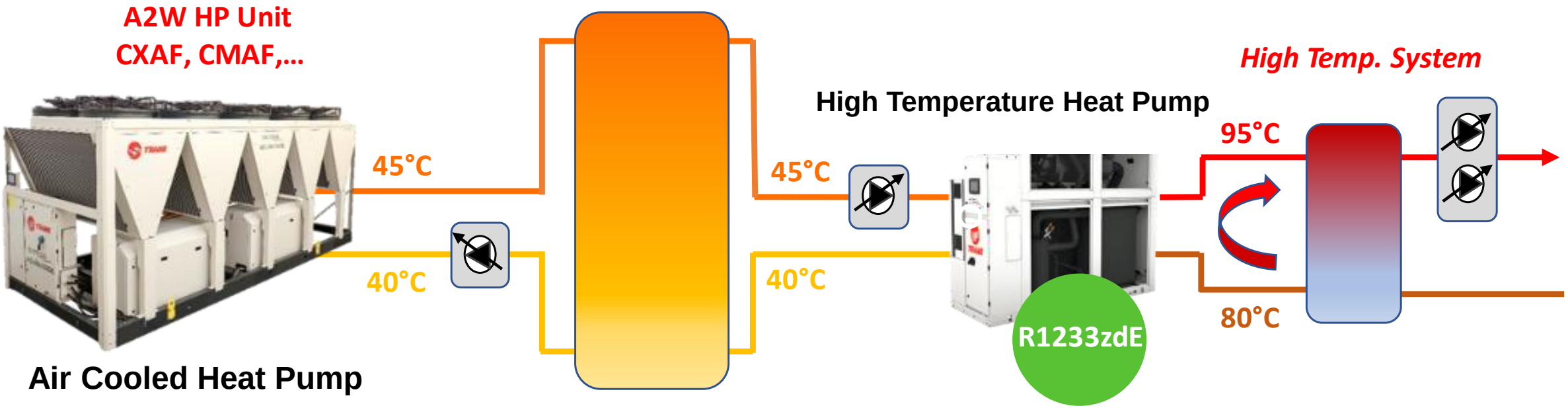
Air Cooled Multi-pipe units

AND

TRANE TECHNOLOGIES

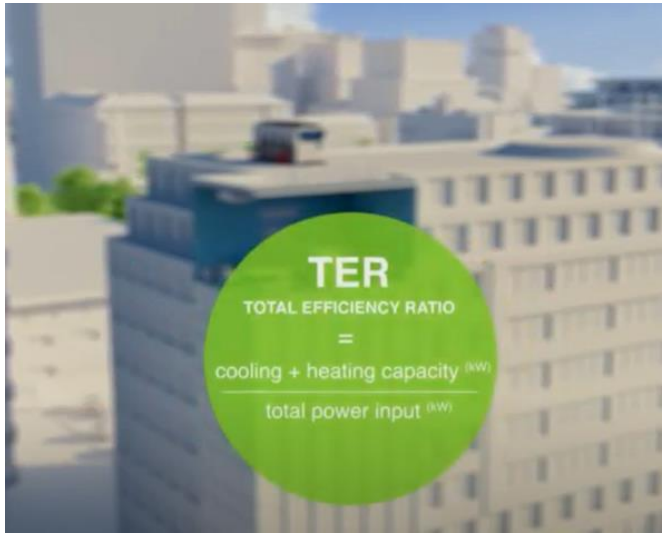
ELIMINATE DIRECT EMISSIONS

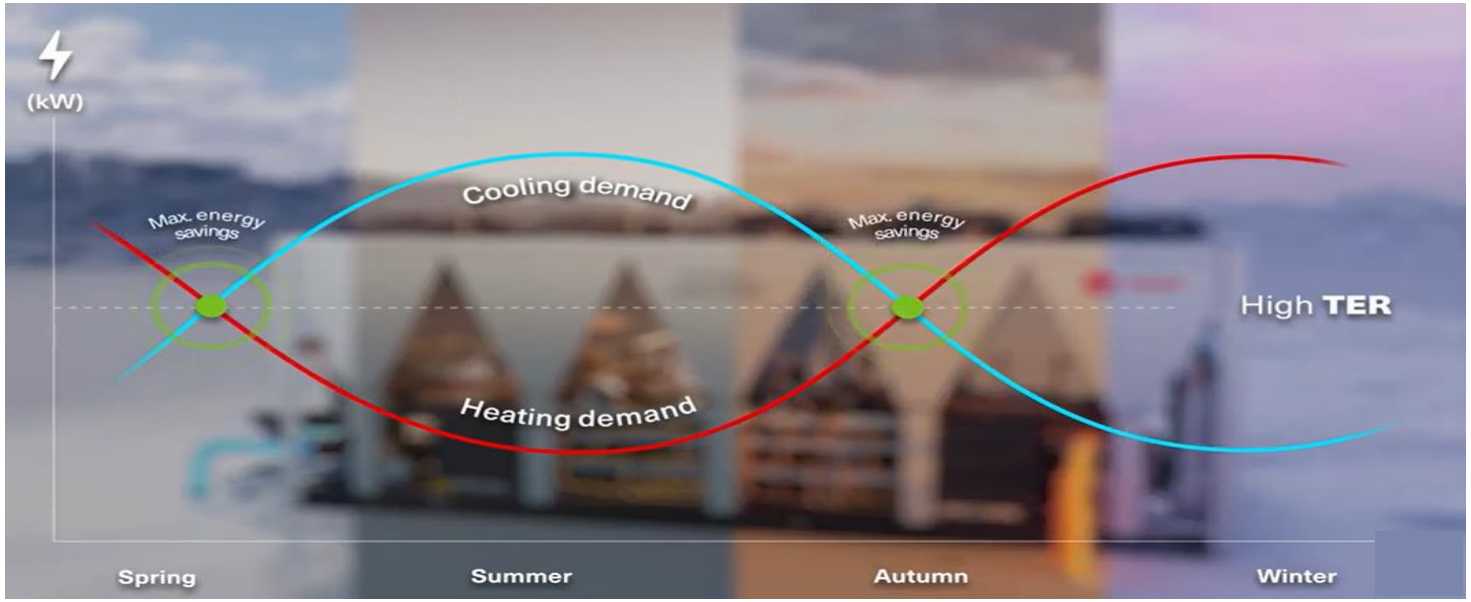
- **Cascade System** with Air to Water Heat Pump + **High Temperature Water to Water Heat Pump**
- Higher Booster Evaporator Temperature (45-40°C) for:
  - Larger Booster Capacity
  - Better Efficiency



TRANE TECHNOLOGIES

ELIMINATE DIRECT EMISSIONS





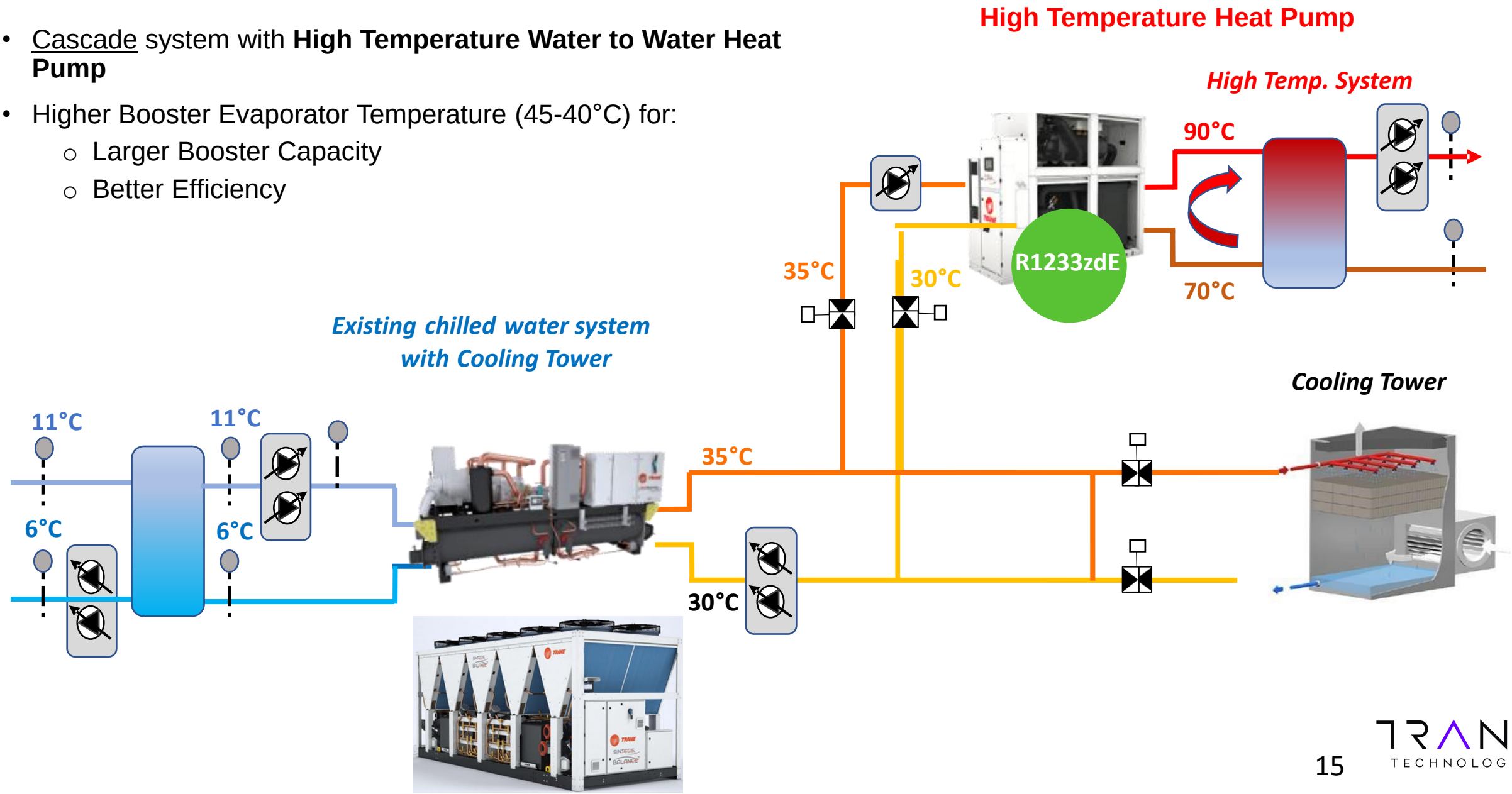
TER is an official ratio already used by HVAC industry in Europe.

Eurovent certification validates TER

TRANE TECHNOLOGIES

ELIMINATE DIRECT EMISSIONS

- Cascade system with **High Temperature Water to Water Heat Pump**
- Higher Booster Evaporator Temperature (45-40°C) for:
  - Larger Booster Capacity
  - Better Efficiency



TRANE TECHNOLOGIES

Case Study : BIC VIOLEX – (Attica)

Located in Attica region, BIC VIOLEX plant is a blade production unit.

Scope of project :

✓Reduce the use of fossil fuel

✓ Energy Savings

✓ Reduced CO_2 footprint

✓ Increase Sustainability

- **Processes to be considered :**
  - Process Cooling @ 5 ^oC & Heating @ 85 ^oC (blade production)
  - Dehumidification
  - Space Cooling & Heating
- **Existing Thermal Energy Production Model :**
  - Natural Gas boilers – Total Capacity 1900 kW
  - Air Cooled Chillers – Total Capacity 5500 kW

TRANE TECHNOLOGIES

Case Study : BIC VIOLEX

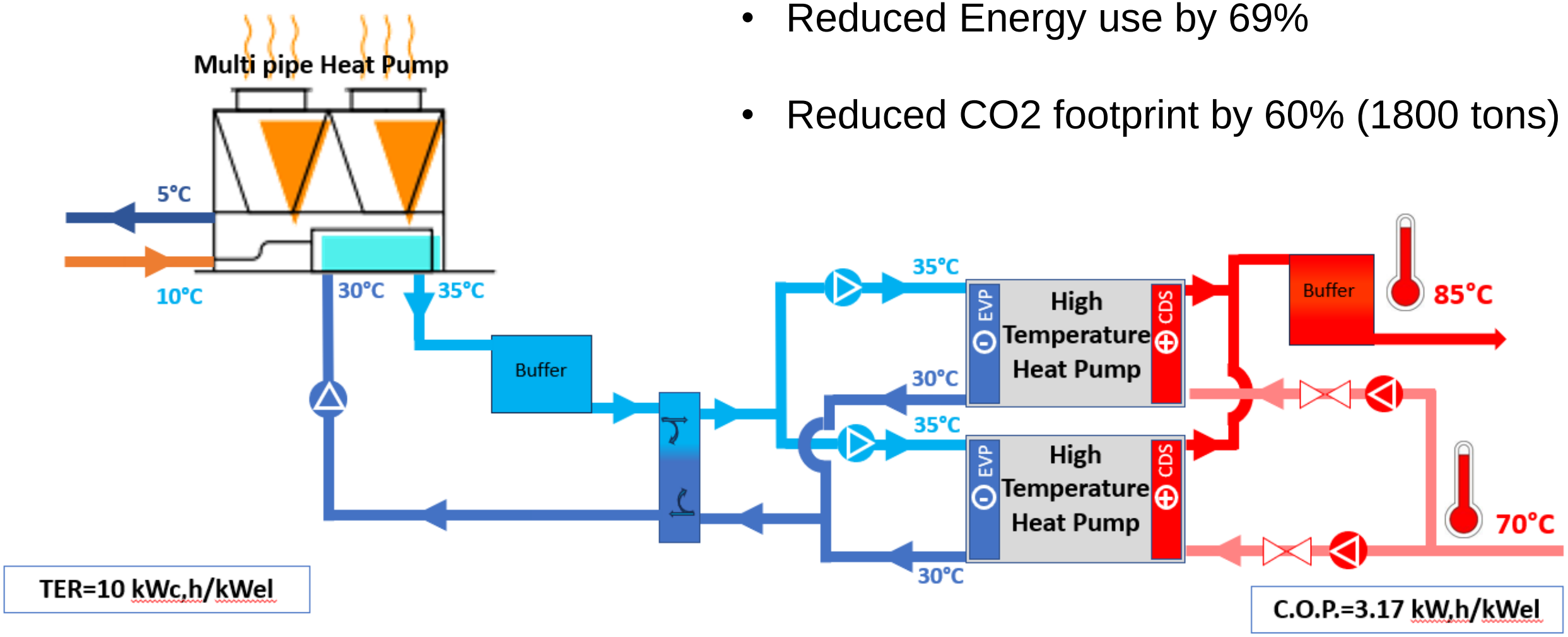
- **Scope of project :** Reduce the use of fossil fuel, Energy Savings, Reduced CO_2 footprint, Increase Sustainability
- **Strategy :**
  - Reclaim Waste Heat Energy & Re-purpose by **combining** ***Heating*** & ***Cooling*** needs.
  - Produce Thermal Energy with significantly higher Efficiency Levels
- **Equipment :**
  - Air Cooled Multipipe Heat Pump
  - Water to Water High Temperature Heat Pumps

TRANE TECHNOLOGIES

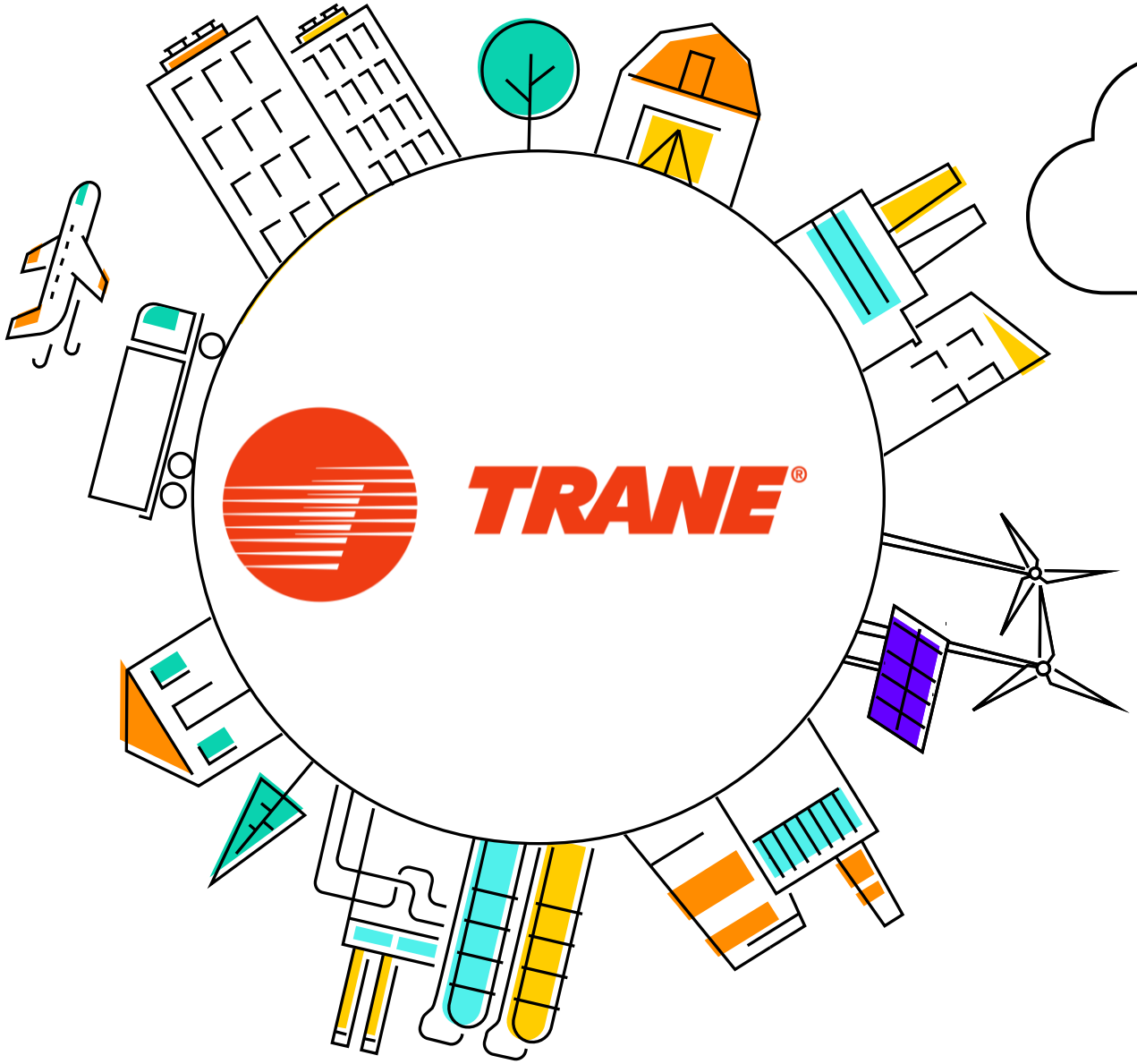
BIC VIOLEX : 4pipe + booster

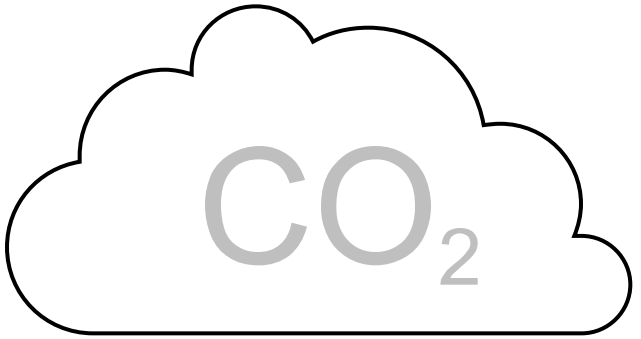
Expected Results :

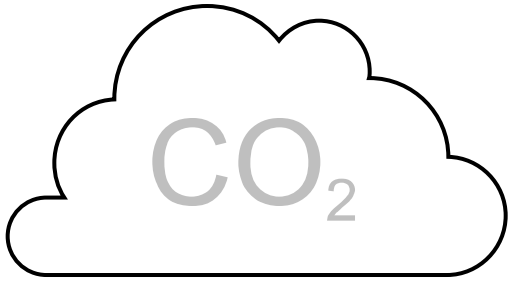
- Reduced Energy use by 69%
- Reduced CO2 footprint by 60% (1800 tons)



TRANE TECHNOLOGIES







TRANE TECHNOLOGIES™