



SDT Spring Conference

Innovative energy solutions for the Dairy manufacturer to
reduce carbon emissions

Tom Marren BSc (Eng), MBA
CEO, Astatine

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What We Do

Renewable Heat & Storage

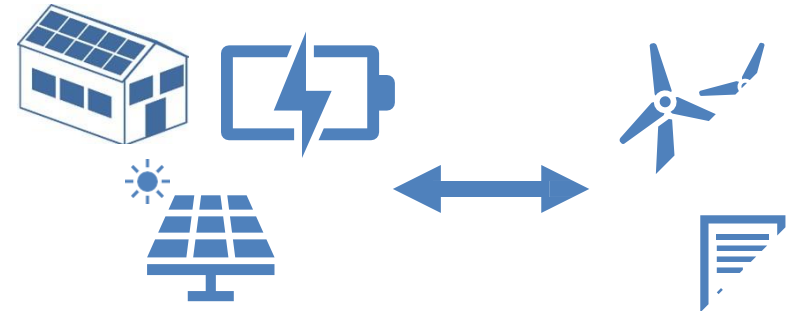
(High-temperature heat pumps and thermal storage)

Up to 130°C (200°C)



Renewable Electricity & Storage

(Solar Power, Batteries and Corporate PPAs)



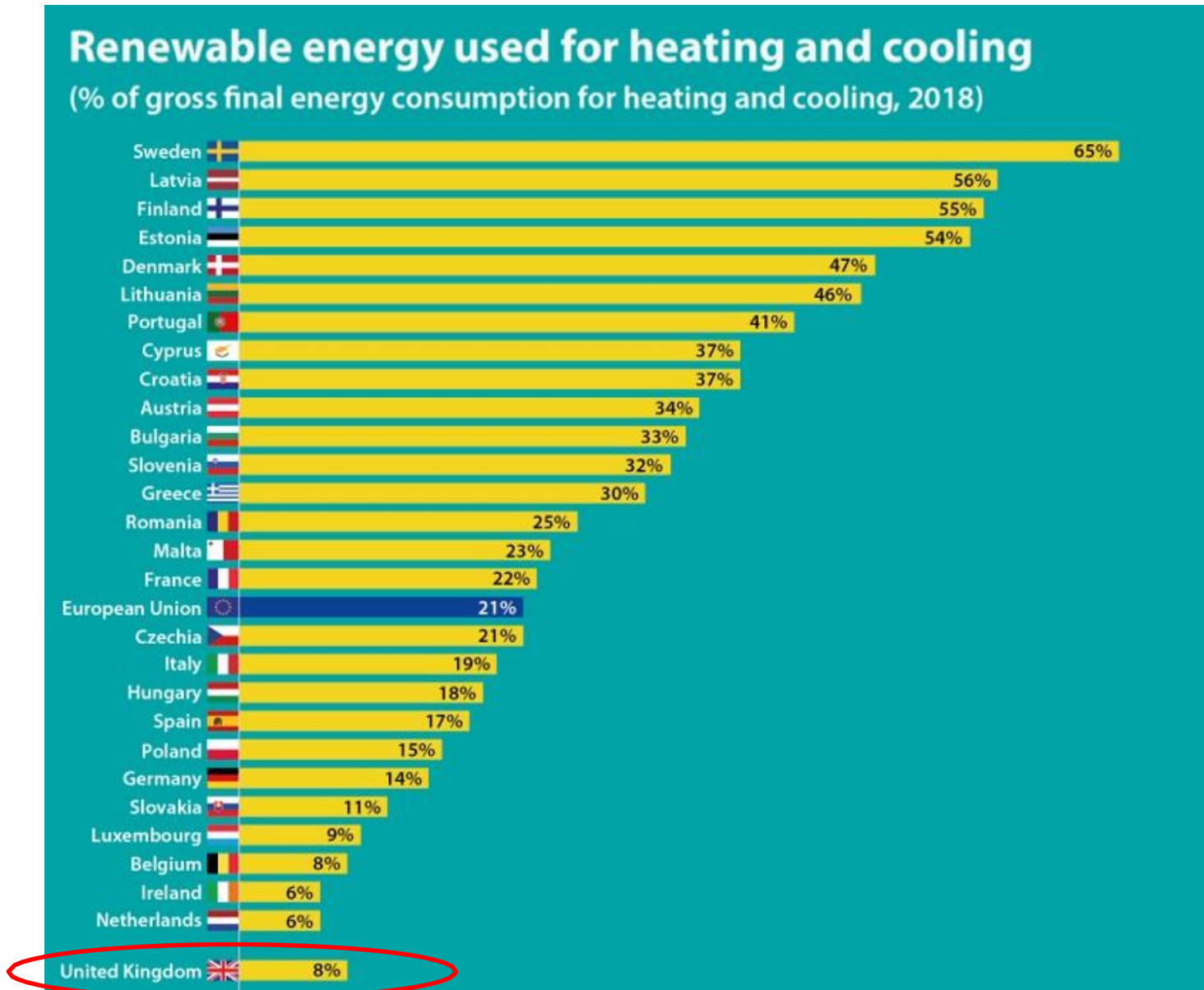
You Fund Or We Can Fund

(Heat & Power As A Service)



Industrial Heat Pumps

Renewable Heat Penetration

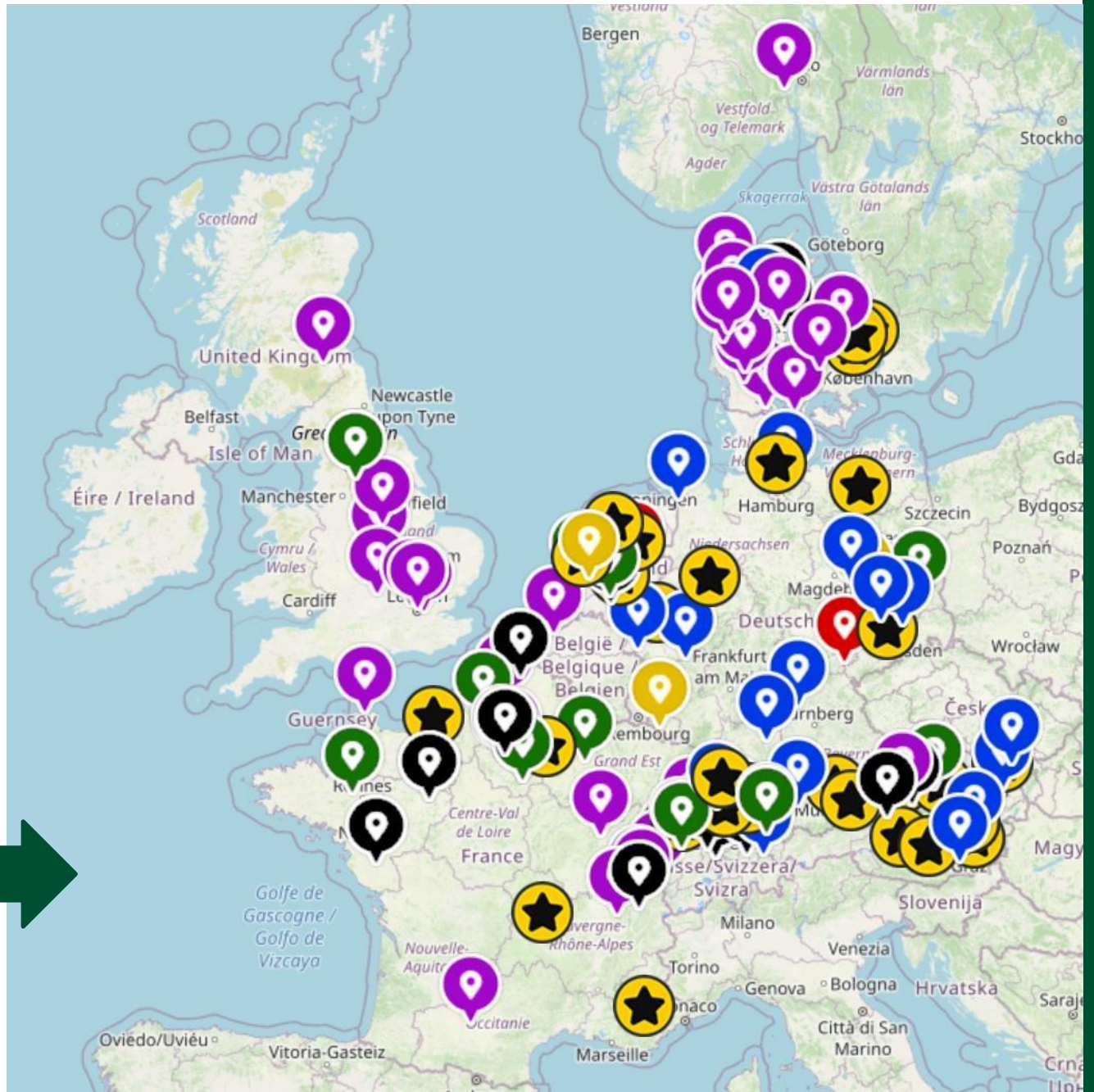


PROVEN HEAT PUMP TECHNOLOGY

- High-temperature heat pumps are a proven technology widely used in the rest of Europe.
- ~20,000s of installations across Europe each year
- Map from a study by the International Energy Agency



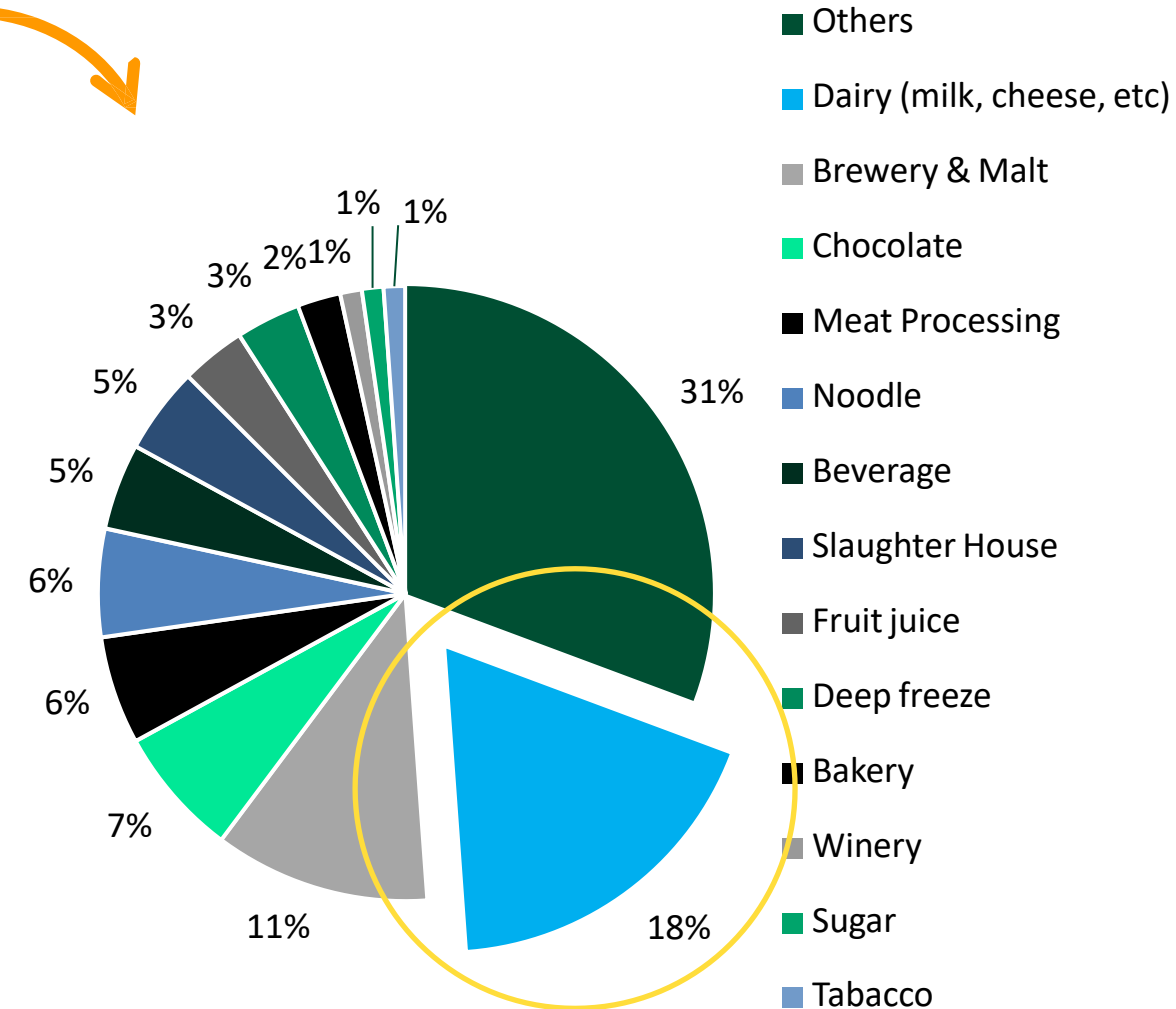
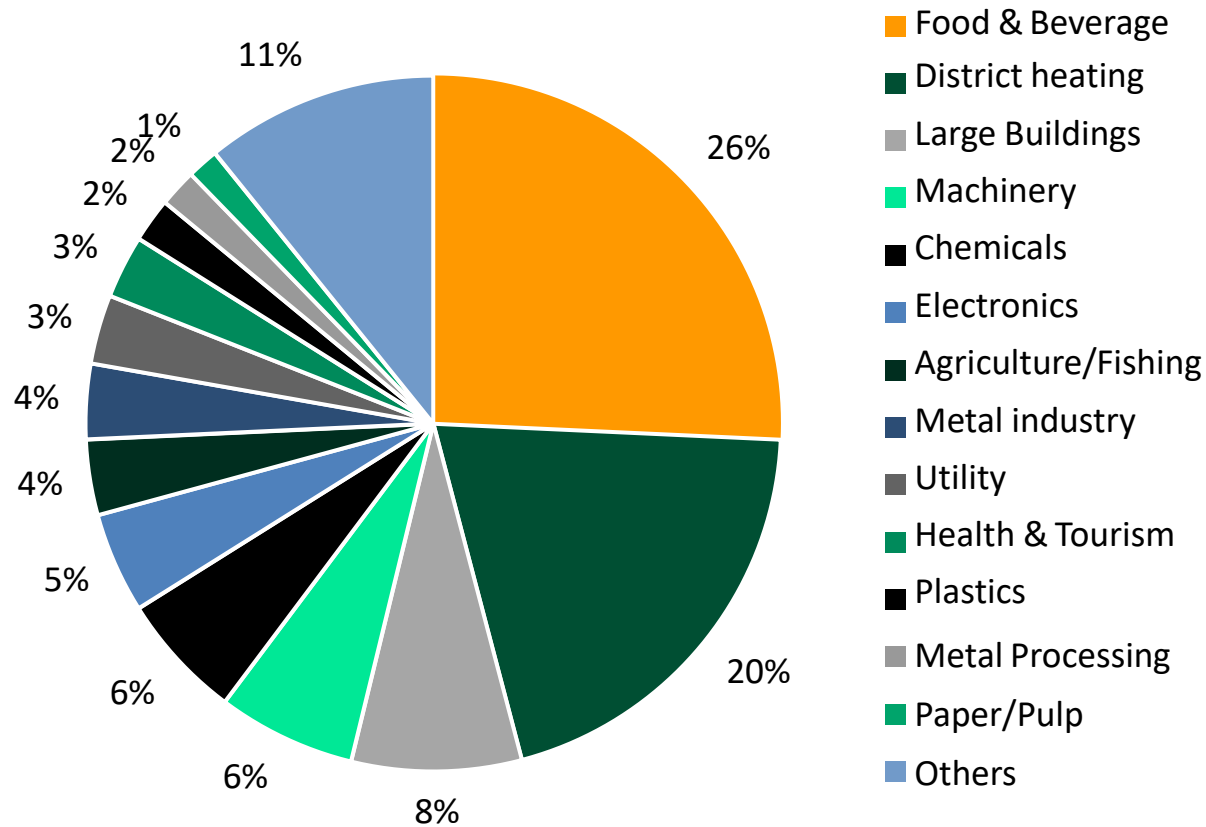
■ Miscellaneous ■ Chemicals ■ Textile ■ Best Practise ■ Machinery ■ Food ■ District Heating



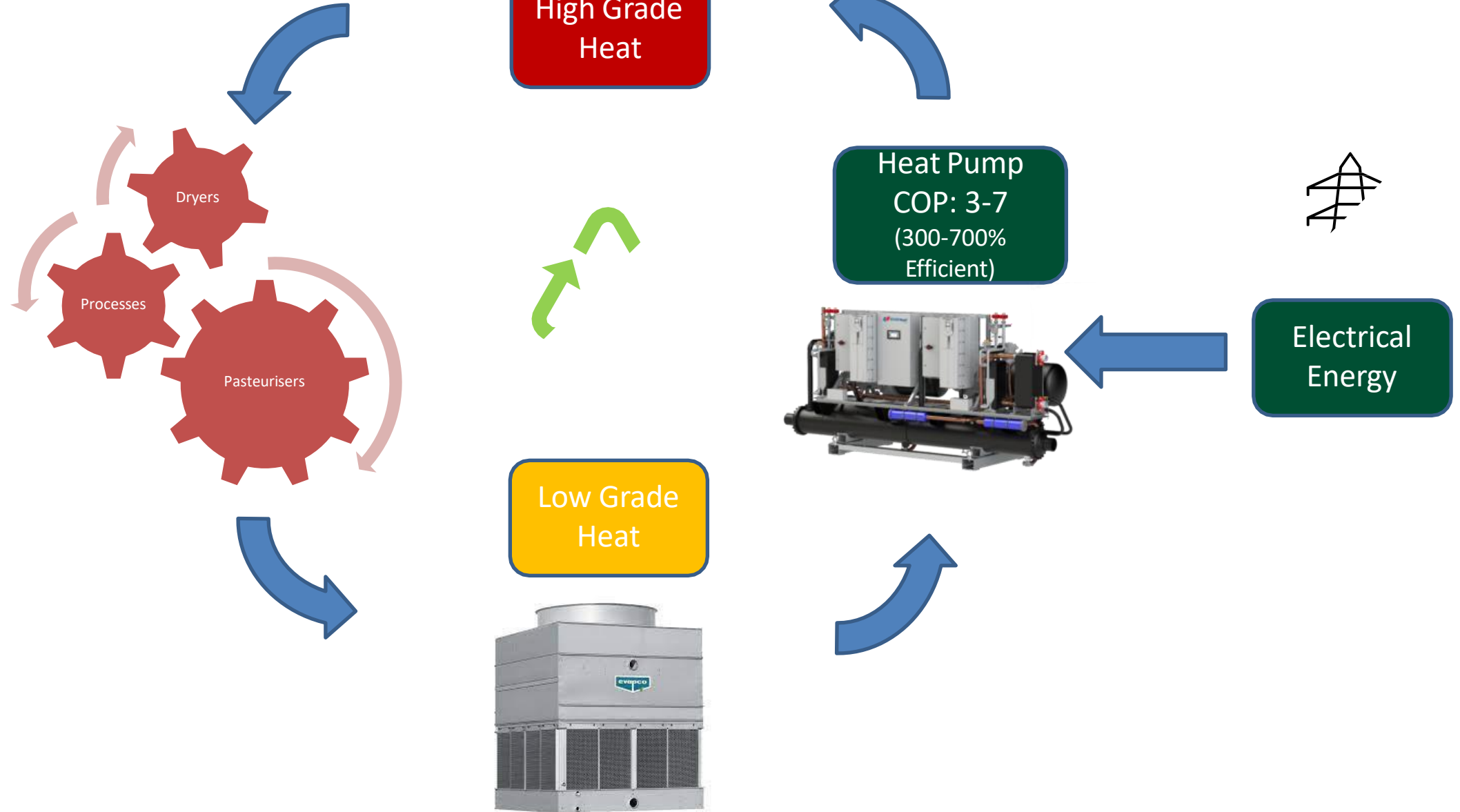
Dairy is the most common application for industrial heat pumps

Sample of 88 Food & Beverage Industrial Heat Pumps Globally by Application

Sample of 342 Industrial Heat Pumps Globally by Application

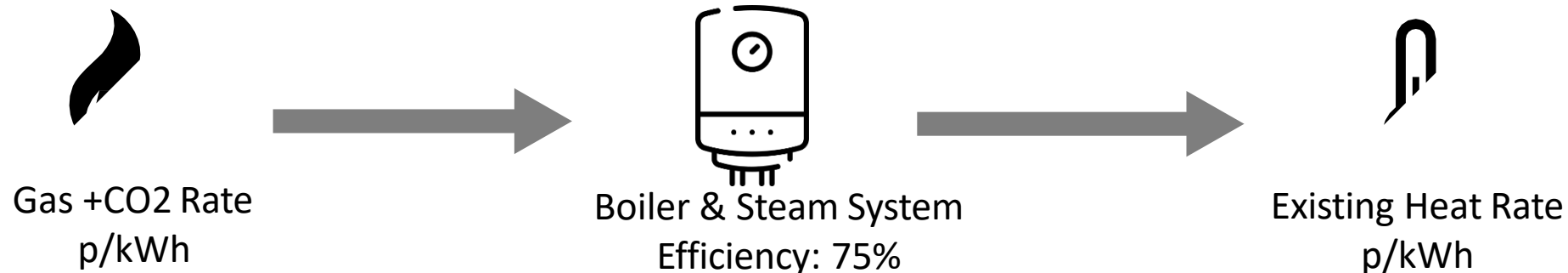


Heat Life Cycle

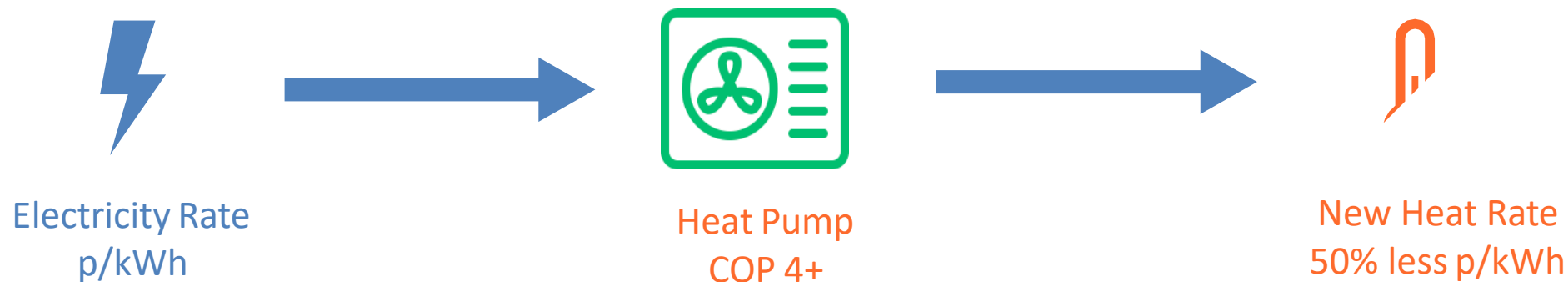


Source of Economic Savings with a Heat Pump

Current System



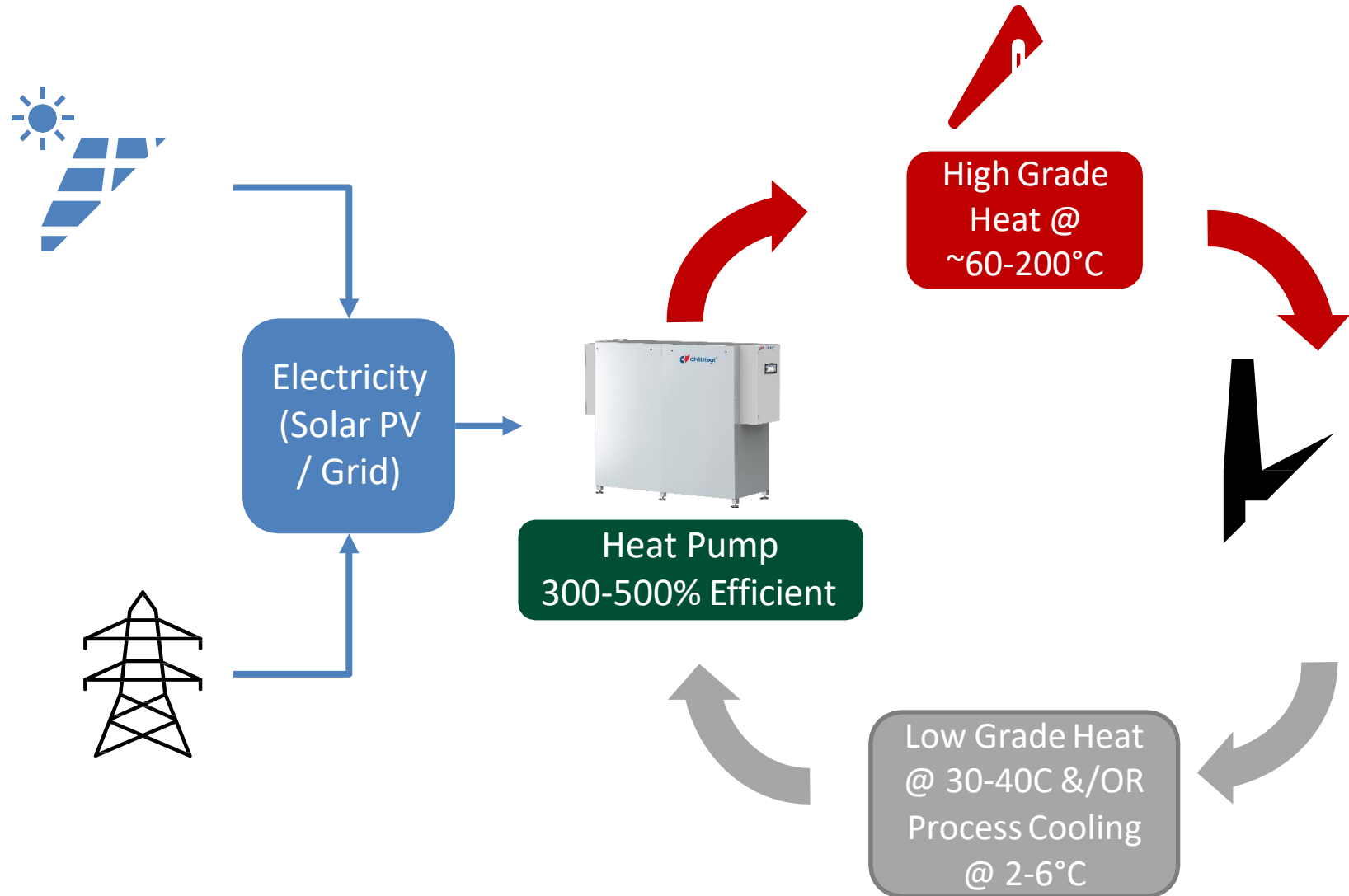
New System



If 3 MW Heat for 6000 hours/year, then Savings = >£1 Million/year

Typical Dairy Processor Project

- Heat Load:
 - ✓ ~3 MWth
- Run Hours:
 - ✓ >6000/year
- COP:
 - ✓ >4
- Annual Savings:
 - ✓ >£1 million/year
- Payback:
 - ✓ ~2-4 years



Heat Sinks and Heat Sources

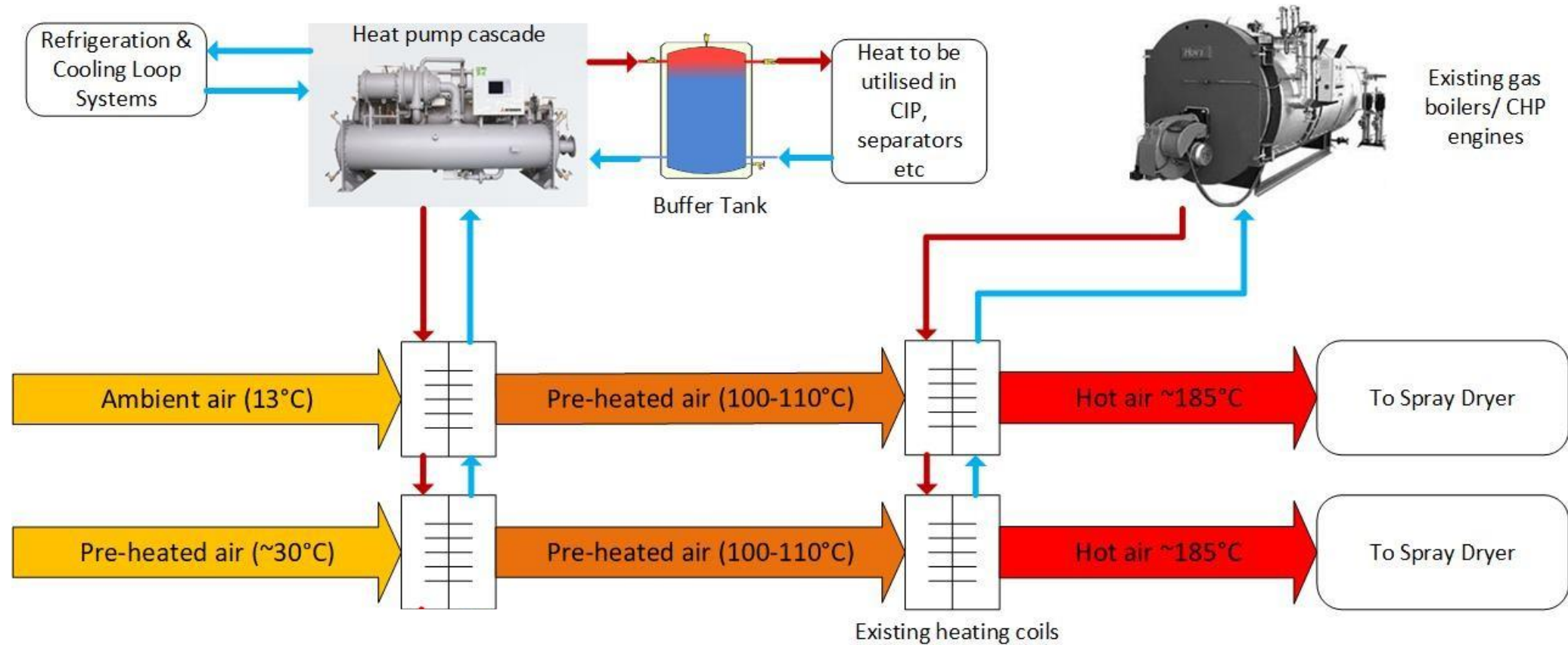
Heat Sources

- Cooling Towers
- Chilled Water
- Refrigeration
- Exhaust Recovery
- Air Compressors

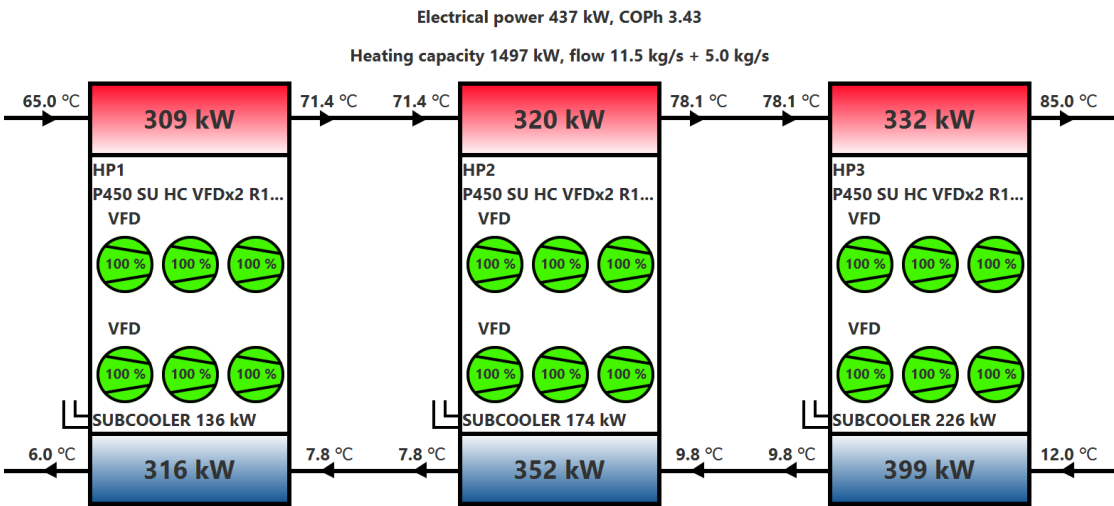
Heat Sinks

- Pasteurisers
- Cheese Vats
- Milk Dryers
- Boiler Feed Water
- Process Water
- CIPs

1. Example PRE-HEATING DRYER AIR



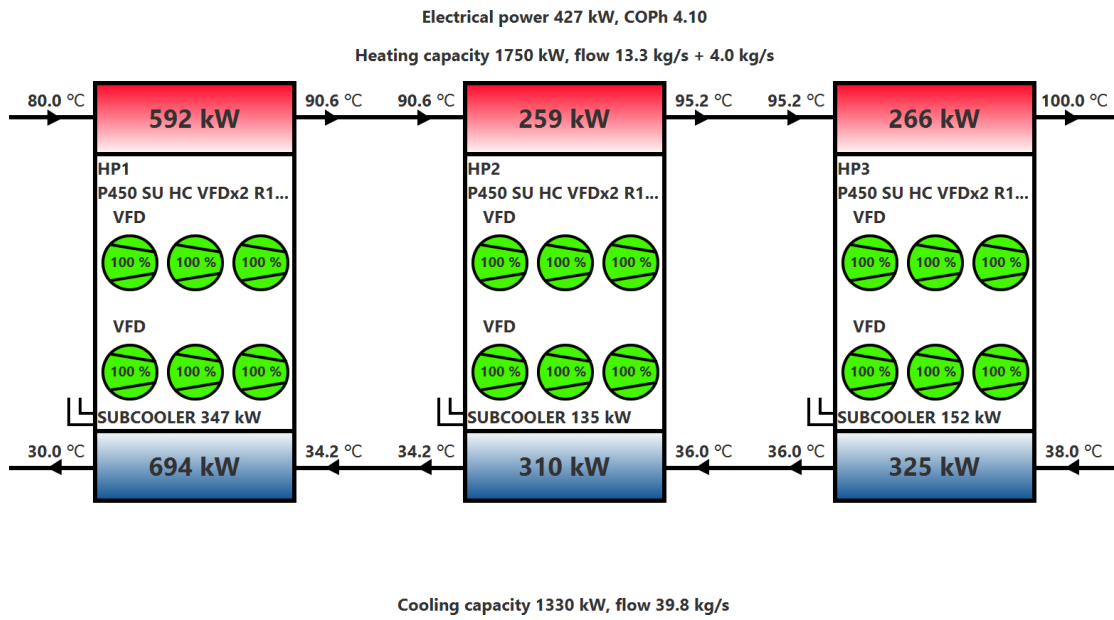
Chill/Heat Operation



Cooling capacity 1067 kW, flow 42.4 kg/s

P450 Chill/Heat Summary	
Heating Capacity (kW)	1,497
Cooling Capacity (kW)	1,067
Electrical Power (kW)	437
COPh	3.43
COPc	2.44
Combined COP	5.87

Heating Operation



P450 Chill/Heat Summary	
Heating Capacity (kW)	1,750
Electrical Power (kW)	427
COPh	4.1

Case Studies

| Industrial Heat Pump for Milk Production

Application	Flue gas Condensation, Waste heat from chillers
Country	Austria
Year of Installation	2015
Capacity	1540 KW
Supply Temperature	78/85°C
Source Temperature	45/35°C
Efficiency (COP)	3.9
Energy Savings	--
Financial Savings	--
Payback	--



| Industrial Heat Pump for Cheese Production

Application	Cheese Production - Heating / hot water supply
Country	Switzerland
Year of Installation	2018
Capacity	520 KW
Supply Temperature	92°C
Source Temperature	18°C
Efficiency (COP)	4.2
Energy Savings	1.5 million kWh of gas
Financial Savings	--
Payback	--



| Industrial Heat Pump for Cheese Production

Application	Cheese Production
Country	France
Year of Installation	2017
Capacity	1700 KW
Supply Temperature	85°C
Source Temperature	50/30°C
Efficiency (COP)	5.6
Energy Savings	11,320 MWh
Financial Savings	--
Payback	--



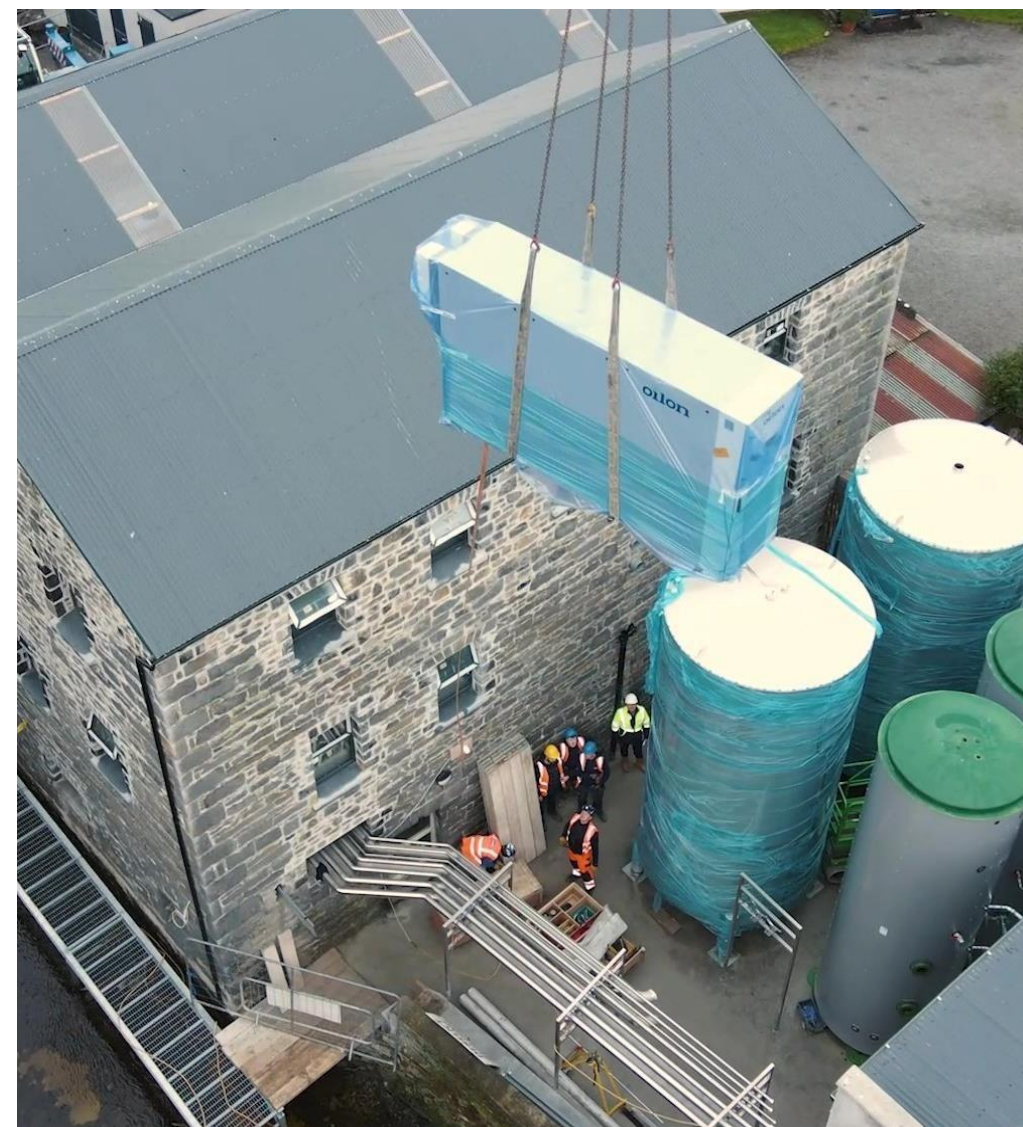
Industrial Heat Pump for Milk Drying

Application	Milk Drying
Country	Denmark
Year of Installation	2014
Capacity	1200 KW
Supply Temperature	85°C (returns at 55°C)
Source Temperature	45°C (returns at 22°C)
Efficiency (COP)	5.6
Energy Savings	4.6 GWh
Financial Savings	--
Payback	20 Months



HEAT PUMP EXAMPLE – Ahascragh Distillery

Application	Distillery
Country	Ireland
Year of Installation	2023
Heat Capacity	1000 kW
Input Temperature	60 °C
Output Temperature	120 °C
Annual Financial Savings	~ 50%
Annual Carbon Savings	>70%
Efficiency (COP)	3.2 – 4.2
In the Media	<u>The Irish Times</u>



Industrial Solar

Synergy between Solar PV and Heat Pumps

- Heat Pump system utilising Solar energy is 100% renewable
- Addition of solar energy further reduces carbon emissions and running costs
- Heat Pump system can store excess solar energy using thermal storage
- Peak solar energy production coincides with peak milk production.



A solar farm developed by Astatine at Dale Farm, Co. Tyrone, Northern Ireland

Typical Savings

Solar PV

Cost
50%

- >50% Reduction in Elec Operating Costs
- 3-4 Year Paybacks

Carbon
~30%

- ~30% Reduction
- Scope 2 Emissions



Rooftop solar PV project developed by Astatine at CMLS' cold storage facility in Oranmore, Co. Galway

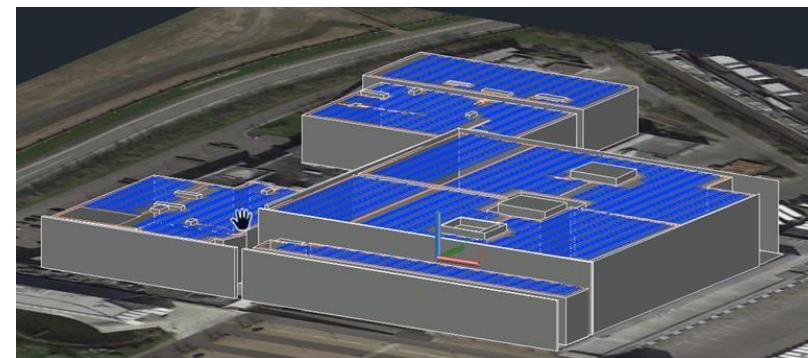
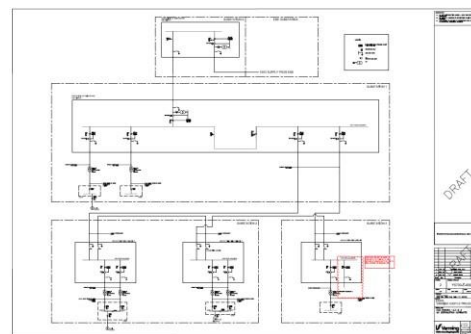
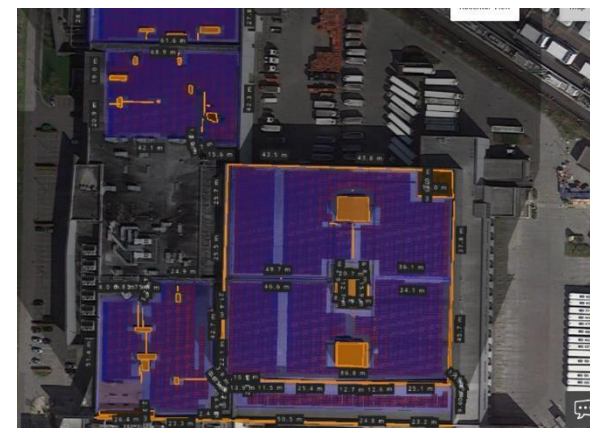
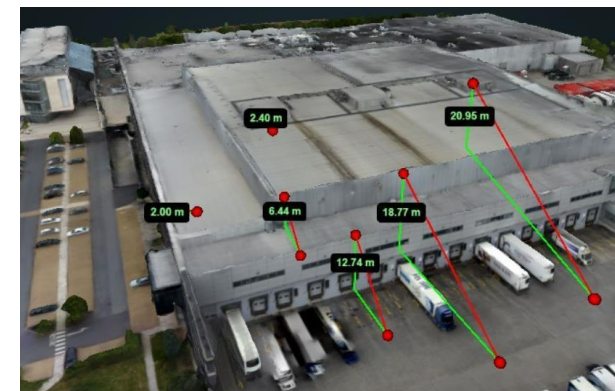
Site Solar Modelling

Energy Consumption Analysis

3D Model of the Rooftop

Electrical Equipment Review

Solar Modelling





Financing

Funding Options

Client Funded



Astatine Funded

Design - Build

- Client pays the upfront costs
- Enables access to ACA scheme for additional savings
- Astatine offer the client a separate contract to cover O&M

Energy as a Service

- Astatine pays upfront costs
- Client billed monthly for heat consumed at agreed rate per kWh
- Astatine responsible for all O&M over the term of the contract

Questions?