



GREEN TECHNOLOGY OF NORWAY



ULMATEC



SPERRE



anda
power solutions



TEKNOTHERM



Waste Energy Recovery

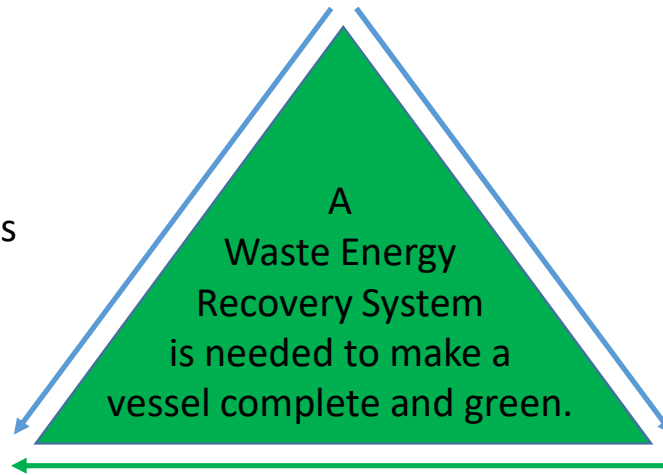
The 3rd group within green technology

1: Efficiency

Improved efficiency is reducing losses in the conversion process from energy source to useable energy.

2: Alternative energy sources

Alternative energy focus on utilization of energy with less harmful emissions for the environment.

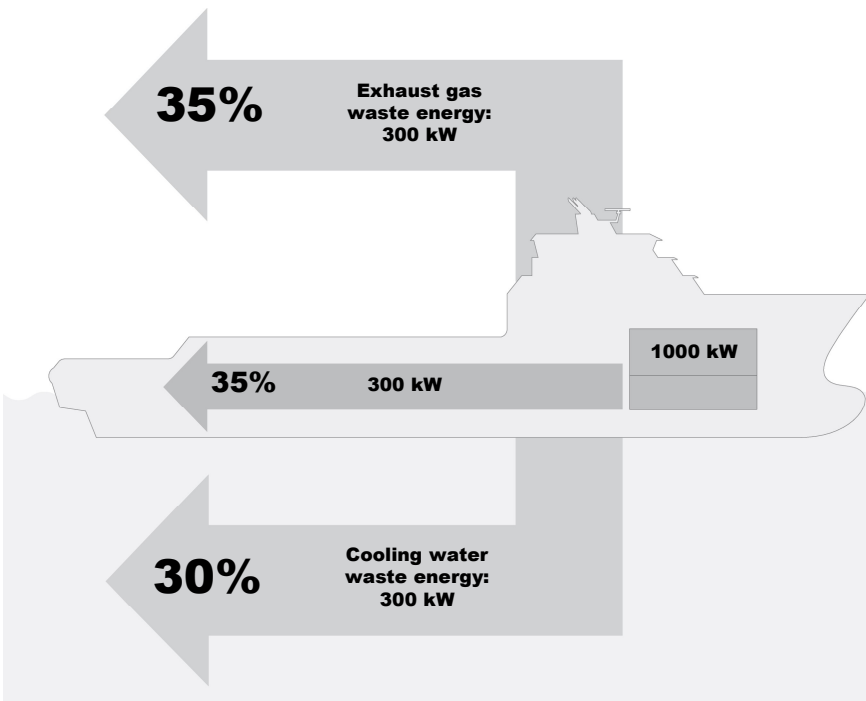


3: Waste Energy Recovery

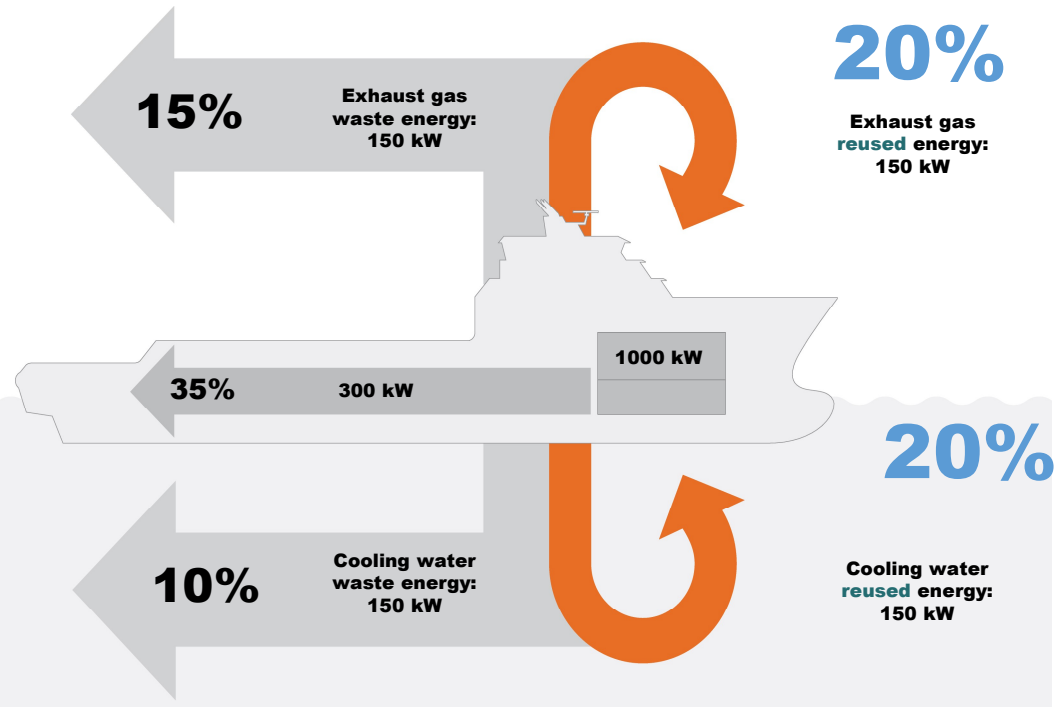
WERS does not fully belong to any of those groups:

- It captures the losses, and prepare it for re-use. (Efficiency)
- The captured energy is transformed from fuel to heat. (Alternative energy)

TRADITIONAL ONLY 30-40% OF ENERGY IS USED EFFICIENTLY



NOW UP TO 75% OF ENERGY CAN EASILY BE UTILIZED



THE COST OF ENERGY

**100kW Electric Power from
generator**

= 200-300 Tonnes fuel /year

= >100 Tonn Nox /year



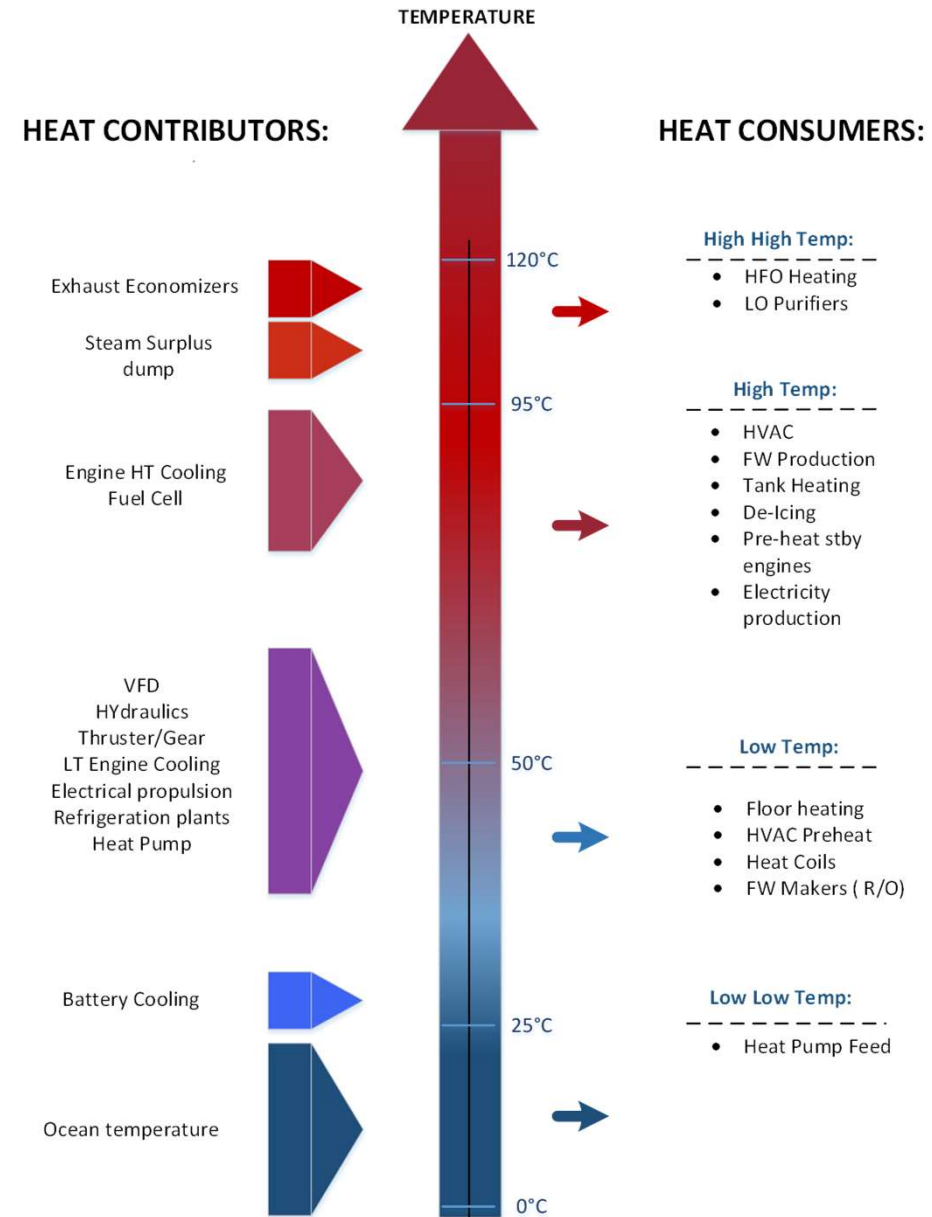
Ulmatec Pyro

“Cascading Heat Recovery Systems”

A Waste Heat Recovery System that utilizes heat losses at multiple temperature ranges.

Re-distribution is typically divided into 4 groups:

- Low Low Temp:
- Low Temp
- High Temp
- High High Temp





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**WASTE ENERGY
MANAGEMENT
SYSTEM**



**HEAT
EXCHANGERS**



**HYBRID POWER
SOLUTIONS**



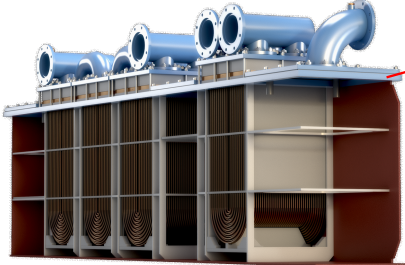
**HEATING &
COOLING
SYSTEMS**

Waste Energy Management System

SPERRE Pleat cooler



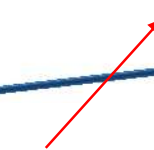
SPERRE Rack cooler



TEKNOTHERM HVAC Heat Pump



ULMATEC Pyro



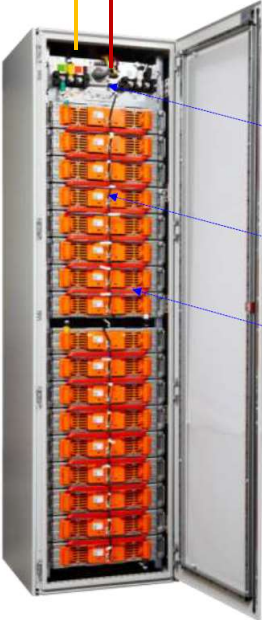
Cold Water

Hot Water



El.power

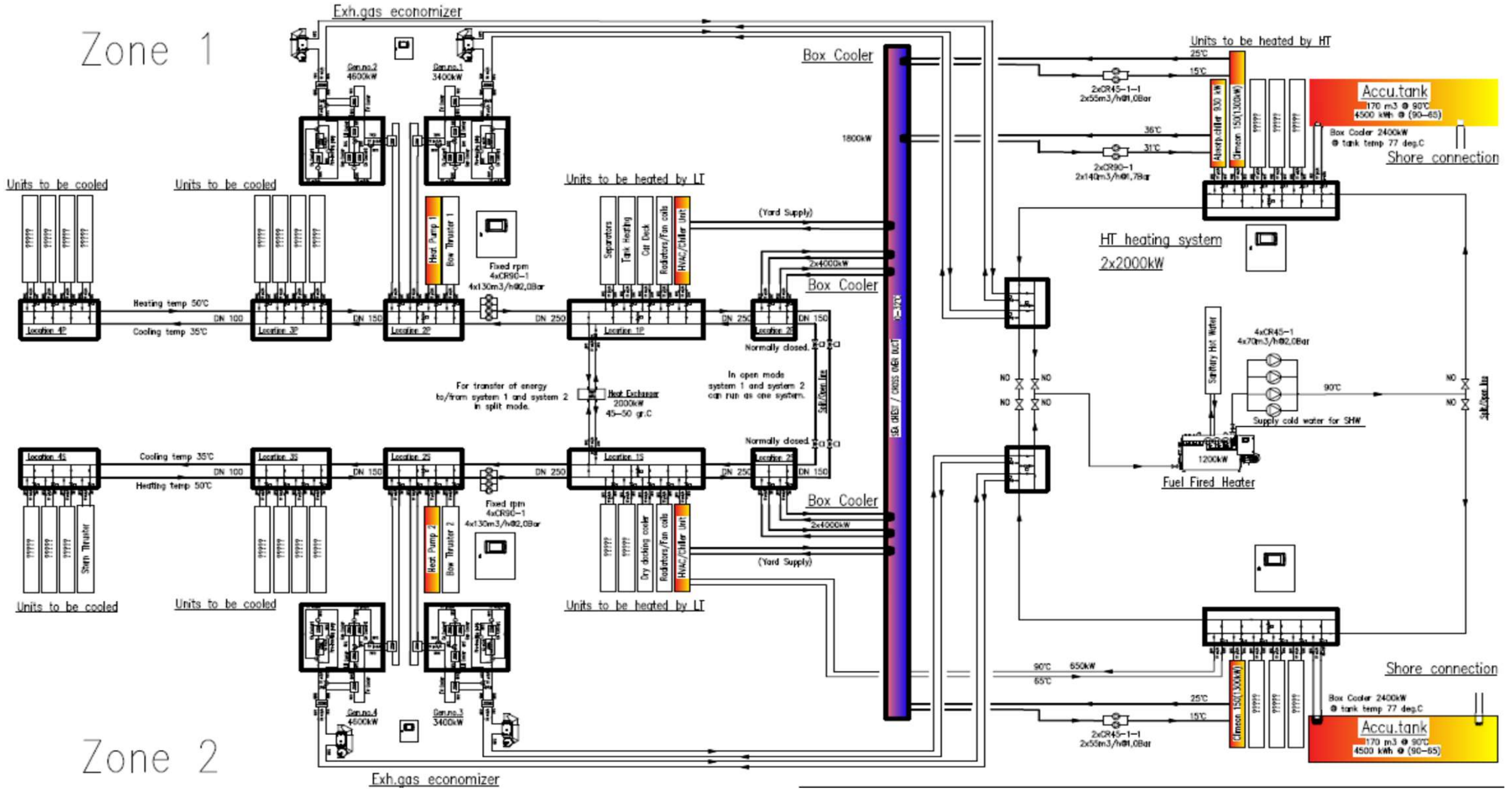
ANDA



- Battery Protection Unit (can be mounted either on the top or bottom as needed)
- Communication Cable
- Power Cable

Passenger Vessel

Zone 1



Zone 2

Total Savings kWh, Passenger Vessel

	January	February	March	April	May	June	July	August	September	Oktober	November	Desember	Total
Energy from Battery	3 953 069	3 953 069	3 953 069	3 953 069	3 953 069	3 953 069	3 953 069	3 953 069	3 953 069	3 953 069	3 953 069	3 953 069	47 436 830
Energy from Climeon	118 874	130 341	289 495	469 060	628 209	724 146	774 912	732 952	613 300	442 609	295 644	140 616	5 360 157
Reduced Energy by for Apsorbtion Cooling	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy from Diesel engines	17 959 093	17 947 626	17 788 471	17 608 907	17 449 758	17 353 821	17 303 054	17 345 015	17 464 667	17 635 358	17 782 323	17 937 351	211 575 443
													-
Energy in propulsion loss	577 203	577 203	577 203	577 203	577 203	577 203	577 203	577 203	577 203	577 203	577 203	577 203	6 926 430
Propulsion Energy kWh	21 453 833	21 453 833	21 453 833	21 453 833	21 453 833	21 453 833	21 453 833	21 453 833	21 453 833	21 453 833	21 453 833	21 453 833	257 446 000
													-
Heating effect shore power	-	-	-	-	-	-	-	-	-	-	-	-	-
													-
Utilized Energy from HT system for HVAC heating	9 456 136	9 370 697	8 048 822	6 330 984	4 500 133	3 097 340	2 190 274	2 555 888	4 155 029	6 169 325	7 744 815	9 227 552	72 846 994
Utilized Energy from LT system for HVAC pre-heating	1 850 026	1 827 646	1 491 956	1 080 678	669 007	370 884	185 209	259 456	594 457	1 042 958	1 417 358	1 790 347	12 579 981
LT cooling energy balance (Waste energy to sea)	1 185 109	1 182 815	1 150 985	1 117 805	1 093 791	1 080 895	1 074 474	1 080 991	1 097 853	1 124 395	1 149 755	1 180 760	13 519 627
													-
Total savings	11 425 036	11 328 684	9 830 273	7 880 721	5 797 349	4 192 369	3 150 396	3 548 296	5 362 785	7 654 892	9 457 817	11 158 515	90 787 133
													-
Additional savings Absorption chiller						724 146	774 912	732 952	613 300				2 845 310

MOBILIZING WASTE ENERGY

- UTILIZED IN ENGINE 35%
- WASTE ENERGY FROM EXHAUST SYSTEM 20%
- WASTE ENERGY FROM HT COOLING SYSTEM 10%
- WASTE ENERGY FROM LT COOLING SYSTEM 10%

TOTAL

75%

Takk for oppmerksomheten