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November 2021



Packaged Power Station

Rapid Assembly Containerized PPS
One-stop comprehensive energy utilization solution



Your vision, our mission
PDV POWER

POWER 勤实电力[®]
DILIGENCE · VERACITY PDV POWER



STATIONARY POWER PLANT

Base load, Captive, Mining, Industrial, Residential, Island

Our Vision:

PDV's vision is to become a world-wide recognized power plant service provider for its outstanding quality.



OFFSHORE MAIN POWER PLANT

FPSO, FPS, DPP, MOU

Our Mission:

Our mission is to bring electricity to underdeveloped areas, by following our strongest belief: all the power plant projects we undertake, must be successfully executed promise.

CONTENT

All data provided in this document is non-binding. This data serves informational purposes only and is especially not guaranteed in any way.

Depending on the subsequent specific individual project, the relevant data may be subject to changes and will be assessed and determined individually for each project. This will depend on the particular characteristics of each individual project, especially specific site and operational conditions.

If this document is delivered in another language than English and doubts arise concerning the translation, the English text shall prevail.

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PDV POWER PROFILE

Fast Growing, Continuous Innovation,
Developing Traditional Industries to an Unparalleled Level

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MAIN BUSINESS

PDV is devoted to the market for crude oil power stations on off-shore drilling platforms and large-scale stationary HFO power plants. PDV specializes in the Full Turnkey Engineering power plant design, equipment manufacturing, complete system and installation engineering, as well as operation and management service.

PDV positions itself on the high-end international power plant market as an enterprise offering only excellent products and impeccable service.

Our Main Business :

-  Clean and Renewable Energy Development and Application
-  Crude Oil Power Plant on Offshore Platform
-  Packaged Power Station
-  HFO Combined Cycle Power Plant
-  Upgrading and Modification of Power Plant
-  Investment & Financing

BUSINESS ADVANTAGE



COMPLETE INDUSTRIAL CHAIN

PDV has their very own professional design team, manufacturing factory, engineering and O&M team, which provides complete EPC+O project services.



QUALIFIED CNOOC CONTRACTOR

PDV is involved in the field of CNOOC Crude Oil Main Power Plant since 2006. PDV is one of the few companies all over the world, to have access to the CNOOC OFFSHORE's high-end industry.



EPC PERFORMANCE IN AUSTRALIA

As to date, PDV is the only company that has access to the Australian high-end market with HFO power plant as it's outstanding core business.



POWER PLANT INVESTMENT

PDV possesses a successful track record for power plant investment both in terms of financing and investment.



EXCELLENT PERFORMANCE

PDV is the best performing Chinese company for HFO Power Plant projects, achieving a total installed capacity of over 1800MW.



3D-DIGITAL DESIGN

This is the core technology of PDV. Our independent designing platform allows for system design integration, design collaboration, automatic cost accounting and generation of drawings and BOM. PDV is an industry leader and has promoted comprehensive technological innovation in the power plant design industry.

3D DIGITAL DESIGN



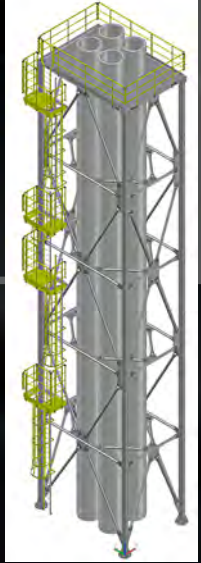
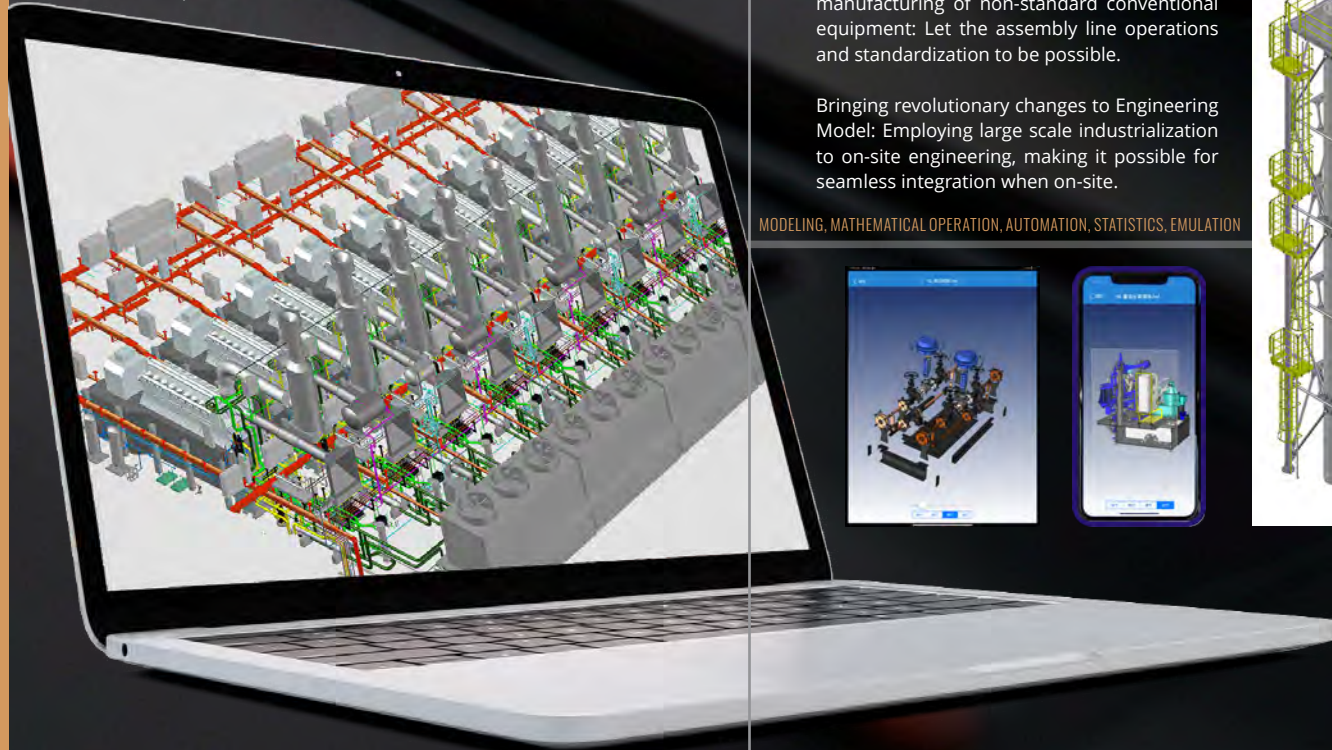
PDV's 3D Digital Design and engineering application are in a leading position in the industry in the world !

The digital design of power station created by PDV is one of the core concepts of **INDUSTRY 4.0**.

Bringing revolutionary changes to the manufacturing of non-standard conventional equipment: Let the assembly line operations and standardization to be possible.

Bringing revolutionary changes to Engineering Model: Employing large scale industrialization to on-site engineering, making it possible for seamless integration when on-site.

MODELING, MATHEMATICAL OPERATION, AUTOMATION, STATISTICS, EMULATION



SMART POWER PLANT



Central Control



Mobile Operation Station



Remote Fault Diagnosis



PMS



Remote Data Center



PP-Cloud



Mobile APP



PRODUCT SERIES

PDV has their own power plant equipment, PPS production and engineering bases. We mainly produce supporting electrical and auxiliary systems equipment for the main genset, engineering prefabrication, and PPS. There are a number of self-developed patented technologies and innovations, pursuing high-quality, cost-effective products with zero defects.



Brand Value:

Diligence, Veracity, Professionalism, Efficiency.

Brand Position:

PDV positions itself on the high-end international power plant market as an enterprise offering only excellent products and impeccable service.

Brand Promise:

PDV's commitment is to find the perfect solution for every power plant project and transform it into reality with professionalism and efficiency.



Auxiliary Module Series

Offshore Equipment

Electrical Panel Series

Electrical Island

Quick-Erection Power Plant

Packaged Power Station (PPS)

Electrical Control System (SCADA)

PLC Module

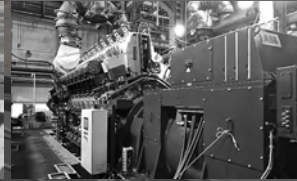
TYPICAL PROJECTS



CRUDE OIL MAIN POWER PLANT
CNOOC OFFSHORE



CAIRN HILL PROCESSING PLANT POWER
AUSTRALIA



CHINA GOVERNMENT-AIDED PROJECT
ANTIGUA AND BARBUDA



GOLD MINES CAPTIVE HFO POWER PLANT
FIJI



GOVERNMENT GRID POWER PLANT
EAST TIMOR



ECUADOR



AL MAYMON POWER PLANT
IRAQ



PDV SELF-INVESTED IPP PROJECT
IRAQ



POWER PLANT DEMOLITION, UPGRADING,
OVERHAUL AND COMBINED CYCLE
BANGLADESH





PPS PRESENTATION

Brand-new concept, unique design, multiple technological breakthroughs, easy-assembly of standardized containers, CCS certification



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PPS INTRODUCTION

PPS (Packaged Power Station) is a modularized, mobile container power plant developed by PDV. The product is a complete solution that is highly integrated and commercializes power plant EPC engineering.

All equipment, pipelines, cables and structures are manufactured in our factory and the load simulation test can be achieved in our facility once assembled into a complete power plant. The on-site assembly can be completed within a few weeks, which greatly reduces the cost and avoids the risks of on-site engineering, shortening the overall project period, thereby significantly reducing the cost per kilowatt.

Suitable Fuel :

-  Heavy Fuel
-  Diesel Fuel
-  Oil & Gas Dual Fuel
-  Biomass Fuel
-  Crude Oil







Our Field :

-  Mining
-  Grid
-  Industrial
-  Island
-  Oilfield
-  Port
-  Large Temporary P.S infrastructure projects
-  Short-term P.S
-  Residents









PPS INTRODUCTION

PPS VALUE

-  **REDUCE PROJECT COST**, The greatest advantage of PPS is to reduce the project cost and on-site construction difficulty, these advantages become apparent for temporary and mobile power supply projects.
-  **FACTORY OPERATION SIMULATION:** Allows for the simulation of operation for the entire plant as well as executing site test according to the load curve, it can also automatically distribute load of multiple engines in parallel and carry out dynamic power factor adjustments to simulate various extreme operating conditions reducing future on-site commissioning risk.
-  **REPEATABLE RELOCATION:** Aligned with the global development trend of renewable energy, PPS can be used as a supplement to variable and stable power and can be relocated at any time with low cost which has great reusability.
-  **COST EFFECTIVE:** PPS offers a high-level configuration with lower overall costing as compared to the conventional power plants.
-  **SMART:** Highly intelligent control for unmanned operation which is equipped with a cross-border remote mobile App data system which greatly reduces the difficulty of onsite operation & management.
-  **SUITABLE FOR MULTIPLE FUELS:** A wide range of gas can be applicable on PPS even the biomass fuel advocated by World Bank, as such it presents great prospects on future development.

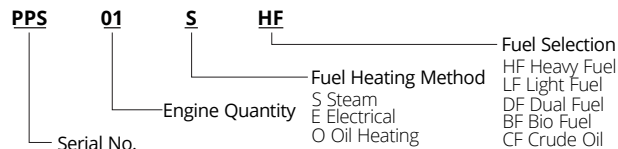
PPS ADVANTAGE

-  Gensets can be freely repaired in the container.
-  Improved Ventilation and heat dissipation conditions.
-  All designed with standard containers reducing logistical expenses.
-  On-site works have been significantly reduced, with the shortest installation period of only seven days.
-  Maximum Genset capacity can go up to 4500MW, a great improvement compared to the traditional containerized power plants with capacities no greater than 1700kW.
-  The on-site fuel storage tank engineering previously considered as a difficulty will now adopt containerized fuel tanks. The containerized tanks will be produced in the factory and assembled on-site.

PPS has highly intelligent local control system, remote data diagnosis center and power station APP which can truly realize unmanned operation, reducing labor cost and improving operation reliability.



DATA SHEET



Power Station

Serial No.	PPS01	PPS02	PPS03	PPS04
Genset Power ^{MW}	1.92, 1.6DF	1.92, 1.6DF	1.92, 1.6DF	1.92, 1.6DF
Unit Capacity ^{MW}	1.92, 1.6DF	3.84, 3.2DF	5.76, 4.8DF	7.68, 6.4DF
Engine Qty. ^{SETS}	1	2	3	4
Voltage Output ^{kV}	6.6, 11, 13.8			
Frequency ^{Hz}	50, 60			
Suitable Fuel	Heavy Fuel, Light Fuel, Dual Fuel, Bio-fuel, Crude Oil			
Suitable Load	Captive, Peak Shaving, Base Load			

Diesel Engine

Brand	MAN	WÄRTSILÄ
Model	9L21/31	9L20DF
Rated Speed ^{rpm}	900, 1000	1000, 1200
Cylinder Bore ^{mm}	210	200
Piston Stroke ^{mm}	310	280
Cylinder output ^{kW}	200-220	160, 185
Effective P. ^{bar}	24.3-27.8	22.0, 21.0
Piston Speed ^{m/s}	9.3, 10.3	9.3, 11.2
Fuel Acceptance	MDO, HFO, CFO, BFO	MDO, HFO, CFO, BFO, DF
Dry Mass ^{ton}	23	11.7

Generator

Application	MAN 9L21/31	WÄRTSILÄ 9L20DF
Brand	ABB	ABB
Capacity ^{kW} (output) ^{kVA}	1,921 (2,400)	1,380 (1,725), 1,600 (2,000)
Standard	IEC 60034-1	IEC 60034-1
Terminal voltage ^{kV}	6.6, 11, 13.8	6.6, 11, 13.8
Frequency ^{Hz}	50, 60	50, 60
Number of phase	3 phase 3 wire	3 phase 3 wire
Number of pole	6, 8	6
Revolving speed ^{rpm}	1000, 900	1000, 1200
Power factor	0.8 lagging	0.8 lagging
Connection	Star	Star
Excitation method	Brushless type	Brushless type
Cooling method	IC0A1	IC0A1
Duty type	Continuous	Continuous
Insulation/Temp. rise	F class/ F rise	F class/ F rise
Protection	IP23 (Default)	IP23 (Default)

DATA SHEET

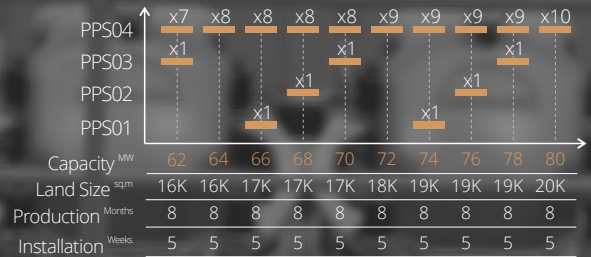
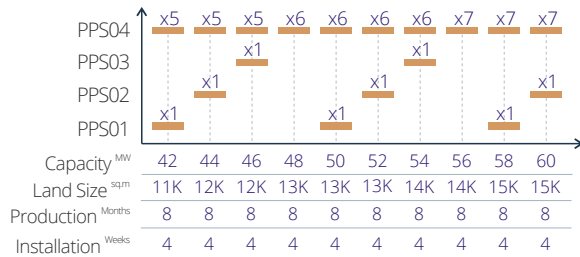
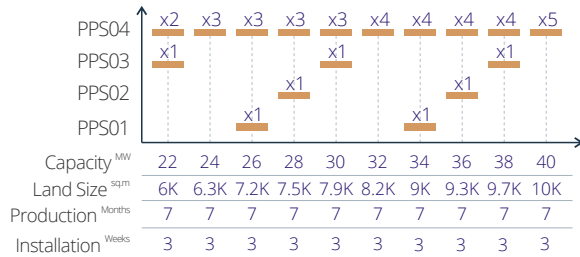
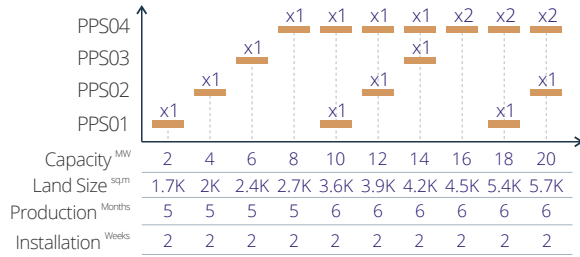
KEY EQUIPMENT BRAND

1. Diesel Engine	: MAN, WÄRTSILÄ
2. Generator	: ABB
3. Turbo-charger	: ENG. MFG. SUPPLY
4. HFO Separator	: ALFA LAVAL, SWEDEN
5. Lube oil Separator	: ALFA LAVAL, SWEDEN
6. Fuel oil automatic filter	: BOLL, GERMANY
7. Lube oil automatic filter	: ENGINE MOUNTED
8. Lube oil cooler	: ENGINE MOUNTED
9. HFO heater	: KELVION, GERMANY
10. Radiator	: KELVION, GERMANY
11. Fuel oil viscosity controller	: VAF, NETHERLANDS
12. Fuel oil viscosity transducer	: VAF, NETHERLANDS
13. Controller transmitter	: VAF, NETHERLANDS
14. Temp. sensor for vis. controller	: VAF, NETHERLANDS
15. Gear pump	: CHINA
16. Screw pump	: IMO, CHINA
17. Water pump	: CHINA
18. Diaphragm pump	: WELDEN USA
19. MV VCB	: ABB
20. LV ACB	: ABB
21. LV MCCB	: ABB
22. PLC	: SIEMENS
23. Auxiliary relay	: ABB, OMRON
24. DC charger module	: EMERSON
25. Station Service Transformer	: CHINA

SYSTEM CONFIGURATION

Cooling Type	: Radiator
Fuel Heat Source	: Saturated Steam, Hot Oil, Electrical
Power Plant Control System	: SCADA
Voltage Regulation Type	: Digital AVR
Secondary Fuel Oil Filter Type	: Self-cleaning
Secondary Lube Oil Filter Type	: Engine Mounted
Lube Oil Cooler Type	: Engine Mounted
Fuel Oil Heater Type	: Lead Welding
JW Preheater	: Electrical
Lube Oil Prepump	: Engine Mounted
Jacket Water Pump	: Engine-Driven Pump
Raw Water Pump	: Engine-Driven Pump
Lube Oil Pump	: Engine-Driven Pump
Water and Oil Pump (system)	: One use, one standby
Medium Voltage Circuit Breaker	: VCB
Station Service Transformer	: Dry Type
Control Power Source	: AC, 110/24V DC, UPS

TYPE SELECTION



CONTROL SYSTEM



Central Control



Mobile Operation Station



Remote Fault Diagnosis



PMS



Remote Data Center



PP-Cloud



Mobile APP



ENGINE TYPE

MAN

MAN Diesel & Turbo SE, based in Augsburg, Germany, is the world's lead-ing provider of large-bore diesel and gas engines and turbomachinery. The company employs around 15,000 staff at more than 100 international sites, primarily in Germany, Denmark, France, Switzerland, the Czech Republic, India and China. The company's product portfolio includes two-stroke and four-stroke engines for marine and stationary applications, turbochargers and propellers as well as gas and steam turbines, compressors and chemi-cal reactors. The range of services and supplies is rounded off by complete solutions like ship propulsion systems, engine-based power plants and turbomachinery trains for the oil & gas as well as the process industries. Customers receive worldwide after-sales services marketed under the MAN PrimeServ brand.

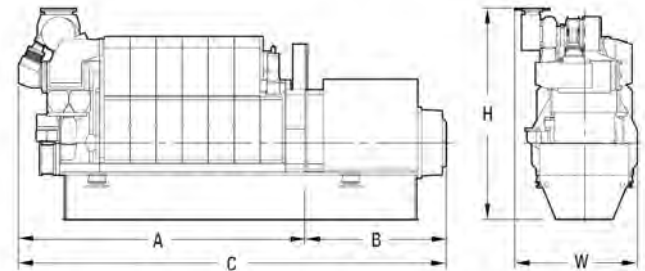
MAN 21/31S

Bore 210mm, stroke 310mm		5L	6L	7L	8L	9L
Engine speed	rpm	1,000/900	1,000/900	1,000/900	1,000/900	1,000/900
Frequency	Hz	50/60	50/60	50/60	50/60	50/60
Electr. Genset Power	kW	1,056	1,267	1,478	1,707	1,921

Dimensions

A	mm	3,959	4,314	4,669	5,024	5,379
B	mm	2,041	2,036	1,971	2,266	2,741
C	mm	6,000	6,350	6,640	7,290	8,120
W	mm	2,110	2,110	2,110	2,180	2,180
H	mm	3,070	3,070	3,170	3,170	3,170
Genset dry mass	t	23.0	26.0	28.5	31.0	33.5

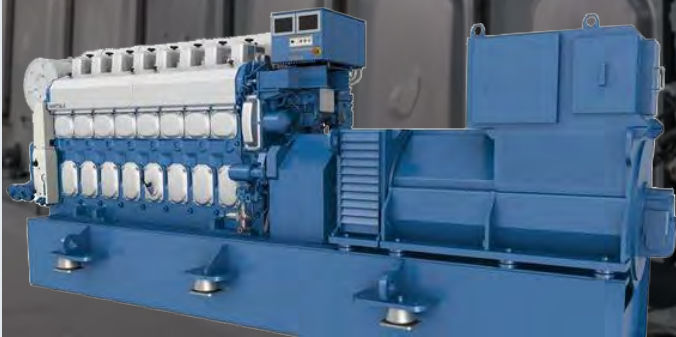
Weight and dimensions are subject to final application



ENGINE TYPE

Wärtsilä

The Wärtsilä 20DF is a four-stroke dual-fuel engine that can be run on natural gas, marine diesel oil (MDO) or heavy fuel oil (HFO). The engine can switch over from gas to MDO/HFO and vice versa smoothly during engine operation without power interruption. The Wärtsilä 20DF design is based on the well proven and reliable Wärtsilä 20 diesel engine which was introduced on the market in the early 1990s. Wärtsilä 20DF completes the lower power range in the dual-fuel Wärtsilä engine family.



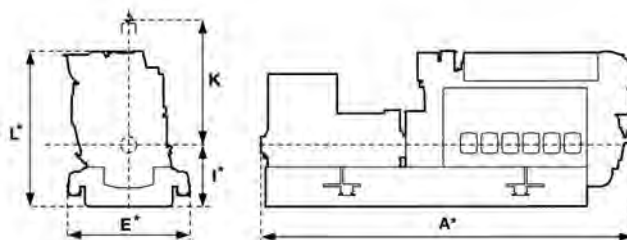
Wärtsilä Genset 20DF

Bore 200mm, stroke 280mm	6L20DF	8L20DF	9L20DF
Engine speed rpm	1,000/1,200	1,000/1,200	1,000/1,200
Frequency Hz	50/60	50/60	50/60
Genset Rated Power kW	920/1,065	1,230/1,420	1,380/1,600

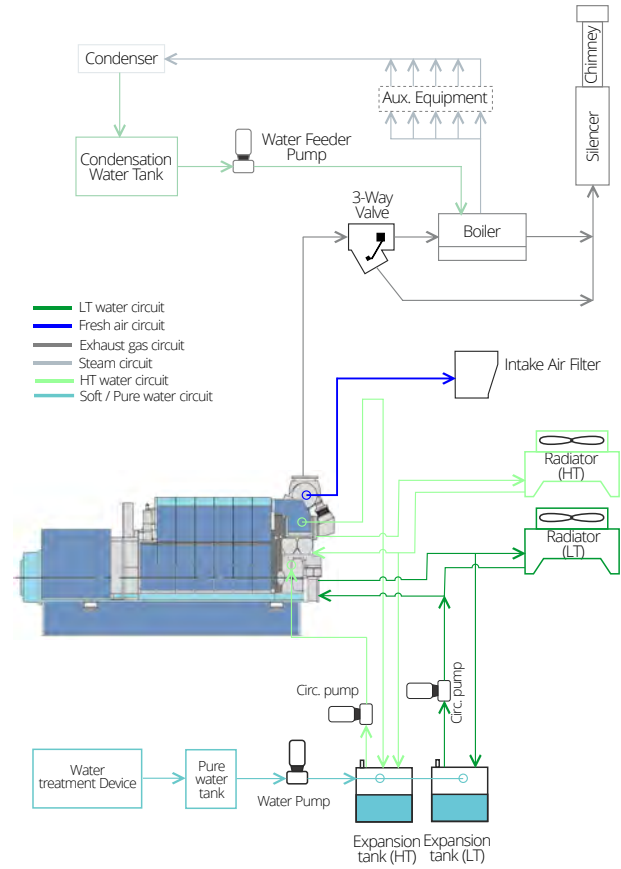
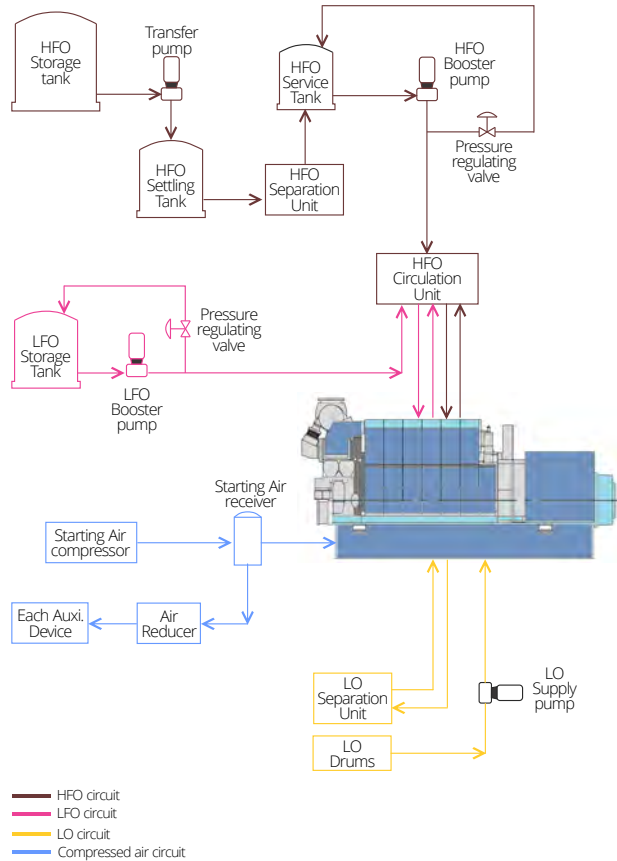
Dimensions

A*	mm	5,325	6,030	6,535
E	mm	2,070	2,070	2,300
I*	mm	895/975/1,025	1,025/1,075	1,075/1,125
K*	mm	1,800	1,800	1,800
L*	mm	2,731	2,781	2,831
Weight		16.9	20.8	23.9

Weight and dimensions are subject to final application



PROCESS FLOW DIAGRAM (PFD)



COMPREHENSIVE SOLUTION OF CLEAN & RENEWABLE ENERGY

Consumer

Combined supply of cold, heat and electricity to maximize energy savings and reduce carbon emissions.

Waste Heat Recovery Air Conditioning

Recover the waste heat discharged by diesel engine to supply air conditioning for buildings or Consumer.

ORC Expander

Condition unstable and low-quality heat sources, stabilize the air-conditioning supply of waste heat air conditioners, and charge the generated electricity into the energy storage center.

Heat Storage Center

Collect and store the excess heat to provide heat to users.

Packaged Power Station

As the main power and heat source, it forms a complementary mode with wind and solar power generation to inform energy storage to collect excess generated electric energy. The thermal efficiency can reach 70%.

Solar Energy

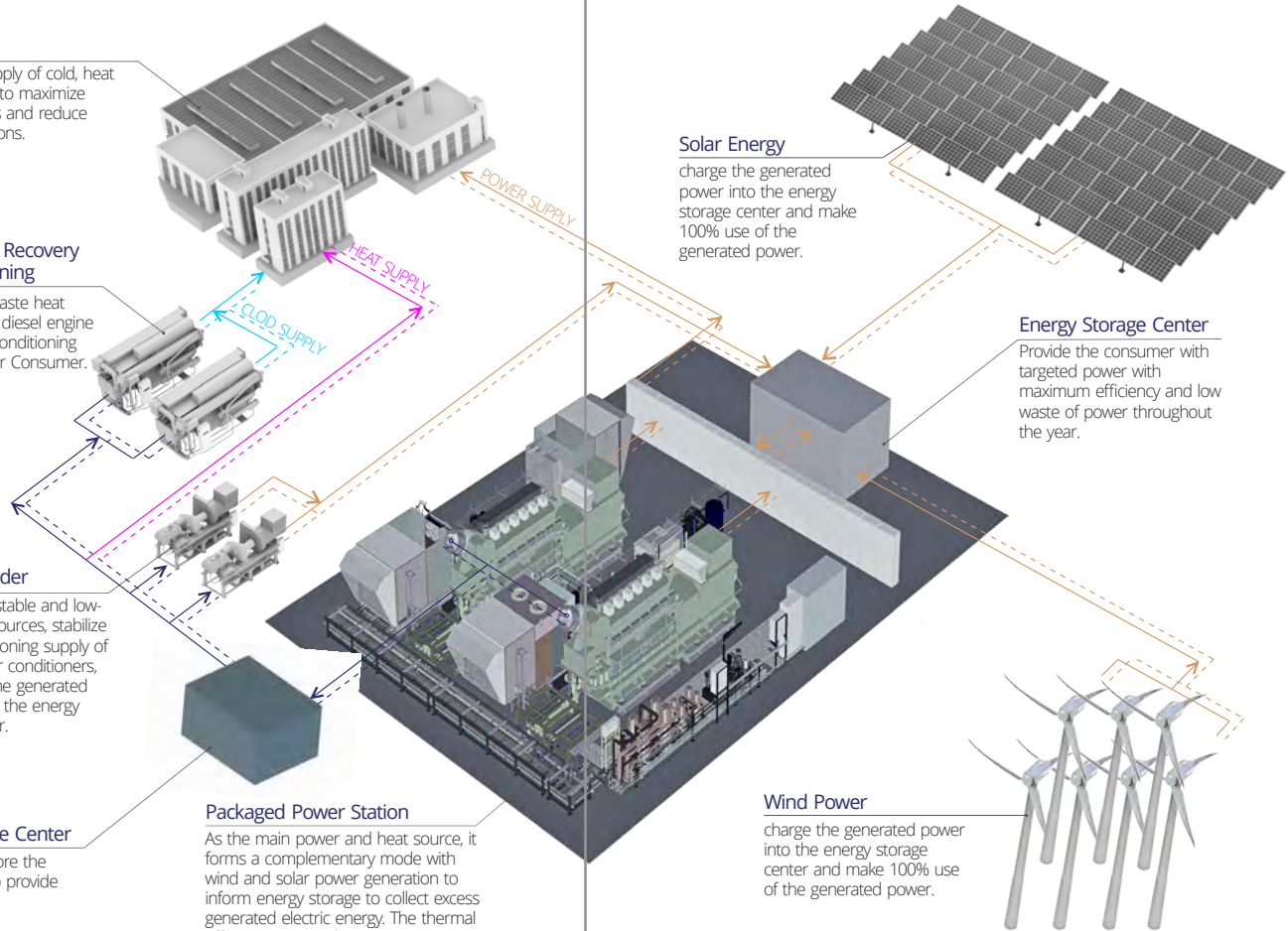
charge the generated power into the energy storage center and make 100% use of the generated power.

Energy Storage Center

Provide the consumer with targeted power with maximum efficiency and low waste of power throughout the year.

Wind Power

charge the generated power into the energy storage center and make 100% use of the generated power.



CONCEPTUAL DESIGN OF DISTRIBUTED ENERGY

