

Caigate Enogia ORC Series

Convert low temperature
heat to electricity



180KW
10 FT Container Module



540KW
20 FT Container Module



1080KW
40 FT Container Module

 HeatPower

 ENOGIA
by Caigate

 Caigate

Dependable, Whenever, Everywhere

Our ORC modules work with a large scale of heat sources and provide a profitable way to produce electricity either consumed or connect into the grid.

The only renewable sourced power generator producing continuous 7x 24 ongoing power.



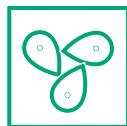
DEPENDABLE

ENOGIA's ORC can be used as **baseload power**. It is able to run 24/7, given the heat source availability. Operation is **very flexible and reliable**, start-up time is fast and it can be operated at part load.



CLEAN POWER

ENOGIA's ORC use **renewable heat sources** like geothermal energy, biomass, biogas, solar and even waste heat streams.



ANYWHERE

ENOGIA's ORC units are the smallest available in terms of power, as well as the **most compact units**. They can be used in difficult environments but also for large to small heat streams, virtually **anywhere in the world**.

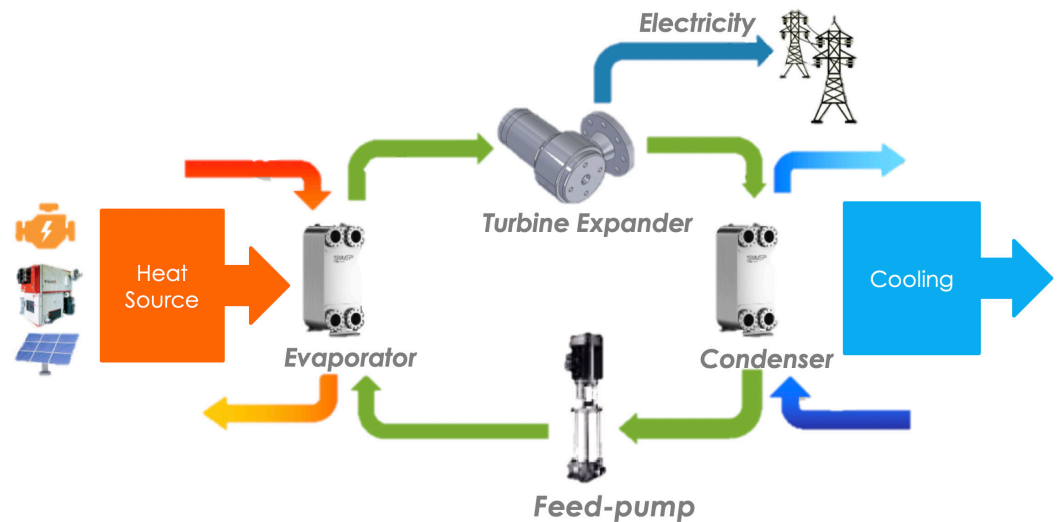
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Technology Principles

ORGANIC RANKINE CYCLE TECHNOLOGY

The only technology converts low temperature waste heat from thermal engines into electricity.



HERMETIC HIGH SPEED TURBINE TECHNOLOGY INNOVATIVE DESIGN, PATENTED BY ENOGIA

WHY THE KINETIC TURBO-GENERATOR?

- Proven concept on larger volumetric ORC units
- Very few moving parts and low stress on components
- No friction, no wear – there's no metal to metal contact

HERMETIC TURBO-GENERATOR WITH A PMG GENERATOR

- Oil Free
- No fluid leaking
- Low maintenance
- Extremely compact units
- Made in France with EU components only, in-house assembled

Applications

BIOGAS, LANDFILL GAS



SOLAR



BIOMASS



GEOTHERMAL



STEEL FACTORY



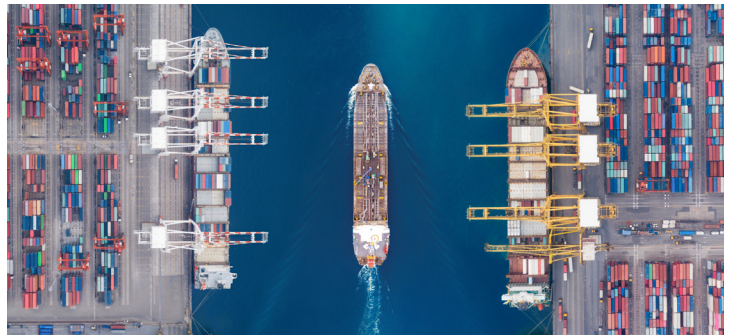
DIESEL GENSETS



CEMENT PLANT



MARINE



Case Studies



LANDFILL WASTE HEAT

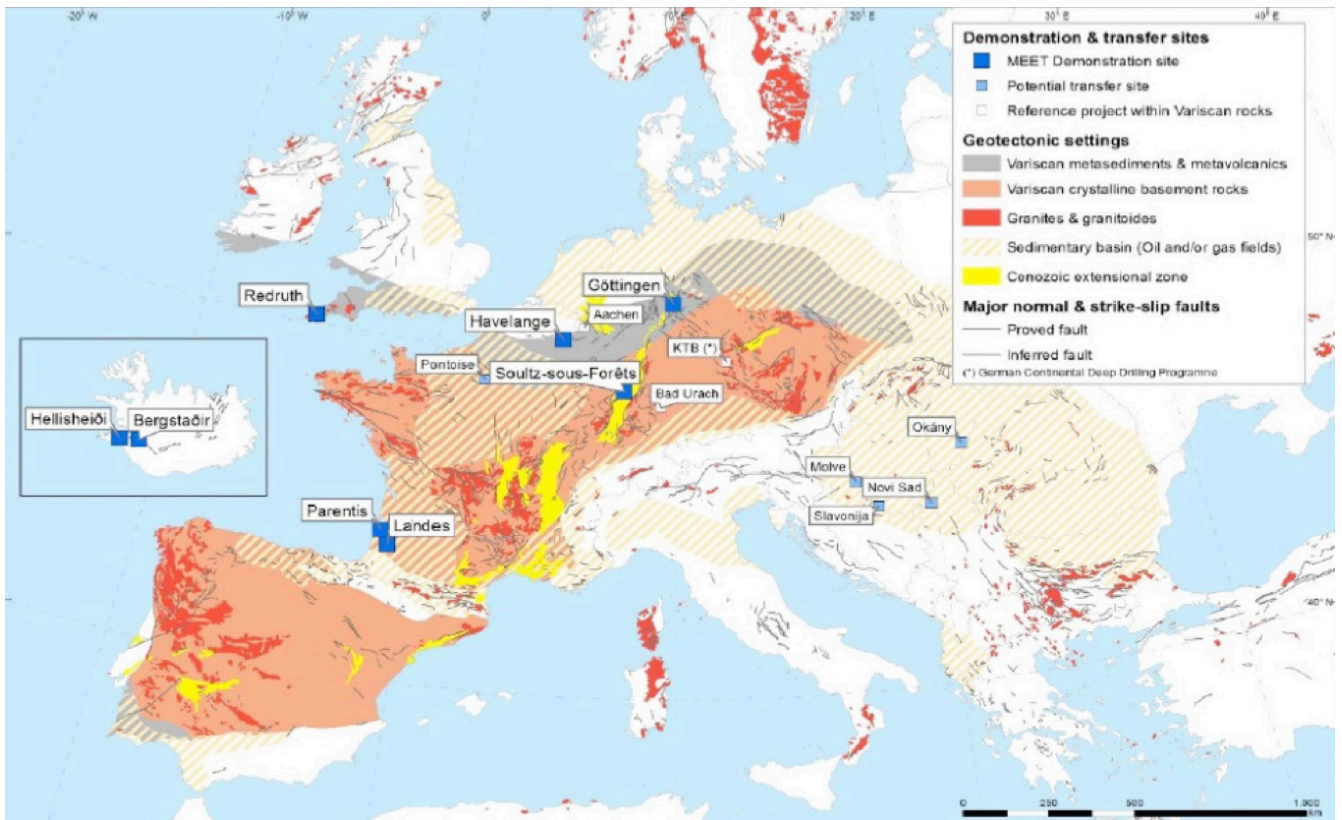
- Status: Start operation in 2015
- Heat source: Gas engine hot water, exhaust on single heat recovery loop
- Delivery Package: ORC module, container housing, hot loop piping, cold loop piping and components, dry cooler on top.

(IMAGE LEFT) LOCATION: JENBACHER SERVICE: FULL MAINTENANCE

MEET GEOTHERMAL DEMONSTRATION PROJECT

Demonstration sites to be commissioned with 3 x ORC. Heat sources:

- Soultz, France: Irregular heat source in the Upper Rhine.
- Reykjanes, Iceland: Drilling depth to 1500-3000 meters, the highest temperature is about 250-280C, the pH is neutral.
- Barentis Oilfield, France: 26 oil fields and 400 oil wells producing 37000m³ hot water output per day.



Case Studies

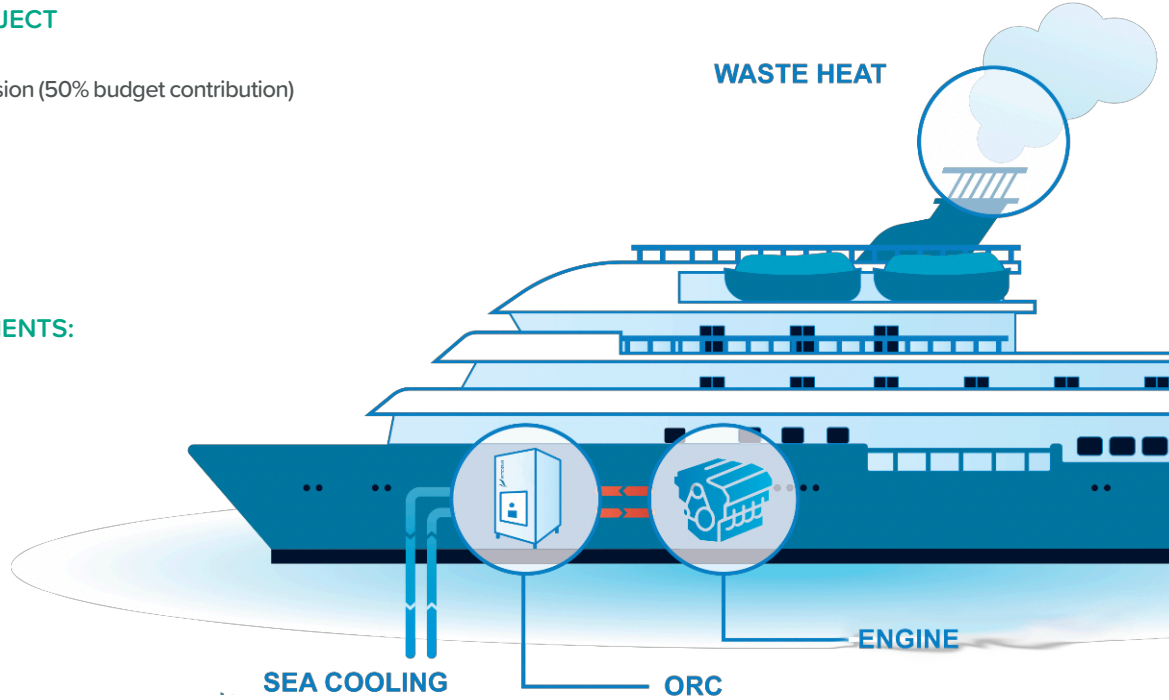
MARINE: EFFICIENTSHIP PROJECT

- Tender owner: European Commission (50% budget contribution)
- Project started: May 2017
- Budget: € 1.25M
- Cost saving: € 3K/annual
- Fuel savings: 3%

COMPLIANT WITH REQUIREMENTS:



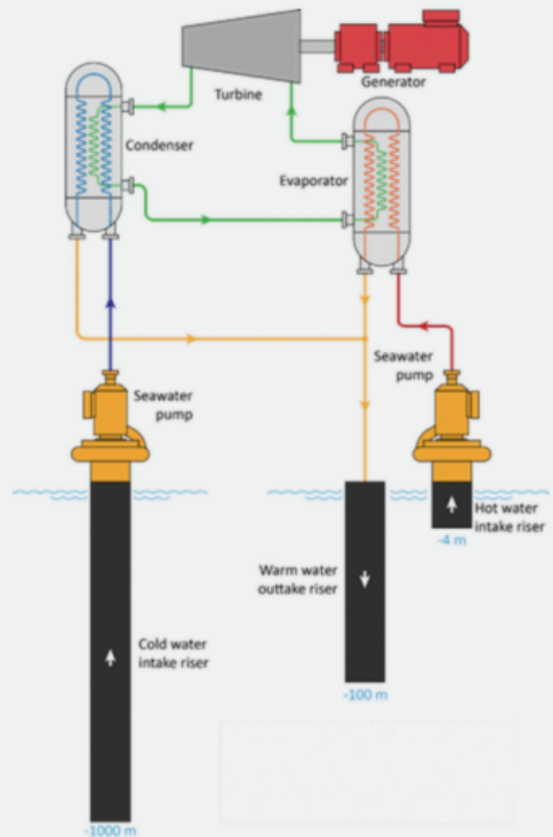
CORPORATE PARTNERS



OCEAN THERMAL ENERGY CONVERSION

Provide zero-emission electricity supply (up to 2 MW) by using the temperature difference between deep sea water and tropical ocean surface.

June 2017, ENOGIA completed the downsizing prototype to verify the feasibility of the system.



Company Overview

Caigate - Enogia (Shanghai) Turbine Technology Co. Ltd.

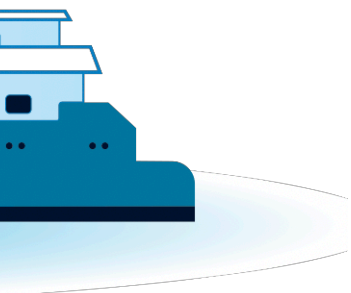
Joint Venture between Caigate (China); and Enogia (France), introducing the advanced ORC technology from ENOGIA.

Enogia SAS

ENOGIA specialized in designing and producing Organic Rankine Cycle Power Plant Solution that convert waste heat into electrical power.

ENOGIA founded in 2009, with head office and facilities in Marseilles, France. ENOGIA henceforth includes dedicated engineering team of high levels and already has more than 70 references in 22 countries.

Being the fastest growth of turnover rate amongst all French cleantechs, winner of Deloitte Technology Fast 50.



Awards



DELOITTE TECHNOLOGY FAST 50 AWARD



ENERGY TRANSITION TROPHY AWARD



MINISTRY OF ECONOMICS OVERALL GRAND WINNER



ENTERPRISE & ENVIRONMENT 2015 COUP DE COEUR DU JURY



ENGIE 2015 INNOVATION DAYS PRIZE



BIOGAZ D'OR 2015 INNOVATION PRIZE



ARTS ET METIERS 2014 INNOVATION PRIZE



CLEANTECH REPUBLIC 2013 SPECIAL JURY AWARD

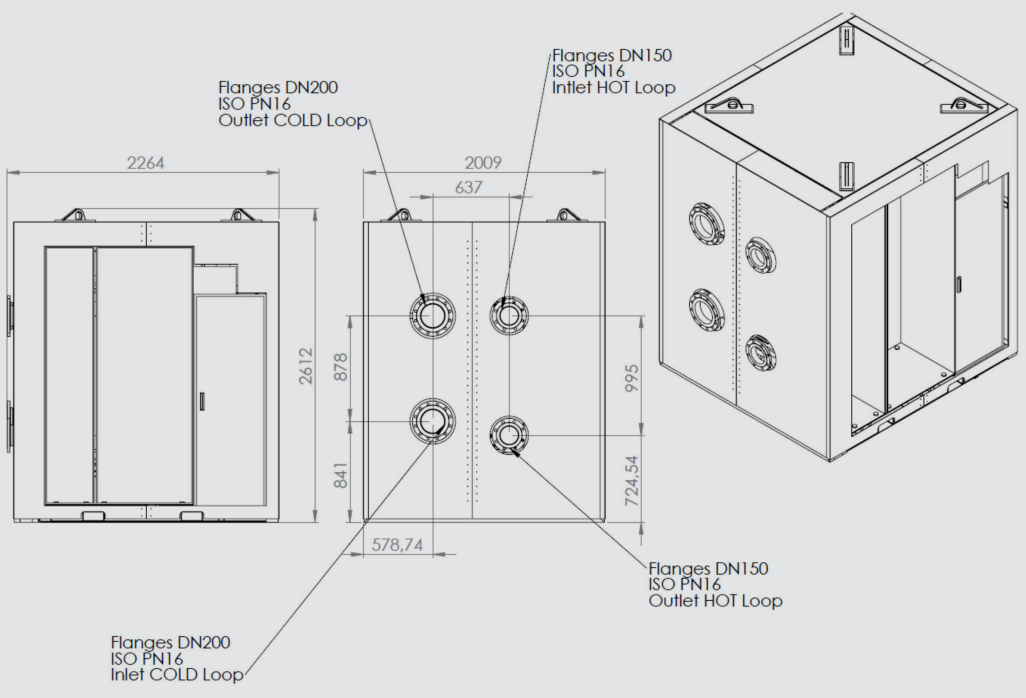
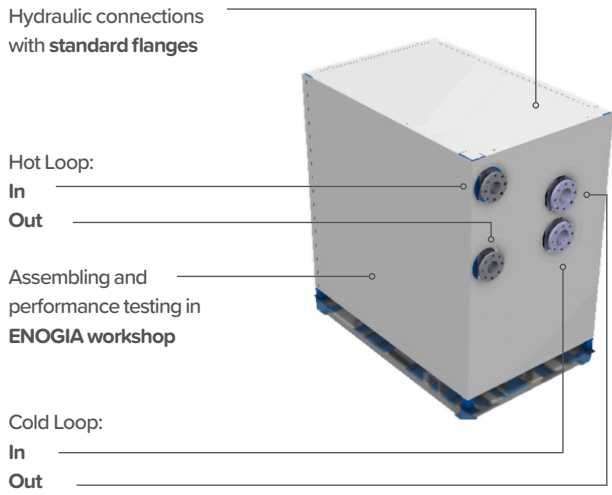
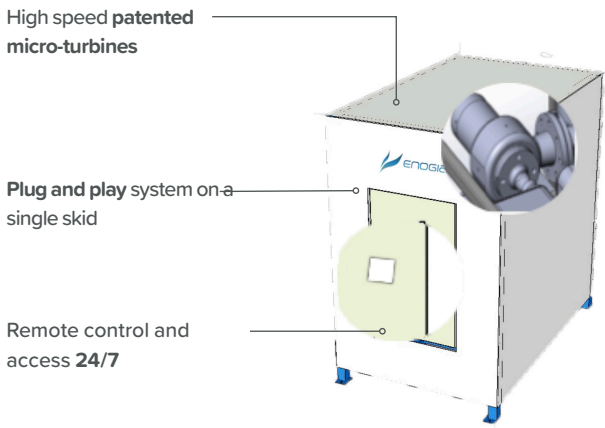


HENRI FABRE 2012 PRIZE FOR SCIENCE AND TECHNOLOGY

Product Overview

180kW ORC Solution

With turbine technology, the system has very low failure rate and it's compact and environmentally compatible. Multiple modules can be operated in parallel according to the scale of the heat source.



Technical Data

180KW ORC SOLUTION DATA:

ELECTRICAL RATINGS	Maximum gross electric power [kWe]	180
	Grid connection	400V, 3ph, 50-60 Hz
HEAT SOURCE	Temperature range [°C]	70-120
	Thermal power input range [kWth]	1400 - 2400
	Hot source medium	Water, steam, oil
	Hydraulic connections	DN 150, PN 16
COLD SOURCE	Temperature range [°C]	0 to 40
	Cold source medium	Sea water, fresh water
	Cooling system	Dry cooler, cooling tower
	Hydraulic connections	DN 200, PN 16
MAIN COMPONENTS	Working fluid	Honeywell R1233zd(e)
	Generator	Medium speed, permanent magnet, axial flux
	Expander	Kinetic turbine
	Heat exchangers	Brazed plate and semi welded plates
	Pump	Multi-stage magnetic coupling
	Controls	Industrial PLC
	Monitoring	Remote web support
MAIN RATINGS	Weight [kg]	7000
	Dimensions L x w x h (mm)	2010 x 2270 x 2610
	Environmental	IP 20
	Noise level [dB] @10m	60
	Design lifetime [yrs]	20
	Safety	Non flammable, non toxic, ODP=1
NORMS COMPLIANCE	Machine directive	2006/42/EG
	PED	2014/68/EU
	Electrical norms	2014/35/EG
	Grid codes	VDE-0126 (G59, VDE-ARN, UL, ... on request)

180 kWe

Maximum gross electric power

70-120°C

Heat source

60 dB(A)

Noise level

400V

Grid connection

7000kg

Weight

20 Years

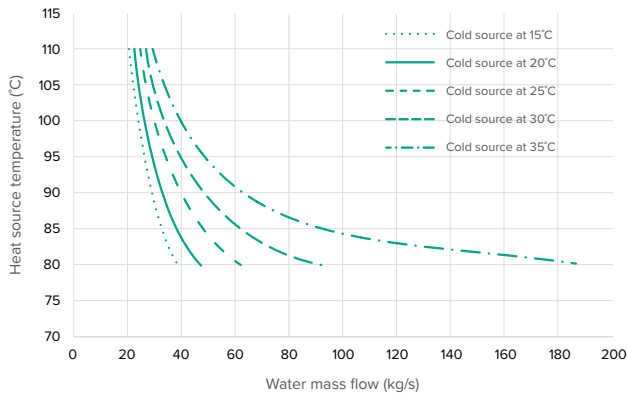
Design Lifetime

Technical Data

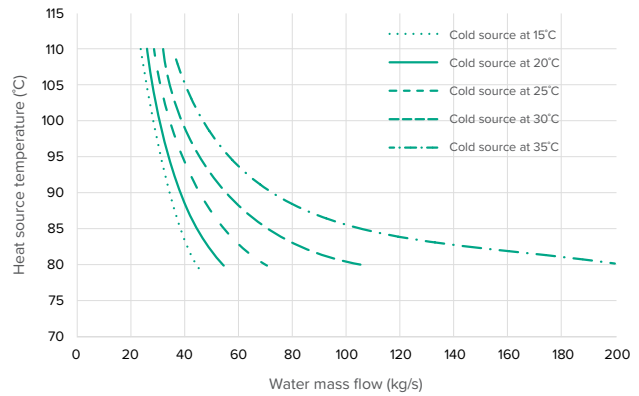
180KW ORC SOLUTION CORRESPONDING RUNNING CURVE:

- Heat source temperature (inlet and outlet)
- Cold source temperature (inlet and outlet)
- Water mass flow rate

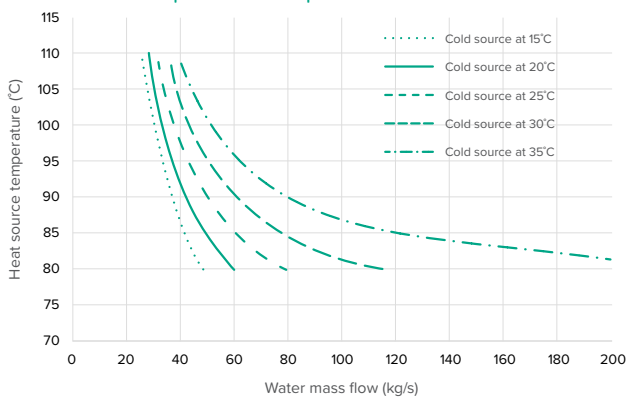
Temperature requirements — 140kW



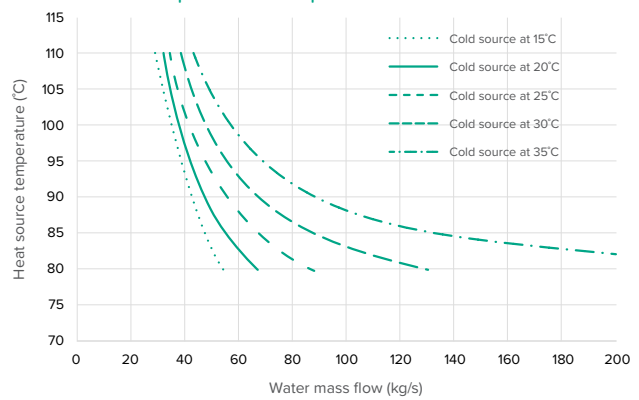
Temperature requirements — 160kW



Temperature requirements — 180kW



Temperature requirements — 200kW



ORC 180KW

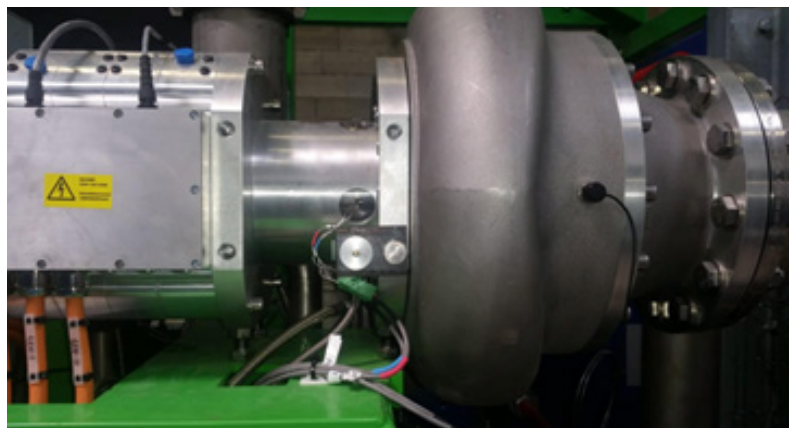
Product Options

THE 180KW ORC SOLUTION

180KW	540KW (20FT)	1080KW (40FT)
		
10FT container	20FT container	40FT container
		

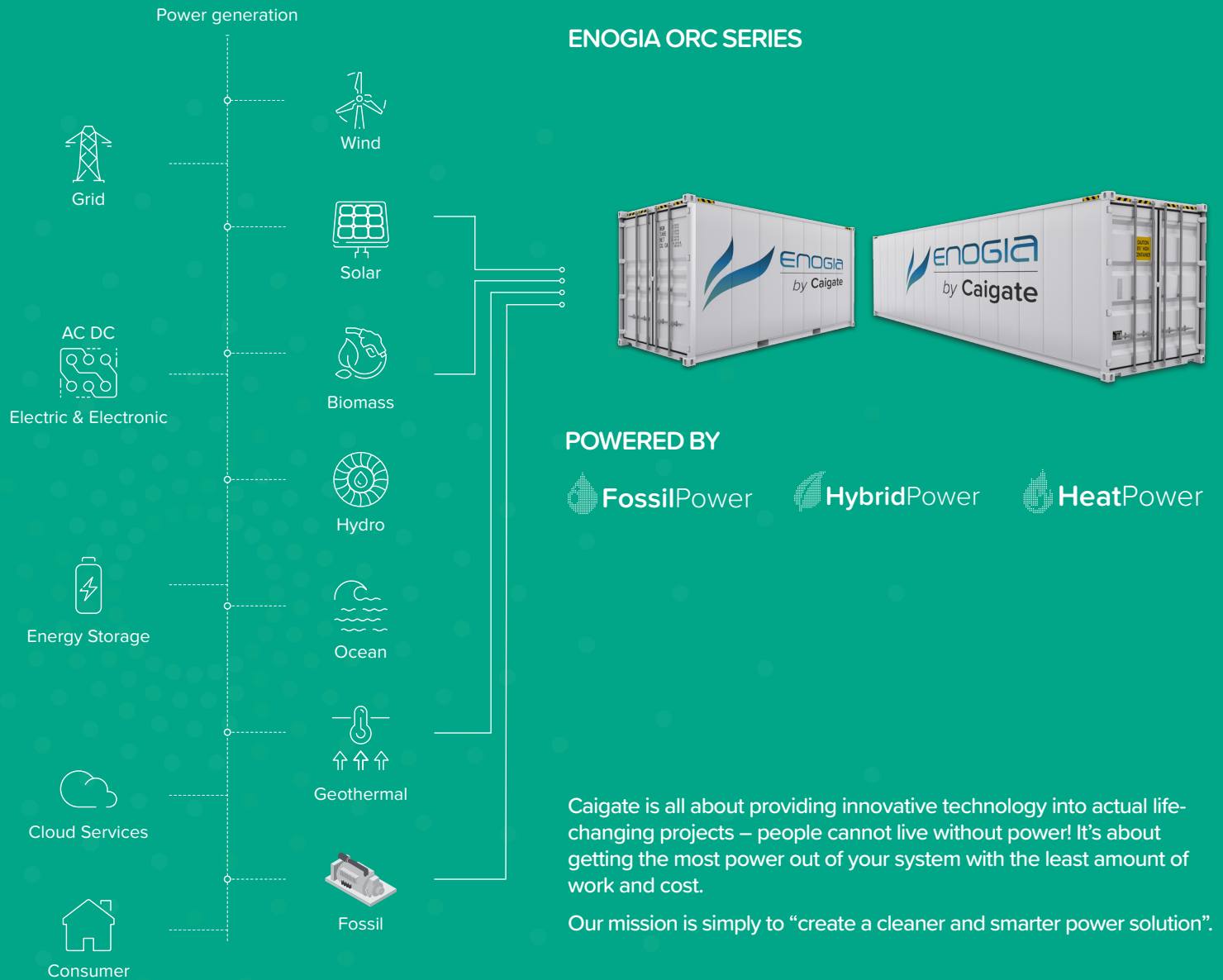
OTHER SERIES

PRODUCT RANGE	LT (Low Temperature)	MT (Medium Temperature)	MT / DE (Medium Temperature / Direct Evaporation)
HOT SIDE CONDITIONS	70-120°C hot water inlet	150-200°C hot water or oil inlet	200-400°C hot gases inlet
WORKINGFLUIDE	R-245fa	New Generation Refrigerant (GWP=1)	New Generation Refrigerant (GWP=1)
10kW (GROSS ELECTRIC POWER)	ENO-10LT	ENO10MT	ENO-10MT/DE
20kW (GROSS ELECTRIC POWER)	ENO-20LT	ENO-20MT	ENO-20MT/DE
40kW (GROSS ELECTRIC POWER)	ENO-40LT	ENO-40MT	ENO-40MT/DE
100kW (GROSS ELECTRIC POWER)	ENO-100LT	ENO-100MT	ENO-100MT/DE



ORC 180kW

Integrated solution provider for Hybrid Microgrid Solution:



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We reserve the right to update product component parameters at any time.