RE100 Power Consortium

RE100POWER CoGen

Easy & Fast Solution

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Business

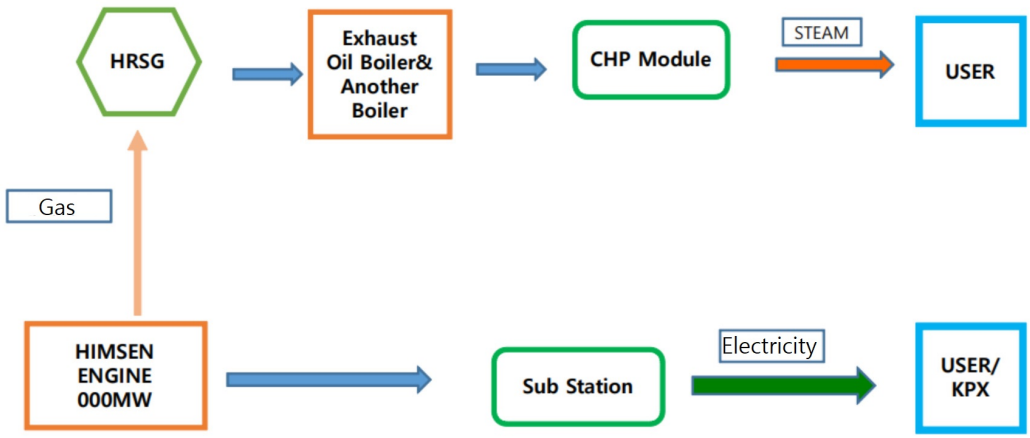
I. Large Scale Combined Heat and Power (CHP) Plant Standard Type

MS Model

MSA Model

This Model is designed to support RE100 participation and address the paid carbon emissions quota for companies located within the petrochemical complex. Electricity generated by the combined heat and power (CHP) plant is sold to KPX (Korea Power Exchange), while the renewable heat (steam) is directly supplied to nearby tenant companies.

RE100POWER Combined Heating Power Plant MODEL



RE100 S'tm

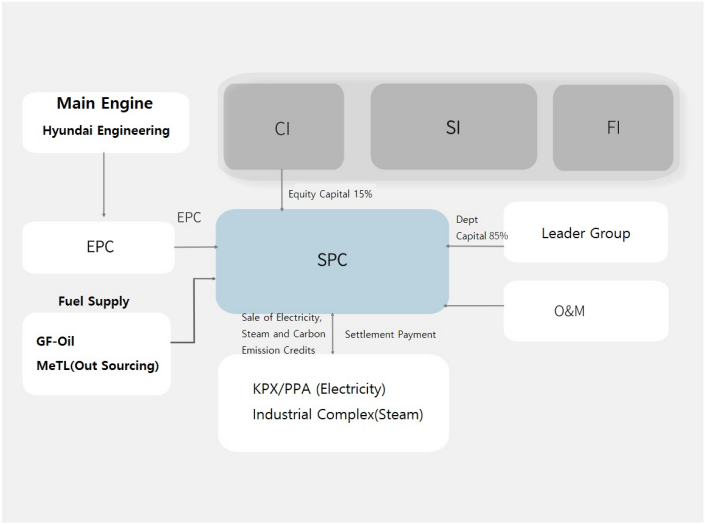
Category	Steam Classification	Transaction Unit Price	Result
General Steam	LNG-Based Byproduct Gas	Production Cost + 50,000 KRW - Carbon Emissions Allowance Purchase 100,000 KRW - Integrated Market Carbon Emissions Allowance Purchase 90,000 ~ 140,000 KRW	Fulfillment of Paid Allocation Obligations
Renewable Steam	Ulsan Renewable Combined Heat and Power Plant	60,000 KRW (/ton/260C^/46 bar)	Fulfillment of Paid Allocation Obligation Compliance with RE100 Regulations (via Carbon Credit Exchange), Realization of Green Taxonomy

I. Large Scale Combined Heat and Power (CHP) Plant Standard Type

MS Model
MSA Model

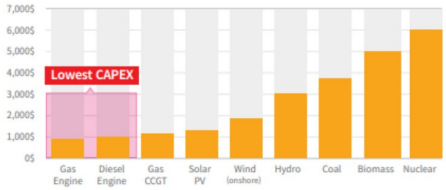
Title	**Renewable Heat and Power Plant**
Specification	14H54DFVX6 Combined GF Boiler **(Aux. 21MW)**
Output(90%)	**Electricity** 827,820MWh/y **Steam** 876,000ton/y (260°/46bar)
CapEx	**KRW 205 billion**
Equity	**KRW 30.75 billion**
Target Objective	"Re100 Campaign ESG Green Taxonomy"
Profit	**Electricitv Profit** **Steam Profit**
Analysis	IRR 29% ROI 4.8/year

RE100CoGen Business Structure



This Model is being developed by RE100 power Co.,Ltd., which is preparing the project and plans to operate the power plant with multiple companies as end users under a system integration (SI) approach. Although the current project financing (PF) environment is challenging, renewable combined head and power (CHP) Plants can still secure PF relatively Easily through domestic financial institutions. Compared to gas turbines, high HRR diesel engines offer better cost-effectiveness and allow for the rapid assembly of 21MW modules, significantly reducing power plant construction costs.

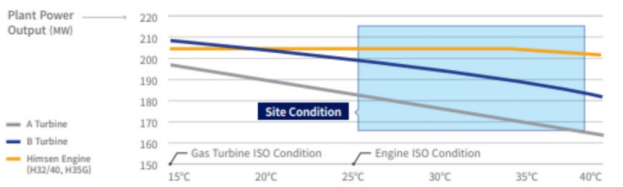
Gas Turbine vs. Steam Turbine vs. Diesel Engine



Diesel (Biofuel) engines are among the most cost - effective power sources available. The operational and maintenance costs are also significantly lower compared to other types of power generation systems.

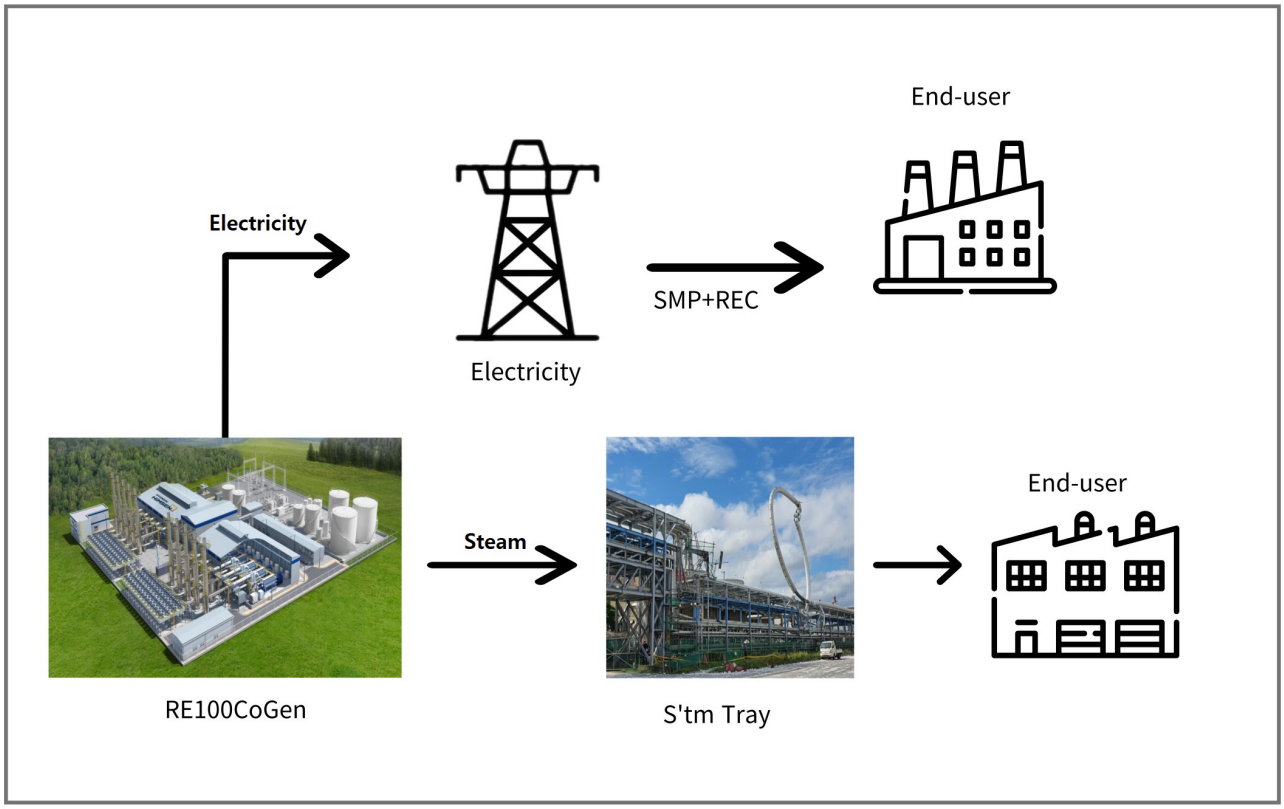
Diesel engines are a power source that is relatively less affected by temperature variations.

Impact of Ambient Temperature on Gas Turbine and Engine Plant Output



I. Large Scale Combined Heat and Power (CHP) Plant MS Model
PPA Cogen MSB Model

Renewable Electricity / Renewable Steam Supply Process



Starting in 2026, the Carbon Border Adjustment Mechanism(CBAM) will be fully implemented, and the carbon emissions trading markets will be integrated. The price gap between the European futures market and Korea Allowance Units(KAUs) will be subject to carbon border tax charges. Utilizing PPA CoGen can help prevent excessive losses

Carbon Border Adjustment Mechanism(CBAM)

The European Union(EU) is introducing the world's first Carbon Border Adjustment Mechanism(CBAM), a carbon border tax that imposes costs on imported products with higher carbon emissions than those produced within the EU. Starting in 2023, the EU began a trial phase of CBAM on high-emission goods such as electricity, cement, fertilizers, steel, and aluminum. The mechanism will be fully implemented in 2026.

I. Large Scale Combined Heat and Power (CHP) Plant

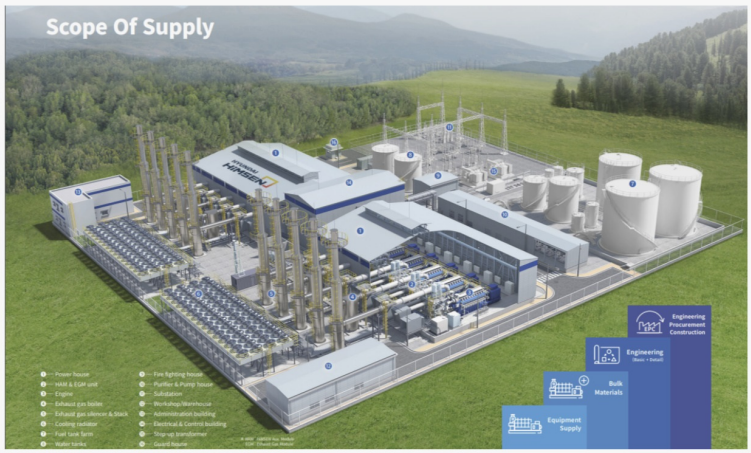
REGO Type

MS Model

MSC Model

Location	Model Type	Plant Specifications		CapEX	Equity
Petrochemical Complex	Type-C/Model-Msc CHP	Electricity	300MW	KRW 648 Billion	KRW 97.2 Billion
		Steam	200TNH		

Major Korean companies have joined the RE100 campaign to overcome export restrictions. However, due to the Green Premium scheme's failure to obtain international certifications, the majority of participating companies have been unable to report their implementation performance.



RE100 가입기업 신재생에너지 전환율

신재생에너지 전환율(%) ■ 녹색프리미엄 ■ REC

		RE100 가입시기	RE100 달성목표
1	SK아이테크놀로지	2021년	2030년
2	LG이노텍	41.08	2022 2030
3	LG에너지솔루션	31.4	2021 2030
4(5)	SK하이(SK머티리얼즈)	31.45	2020 2040(2050)
6	아모레퍼시픽	28.99	2021 2030
7	SK실트론	26.41	2020 2040
8	SK하이닉스	13.56	2020 2050
9	삼성전자	12.09	2022 2050
10	삼성디스플레이	9.19	2022 2050
11	SK텔레콤	9.07	2020 2050
12	SKC	1.45	2020 2040
13	고려아연	0	2021 2050
14	롯데칠성음료	0	2021 2040
15	미래에셋	0	2021 2025
16	한국수자원공사	0	2021 2050
17	KB금융그룹	0	2021 2040
18	기아	0	2022 2040
19	네이버	0	2022 2040
20	삼성SDI	0	2022 2050
21	인천국제공항공사	0	2022 2040
22	현대모비스	0	2022 2040
23	현대위아	0	2022 2050
24	현대자동차	0	2022 2045
25	KT	0	2022 2050

※SK머티리얼즈는 2021년 SK㈜사업부문으로 편입, 삼성바이오로직스, 삼성전기는 2022년 11월 가입

자료: 구자근 국민의힘 의원실, 본지추산 The JoongAng

REGO Type Plant Standard

Companies with poor RE100 implementation performance can benefit by investing equity in remote renewable power plants. by fulfilling their RE100 commitments through these investments and receiving high dividends from the operating profits of the power plant company, they can recover their investment costs early.

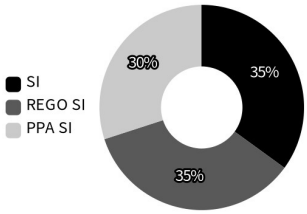
Category	Industry Type	Greenhouse gas annual Emission (Co2 ton)	Energy Usage(TJ)	Verification Institution
Company	Conversion	1,187,390	14,821	(주)디엔브이비즈니스어슈어런스 코리아
Company	Industry	122,294	1,622	한국표준협회
Business site	Industry	95,478	1,781	(주)디엔브이비즈니스어슈어런스 코리아
Company	Building	144,480	2,987	한국표준협회
Business site	Industry	28,957	586	한국표준협회
Business site	Industry	25,684	523	한국생산성본부인증원(주)
Business site	Industry	28,320	576	이큐에이(주)
Company	Industry	405,811	9,252	(재)한국화학융합시험연구원
Company	Conversion	1,953,049	37,296	(주)한국품질재단

Each company's energy consumption (RE100 implementation target) will be used by the contracted verification body to calculate the amount of Co2, reduction, based on the reference example above. If trust in the existing verification body is an issue, support can be provided by the RE100 Power Consortium.

Example Structure for REGO Power Plant Development

CASE 1, CASE 2 IRR(CoGen#1)

Feasibility Study Results		Case1	Case2	Case3	Case4
Return on Investment (ROI)					
Pre-Tax Real Rate of Return	12.23%	12.23%	30.42%	12.23%	30.42%
Post-Tax Real Rate of Return	11.11%	11.11%	26.60%	11.11%	26.60%
Pre-Tax Nominal Rate of Return	14.47%	14.47%	33.03%	14.47%	33.03%
Post-Tax Nominal Rate of Return	13.33%	13.33%	29.13%	13.33%	29.13%



Investment Ratio for REGO Power Plant

Strategic Investor(SI)

Investment Company	Investment Ratio	Investment Amount	25-Year Dividend Income
A社	20%	KRW 19.5 Billion	KRW 72.7 Billion
B社	15%	KRW 14.6 Billion	KRW 54.3 Billion

35%

Companies Located in Yeosu Industrial Complex (PPA User SI)

SI [CI]	Investment Ratio	Investment Amount	25-Year Dividend Income	PPP Cost	PPP Cost after Deducting Revenue	Benefit
OO社	20%	KRW 19.5 Billion	KRW 72.7 Billion	KRW 0000	PPP Cost X 60 %	Securing Carbon Emission Allowances for RE100 Compliance Financial Benefits of Green Taxonomy Implementing ESG Management
OO社	10%	KRW 9.8 Billion	KRW 36.7 Billion	KRW 0000	PPP Cost X 60 %	Securing Carbon Emission Allowances for RE100 Compliance Financial Benefits of Green Taxonomy Implementing ESG Management

30%

SI for Non-RE100 Compliant Companies (Companies Interested in REGO)

RE100 Companise Located Nationwide	Energy Consumption	Equity Investment Ratio	Investment Amount	25-Year Dividend Income	Benefits
OO社	30MW	10%	KRW 72.7 Billion	KRW 36.7 Billion	100% RE100 Membership and Compliance Financial Benefits of Green Taxonomy Implementing ESG Management
OO社	50MW	17%	KRW 36.7 Billion	KRW 61.8 Billion	
OO社	24MW	8%	KRW 7.8 Billion	KRW 29.2 Billion	

35%

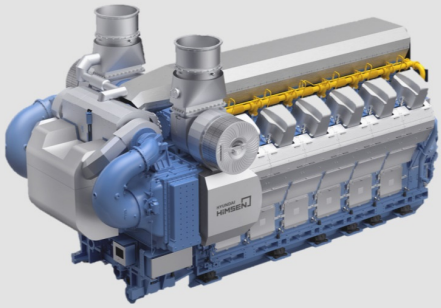
II. Distributed Power 2.88MW Private (SS Model)

This model allows industrial sites that require renewable electricity or renewable steam to own a small-scale power plant capable of independently supplying their own energy needs.

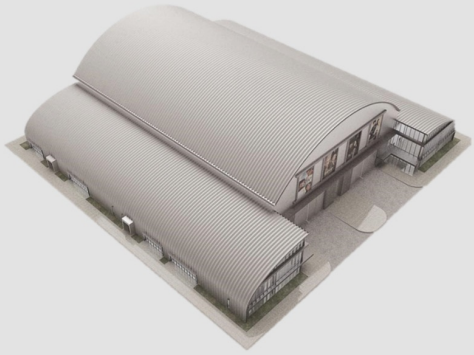
The 2.88MW engine power plant installed by our company is subject to approval by the provincial governor or metropolitan mayor under the Electricity Business Act. Since the approval process takes less than 90 days, the plant can be operational within approximately six months, allowing sufficient use of renewable electricity and steam.

Power Plant Specifications	Licensing Authority	Required Period	Construction Period	Total Required Period
Under 3MW	Metropolitan Mayor Provincial Governor	90 Days	90 Days	within D+ 180 Days
Over 3MW	Ministry of Trade, Electricity Committee	over 360 Days	over 720 Days	D+ 1080 Days

Single Type SSA Model



RE6H32/40엔진



Power Plant Management Center

II. Distributed Power 2.88MW Private (SS Model)

Cooperative Type SSC Model

Cooperative Station

Exhuast Heating Boiler

The Difference from the SSB Model (Cooperative Type) is that this type/Model is designed for areas where independent companies are located in close proximity and require not only renewable electricity but also a small amount of renewable steam.

EX)

Company	T.J Energy Usage	Needs	Units	Output	Installation Site
A社	5MW	Electricity	2EA	5.76MW	Lease Agreement with C社 *Boiler : A社, B社 's land *Fuel Storage/Management Center, Control Facilities: Jointly Owned by A,B,C社
		S'tm 10ton		S'tm 10ton	
B社	3MW	Electricity	1EA		
C社	6MW	Electricity	2EA	5.76MW	
		S'tm 15ton		S'tm 15ton	
Total	14MW	S'tm 25ton	5EA	S'tm 25ton	

II. Distributed Power 2.88MW Private (SS Model)

Cooperative Type

SSD Model

Shared Facility

Cooperative Cogeneration Type

Example) Banwol Industrial Complex Dyeing and Paper Industries

Cases where Demand for Renewable Steam Exceeds That for Renewable

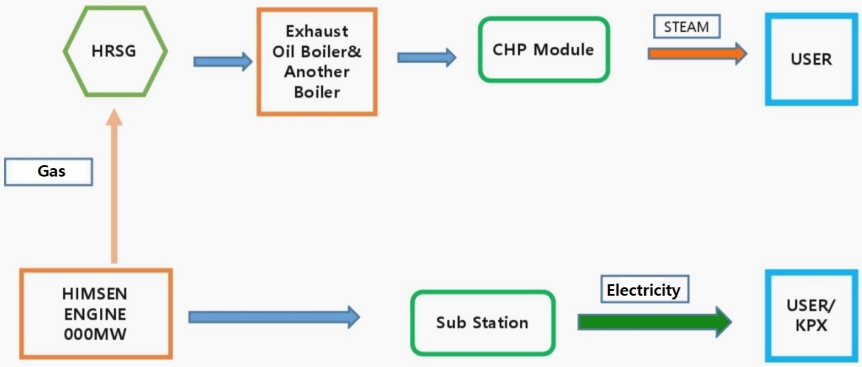
Company	TJ Energy Usage	Needs	Units	Installation Location	Shared Facility
A社	3MW	Electricity	1EA	Company with Idle Land Required area: approximately 5,000㎡ Cooperative Complex with Land Lease Arrangement	Fuel Storage Facility S'tm Tray Shared Management Center Boiler Plant
		S'tm	15ton/h		
B社	6MW	Electricity	2EA		
		S'tm	20ton/h		
C社	3MW	Electricity	1EA		
		S'tm	20ton/h		
계	12MW	Electricity	4EA		
		S'tm	55ton/h		

II. Distributed Power 2.88MW Private (SS Model)

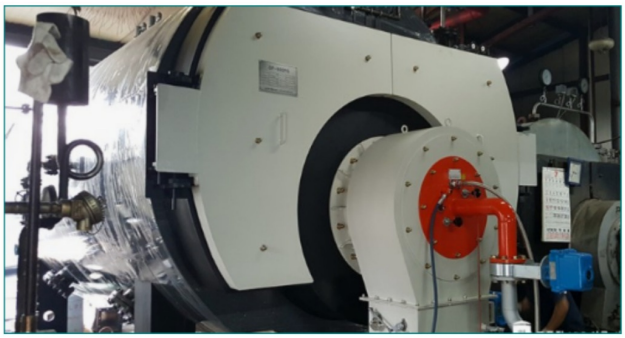
Cooperative CHP Type SSD Model

Combined Heat and Power (CHP) System

RE100POWER Combined Heating Power Plant MODEL



This system utilizes the exhaust gas emitted from the engine generator to heat an exhaust oil boiler located at the downstream end, producing steam (S'tm). The steam can be supplied at a cost comparable to or lower than that of conventional steam. By using this steam, companies are exempt from paying for carbon emissions allowances under the paid allocatio scheme.



GF Burner

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Power Plant

Power Plant

I. Power Line-Up

HiMSEN Engine Line-up for Stationary Gensets

HD HiMSEN Engine / GenSets are available in a wide range from 2.88MW on-site generation for self-use to large-scale units up to 21MW. RE100Power also develops large-scale cogeneration plants up to 500MW.

HYUNDAI Engine in Numbers

Total **170** Million HP
2-Stroke Engine

Total **15,000** Sets
HIMSEN Engines

Max. **500** Units / 2-Stroke
Annual Production

Max. **1,800** Units / 4-Stroke
Annual Production

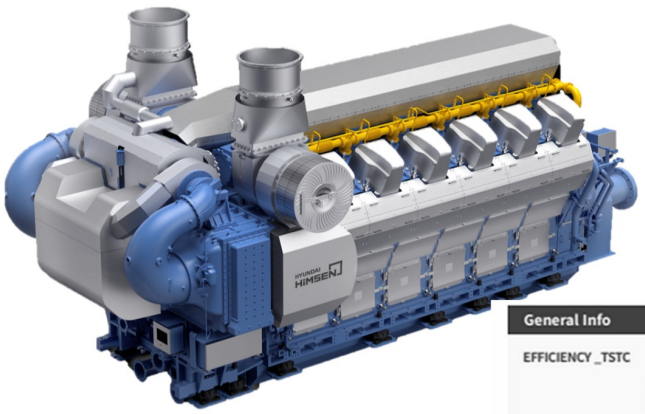
Power Line Up : Full Range Capacity, Fuel Flexibility

	Fuel	Model	Solution	Power Range
4-Stroke (HiMSEN)	Gas	H35G(V)	● ●	2.7~9.7MW
		H54GV	● ●	16.3~21.8MW
	Dual Fuel	H27DF	● ●	1.6~2.6MW
		H35DF(V)	● ●	2.7~9.3MW
		H54DFV	● ●	16.3~21.8MW
	Liquid Fuel	H21/32	● ● ●	1.1~1.7MW
		H21C	● ● ●	1.1~2.0MW
		H25/33(V)	● ● ●	1.6~6.6MW
		H32/40(V)	● ● ●	2.8~9.7MW
		H32CV	● ●	6.9~10.4MW
		H46/60V	● ●	13.4~20.1MW

● Engine Power Plant ● Packaged Power Station ● Modular Power Plant ● Emergency Generator

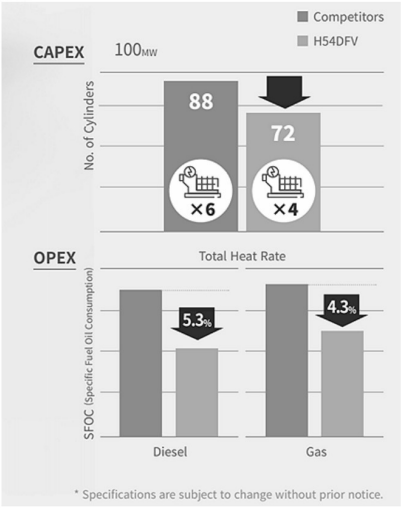
Power Plant

I. Power Line-Up

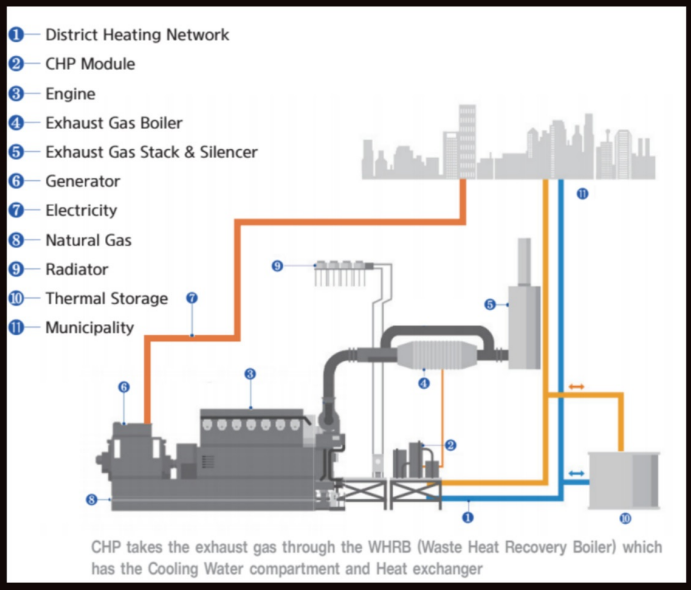


General Info	
EFFICIENCY _TSTC	51.2%
EFFICIENCY _SSTC	50.2%
OUTPUT RANGE	16.8~25.2MWm

* TSTC : Two Stage Turbo Charger
SSTC : Single Stage Turbo Charger



Operation Flow of CHP



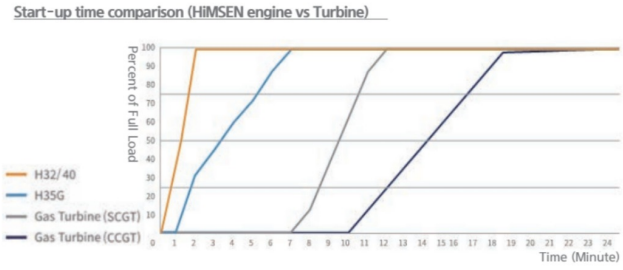
For distributed power systems, on-site power plants use a cost-effective
liquid fuel type.

The HD HiMSEN engine - Korea's largest domestically produced engine
- is the pride of RE100CoGen, offering approximately 40% lower costs
compared to gas turbines or steam turbines.

Power Plant

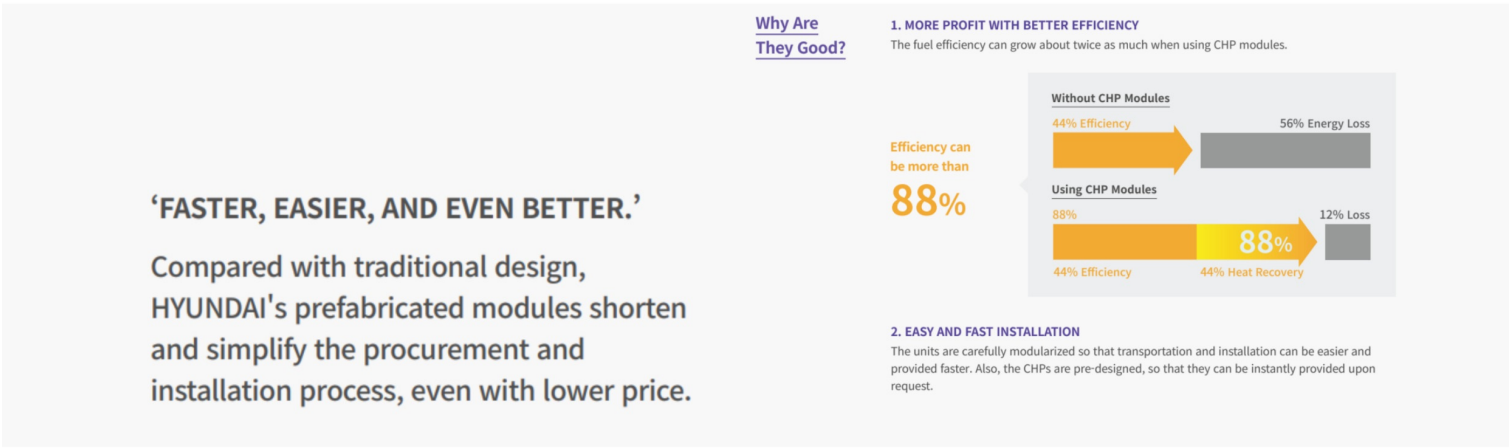
I. Power Line-Up

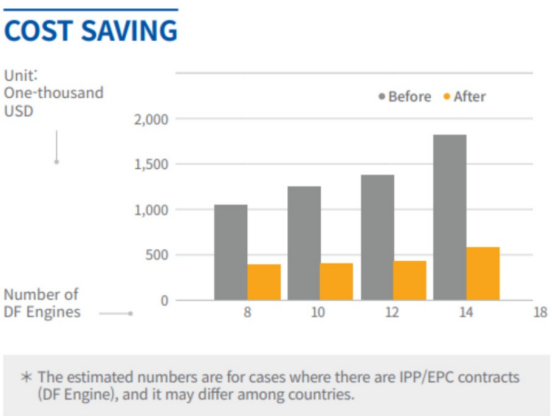
More PROFIT



In addition to a 52% power generation efficiency, utilizing exhaust gas through an Exhaust Heating Boiler System can produce high-pressure renewable steam, achieving an overall efficiency of up to 88%.

A 100MW DF Engine GenSet system, with a total weight of 3,000tons, enables the construction of a compact renewable power plant, and can reduce construction time by 40% compared to other systems.





The HD HiMSEN Line-up is Korea's most cost-effective power generator, offering superior technology, safety, and after-sales service compared to GE, SIMENS, and Wartsila.

Power Plant

Ⅱ. Large Scale Combined Heat and Power(CHP) Plant

HYUNDAI DF Engine H54DFV (MS Model)

STANDARD Type MSA Model

PPA CoGen Type MSB Model

REGO Type MSC Model

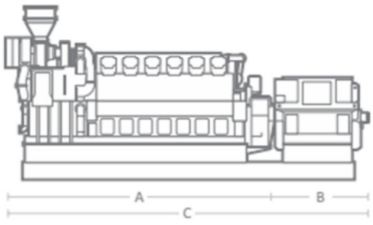
Ⅱ. Large Scale CHP Plant Engine GenSet

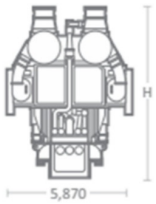
HYUNDAI DFH54DFV TSTC
(Standard Type - MSA Model)

RE100 Cogeneration Power Plant

HYUNDAI DF Engine, H54DFV TSTC

H54DFV I Bore: 540 mm, Stroke: 600 mm





Main Data

Speed	600 rpm		600 rpm	
Frequency	60 Hz		50 Hz	
	Eng. (kW)	Gen. (kW)	Eng. (kW)	Gen. (kW)
12H54DFV TSTC 1)	16,800	16,380	16,800	16,380
14H54DFV TSTC	19,600	19,110	19,600	19,110
16H54DFV TSTC	22,400	21,840	22,400	21,840

Based on alternator efficiency of 97.5 %.
1) TSTC : Two Stage Turbo Charger

Dimension & Weight

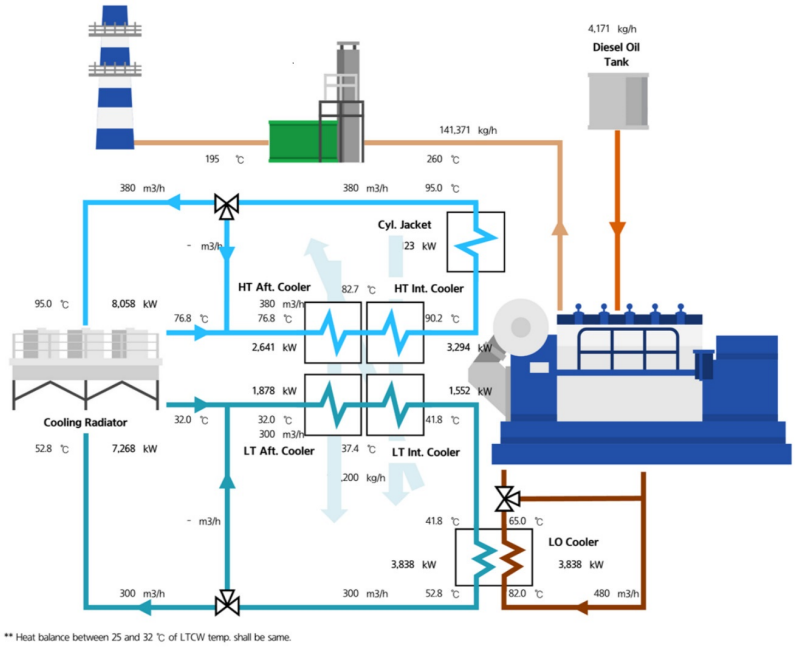
	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
12H54DFV TSTC	12,511	4,638	17,149	7,994	303.0	391.0
14H54DFV TSTC	13,661	4,582	18,243	7,994	335.0	431.0
16H54DFV TSTC	15,086	4,757	19,843	8,383	373.0	480.0

Ⅱ. Large Scale CHP Plant Engine GenSet

HYUNDAI DFH54DFV TSTC
(Standard Type - MSA Model)

Heat Balance 2024

RE100 POWER 사업준비단 #3 114MW DPP — RE1-R02-002
Heat Balance diagram — 2024-02-01



** Heat balance between 25 and 32 ℃ of LTCW temp. shall be same.

Heat Balance Diagram

Engine	14H54DFV X 6		
Design condition			
Altitude	110	m	
Ambient Temperature	24.0	℃	
Cooling Type	Radiator		
Cooling water Temperature	32.0	℃	
Relative Humidity	60	%	
Main Fuel			
Type	Bio Oil		
Density	922	kg/m3	
Low Calorific Value	36,000	kJ/kg	
Performance			
Gross Power Output	19,110	kW	100% Load
Generator Efficiency	97.5	%	PF 0.8
Gross SFOC	218.3	g/kWh	
Plant Power Output	114,660	kW	
Plant Net Output	111,794	kW	
Plant Net SFOC	223.9	g/kWh	
Plant Heat Calculation			
Total Heat Input	250,253	kW	100.0%
Total Available Energy Output	131,267	kW	52.5%
- Plant Generator Net Power	111,794	kW	44.7%
- Exhaust Gas Heat Recovery	16,607	kW	6.6%
- Auxiliary Power Consumption	2,867	kW	1.1%
Total Heat Dumping	118,986	kW	47.5%
- After Cooler_HT	15,843	kW	6.3%
- After Cooler_LT	11,270	kW	4.5%
- Inter Cooler_HT	19,763	kW	7.9%
- Inter Cooler_LT	9,310	kW	3.7%
- Lub. Oil Cooler	23,030	kW	9.2%
- Cyl. Jacket	12,740	kW	5.1%
- Exhaust Gas	19,516	kW	7.8%
- Generator Loss	2,940	kW	1.2%
- Engine Radiation	4,573	kW	1.8%

*** Remark**
Based on the following conditions
- Specific fuel oil consumption(SFOC) tolerance -/+ 5%
- Mass flow tolerance -/+ 10%, exhaust gas temp. tolerance -/+ 25℃
- Heat dissipation tolerance -/+ 10% for cooler, -/+ 15% for heat recovery

Design Conditions and Performance Data

Category	Condition	Category	Condition
Total Pressure	1,000 mbar	Relative Humidity	60%
Ambient Air Temperature (Fan)	25℃	Charge Air Cooler Water Temperature	25℃

Load capacities with main boom

Load capacities in [t]

	Boom length [m]						
	20	26	32	44	50	56	62
4.9	400.0*						
6	351.0	348.2	345.7				
7	304.9	301.1	299.9	289.7	265.9		
8	266.6	265.9	263.1	257.4	255.0	242.1	203.7
9	239.7	236.9	235.5	231.6	226.9	222.1	200.8
10	215.6	213.3	212.7	207.5	205.8	202.4	189.5
11	195.8	195.7	192.7	189.0	186.2	184.6	177.3
14	153.0	153.1	152.0	148.2	146.8	143.4	137.8
17	122.0	122.1	122.0	121.1	119.5	115.9	111.7
20	97.5	97.8	97.7	96.7	96.1	95.5	93.1
22		85.9	85.9	84.9	84.2	83.6	83.0
24		76.4	76.4	75.4	74.7	74.1	73.4

Loading at Mokpo Plant (500-ton Crawler Crane + 500-ton Hydraulic Crane)
- Specifications review of 500-ton Crawler Crane : allowable single lift capacity ranges from 207.5 tons to 265.9 tons.

Ⅱ. Large Scale CHP Plant Engine GenSet

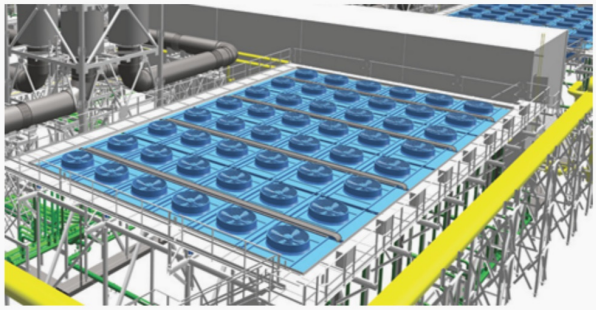
HYUNDAI DFH54DFV TSTC
(Standard Type - MSA Model)

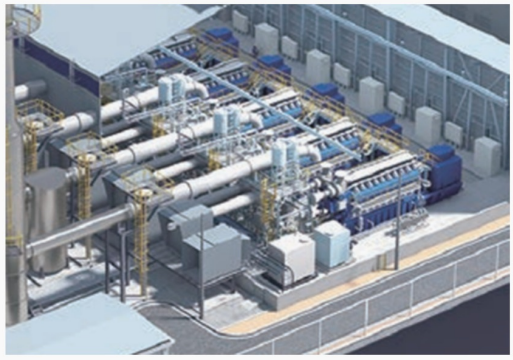
Air-Cooled System

Review of Water Supply Conditions

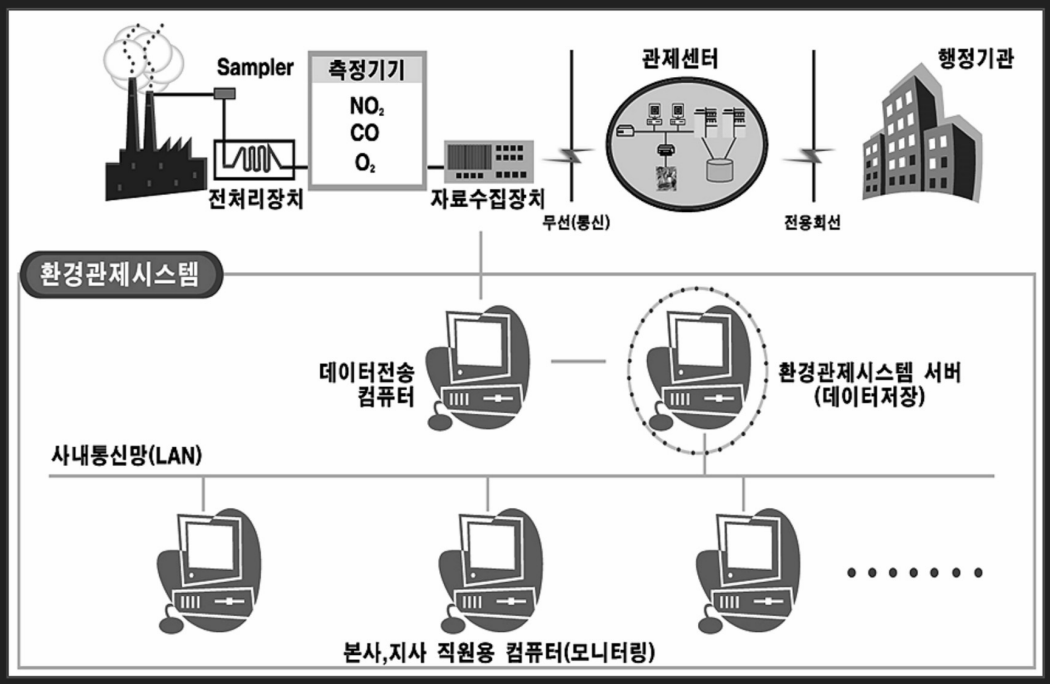
Estimated Cooling Water Demand (The Cooling System for This Project is Air-Cooled)

The heat generated by the power generation equipment in this plant is dissipated through radiators using an air-cooled system, so no cooling water is required.





[Conceptual Diagram of Remote Monitoring and Control System]



Power Plant

III. Small-Scale Private 2.88MW On-Site Power Plant

HYUNDAI LF Engine 6H3240 (SS Model)

Single Type SSA (1set)

Double Type SSB (2set)

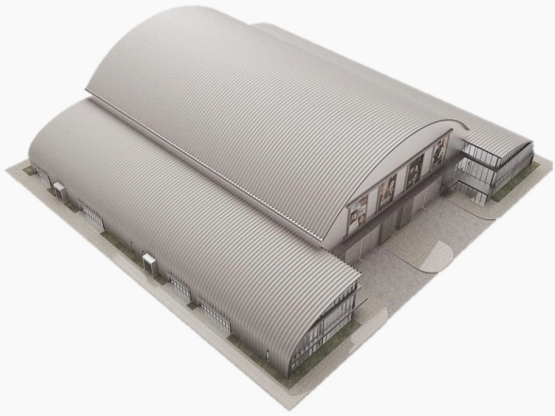
MODULAR POWER PLANT SSC (4set)

PACKAGED POWER STATION SSD **Combined Heat and Power(CHP)**

Ⅲ. Small-Scale Private 2.88MW On-Site Power Plant

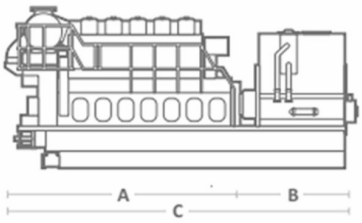
HYUNDAI LF Engine 6H32/40 (SS Model)
Single Type - SSA (1 Set)

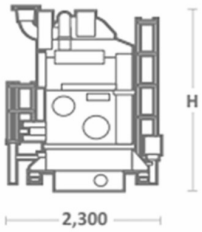
HYUNDAI LF Engine 6H32/40



Power Plant Management Center

H32/40 I Bore: 320 mm, Stroke: 400 mm





Main Data

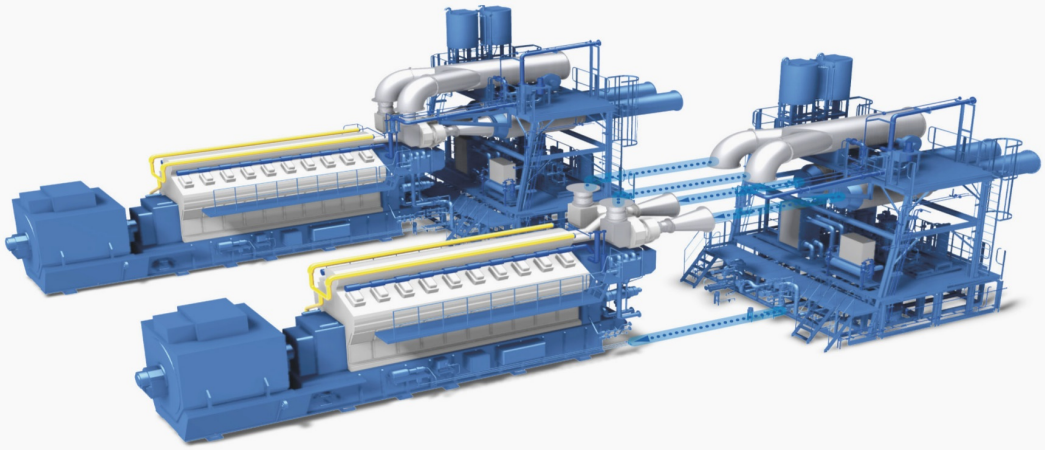
Speed	720 rpm		750 rpm	
Frequency	60 Hz		50 Hz	
	Eng. (kW)	Gen. (kW)	Eng. (kW)	Gen. (kW)
6H32/40	3,000	2,880	3,000	2,880

Dimension & Weight

	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
6H32/40	5,055	3,490	8,545	3,759	33.7	65.2

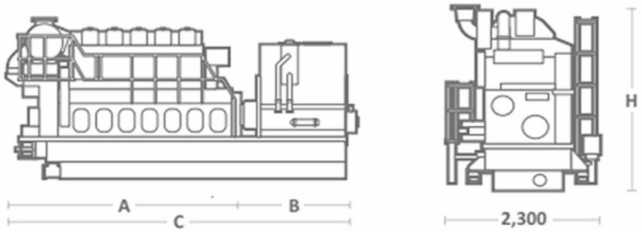
III. Small-Scale Private 2.88MW On-Site Power Plant

HYUNDAI LF Engine 6H32/40 (SS Model)
Single Type - SSA (1 Set)



HYUNDAI LF Engine 6H32/40

H32/40 I Bore: 320 mm, Stroke: 400 mm



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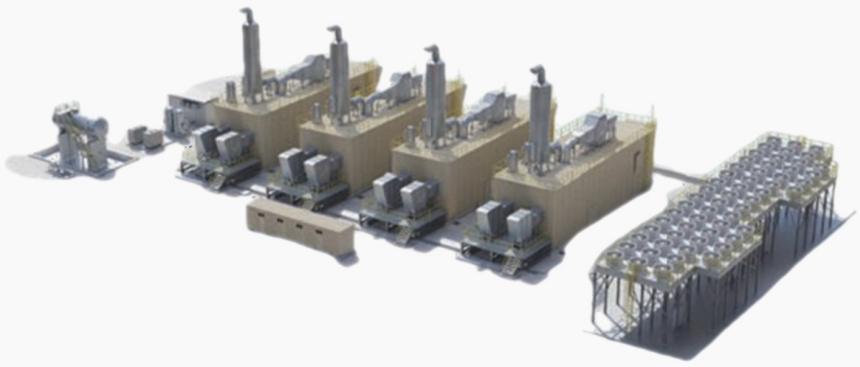
Dimension & Weight

	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
6H32/40	5,055	3,490	8,545	3,759	33.7	65.2

Ⅲ. Small-Scale Private 2.88MW On-Site Power

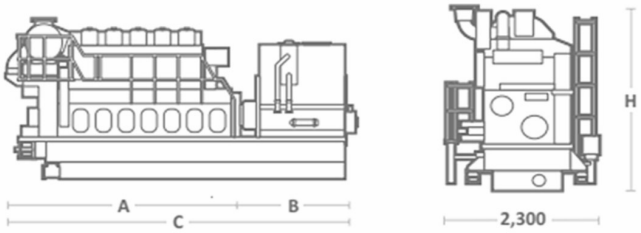
HYUNDAI LF Engine 6H32/40 (SS Model)

MODULAR POWER PLANT - SSC (4 Sets)



HYUNDAI LF Engine 6H32/40

H32/40 I Bore: 320 mm, Stroke: 400 mm



Main Data

Speed	720 rpm		750 rpm	
Frequency	60 Hz		50 Hz	
	Eng. (kW)	Gen. (kW)	Eng. (kW)	Gen. (kW)
6H32/40	3,000	2,880	3,000	2,880

Dimension & Weight

	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
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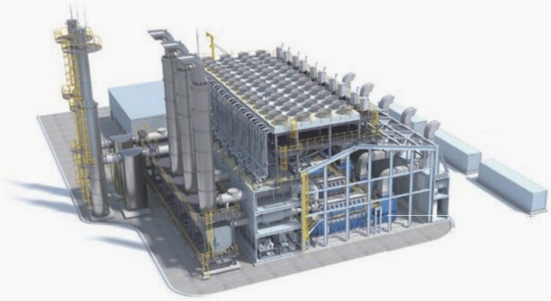
Ⅲ. Small-Scale Private 2.88MW On-Site Power Plant

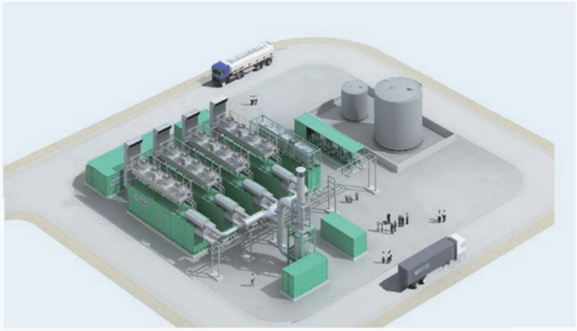
HYUNDAI LF Engine 6H32/40 (SS Model)

PACKAGED POWER STATION - SSD

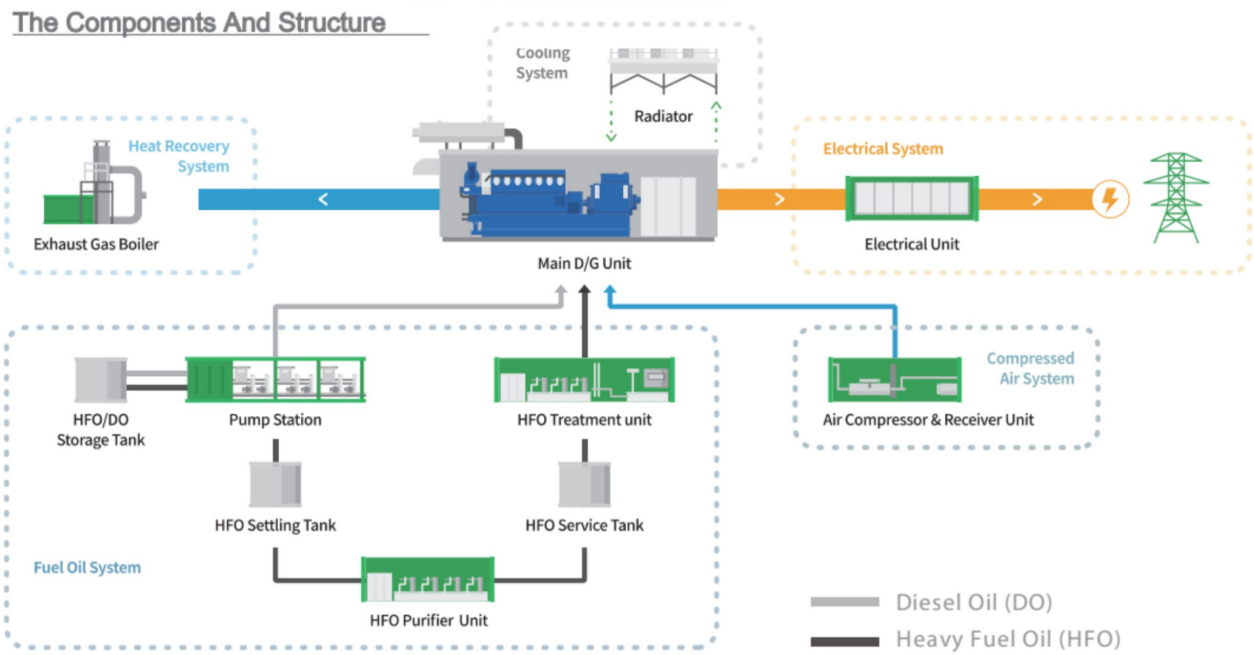
Containerized Type Power Plant



PACKAGED
POWER STATION



The Components And Structure



System can be adjusted by (1) Scope of Supply (2) Detail Engineering

Table of Contents

Feed Stock

I. Renewable Fuel

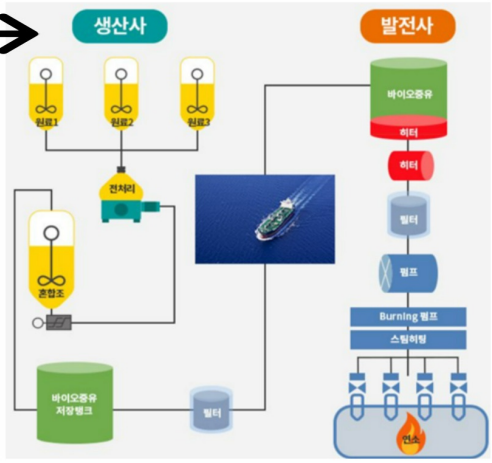
Product Classification by Application

Product	Classification Under Domestic Law	Classification Under International Law	Facility of Use	Certification Standards
GF I	Bio heavy oil	Liquid Biofuel	Power generation facility	Carbon Free
GF II	Bio liquified oil	Liquid Biofuel	Boiler facility	Carbon Free

Fuel production process

Bio Heavy Oil Production and Power Generation Process

Palm Tree Fruit & Oil



Fuel Standard Table

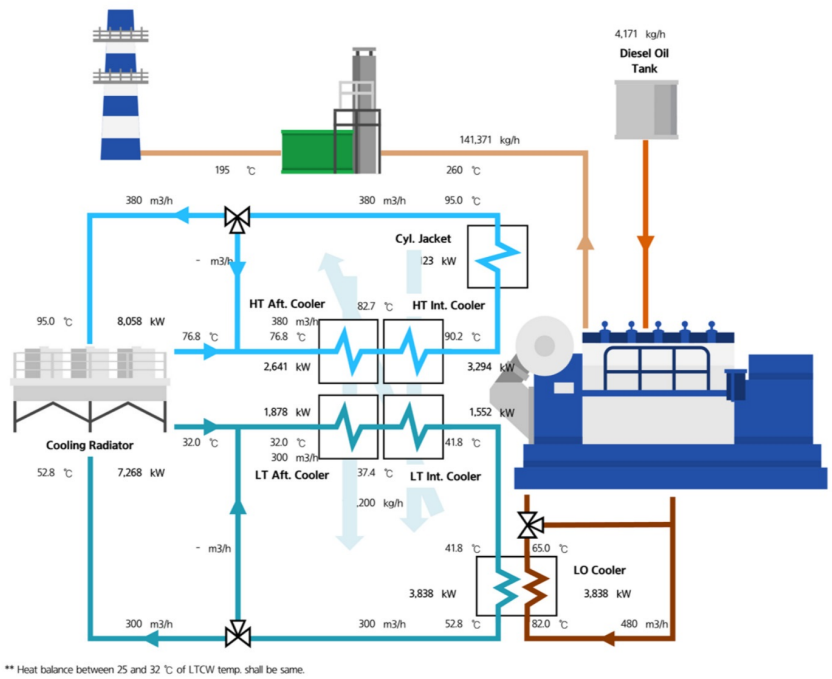
Category		Oil BLR Guide (Heavy Fuel Oil)	GF Oil (Homepage Value)	GF Oil (Test Value)
	Hydrogen (wt%)			11.9
	Oxygen (wt%)			
	Sulfur (mg/kg)	1.5~3.5		0.0065
	Ash(wt%)	LT 0.1		0.01
	P(mg/kg)			24.6
	N(mg/kg)	0.25~0.38	unknown	26
Spectroil	**V(mg/kg)**	20~100	unknown	L1.0
	Ni(mg/kg)	10~60	unknown	L1.0
	Fe(mg/kg)	10~30	unknown	13
	Fe+Ni+V(mg/kg)		unknown	13.3
	Si(mg/kg)		unknown	2.3
	Sodium(Na) & Potassium(K), ppm	LT 35		10.2
	Calcium(Ca), ppm			15.3
	Aluminum(Al), ppm			2.4
MCR	**C-MCR(wt%)**	5~15	**0.7**	0.15
방향족함량_UV (GULF) (New)	mono-Aro. (MAHs)(wt%)		unknown	19.2
	di-Aro. (DAHs)(wt%)		unknown	0.0001
	Tri+ Aro.(wt%)		unknown	0.1306
	di+Tri+ Aro. (PAHs)(wt%)		unknown	0.1307
	total Aromatics(wt%)		unknown	19.3389
Bromine Number	Br No(g/100g)		unknown	32.6
아스팔텐_UOP 614	**C7 insoluble(wt%)**		unknown	0.04
ASTM Color	ASTM		unknown	4.5
미립형잡물(경유)	PM(mg/kg)			333.64
Characteristic	Lower Heating Value(kcal/NM3)	9,485~10,103	8500	9991
	Flash Point(PMCC B, ℃)	80~200		206.5
	물과 침전물(vol%)		0.1	0.05
	Higher Heating Value(kcal/NM3)	10,000~10,722	9000	10604

I. Renewable Fuel

Heat Balance Using Bio-oil

RE100 POWER 사업준비단 #3 114MW DPP
Heat Balance diagram

RE1-R02-002
2024-02-01



Heat Balance Diagram

Engine	14H54DFV X 6		
Design condition			
Altitude	110	m	
Ambient Temperature	24.0	℃	
Cooling Type	Radiator		
Cooling water Temperature	32.0	℃	
Relative Humidity	60	%	
Main Fuel			
Type	Bio Oil		
Density	922	kg/m3	
Low Calorific Value	36,000	kJ/kg	
Performance			
Gross Power Output	19,110	kW	100% Load
Generator Efficiency	97.5	%	PF 0.8
Gross SFOC	218.3	g/kWh	
Plant Power Output	114,660	kW	
Plant Net Output	111,794	kW	
Plant Net SFOC	223.9	g/kWh	
Plant Heat Calculation			
Total Heat Input	250,253	kW	100.0%
Total Available Energy Output	131,267	kW	52.5%
- Plant Generator Net Power	111,794	kW	44.7%
- Exhaust Gas Heat Recovery	16,607	kW	6.6%
- Auxiliary Power Consumption	2,867	kW	1.1%
Total Heat Dumping	118,986	kW	47.5%
- After Cooler_HT	15,843	kW	6.3%
- After Cooler_LT	11,270	kW	4.5%
- Inter Cooler_HT	19,763	kW	7.9%
- Inter Cooler_LT	9,310	kW	3.7%
- Lub. Oil Cooler	23,030	kW	9.2%
- Cyl. Jacket	12,740	kW	5.1%
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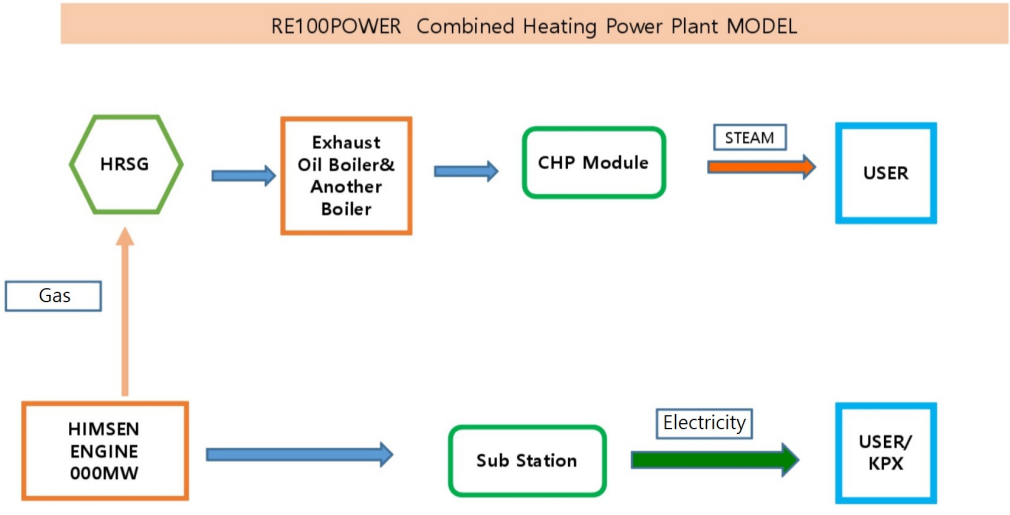
*** Remark**
Based on the following conditions
- Specific fuel oil consumption(SFOC) tolerance -/+ 5%
- Mass flow tolerance -/+ 10%, exhaust gas temp. tolerance -/+ 25℃
- Heat dissipation tolerance -/+ 10% for cooler, -/+ 15% for heat recovery

Regenerative Steam Production Flow Using Exhaust Heat



I. Renewable Fuel

Supply Volume and Development Cases of Bio Heavy Oil

Since the start of commercial deployment on March 15, 2019, bio-heavy oil has been supplied as fuel for all thermal power generators.

Power Generation Company	2017	2018	2019
Korea Midland Power Co., Ltd.	117,309	122,853	193,895
Korea Western Power Co., Ltd.	0	982	0
Korea Southern Power Co., Ltd.	173,081	175,151	219,461
Korea East-West Power Co., Ltd.	156,812	149,042	141,638
Korea District Heating Corporation	2,256	1,729	0
Total Supply Volume	449,458	449,758	554,994

* Currently, Korea Midland Power Co., Ltd. (2 units of 75MW), Korea Southern Power Co., Ltd. (2 units of 100MW), operate with 100% full combustion.

International Market Price of Raw Material CPO

I. Renewable Fuel

Fuel Production Status by Continent

- **Government Guarantee Quantity**

metric ton

Region/Yr	2024.12	2025	2026 (*1)	2027	2028	2029	2030 (*2)
Asia	420,000	420,000	840,000	840,000	840,000	1,500,000	2,700,000
Africa	149,000	318,000	738,000	738,000	738,000	1,240,000	2,800,000
Total	569,000	738,000	1,578,000	1,578,000	1,578,000	2,740,000	5,500,000

(*1) (Indonesia) Malaca Refinary + DSR2 site quantity (Tanzania) Including Tree change quantity
(*2) (Malaysia) Including Sarawak Refinary + RISDA DSR

5,500,000mt(500MW X 4ea)

PPP Status: Country production bases

Shipping Route

II. Outsourcing

PPP Agencies by Nation, Korean Outsourcing Companies

Nation	PPP Institute	Institute Body	Outsourcing Company
Malaysia	RISDA	Ministry of Smallholder Farmer Development	MeTL(TZ)
Indonesia	PTPN3	Public Works Holdings	MeTL(TZ)
East Africa	NDC	National Development Agency	MeTL(TZ)

III. International Certificates

The most critical factors in renewable energy projects are the stable supply of raw materials and the provision of raw materials that have obtained international certification. Off-spec CPO is a raw material that is produced in very small quantities from palm oil, which is the main energy source. In the raw material supply process, it is essential to securely procure materials while meeting the requirements set by international certification.

The 'RE100POWER Consortium' has established itself as the sole company in South Korea capable of supplying renewable energy sources most reliably. This achievement comes from years of networking, experience, advanced technology, and agile research, enabling them to navigate the complex and sophisticated processes of fuel supply and certification.

Palm oil-based off-spec CPO is sourced from countries such as indonesia, Malaysia, and some African nations. While raw material supply is affected by each country's environmental, social, and political conditions, it is even more important to closely monitor the political situation between international certification bodise and the supplying countries.
International certification bodies continuously revise their detailed certification regulations, and the countries subject to the changing rules, which in turn influences international public opinion.

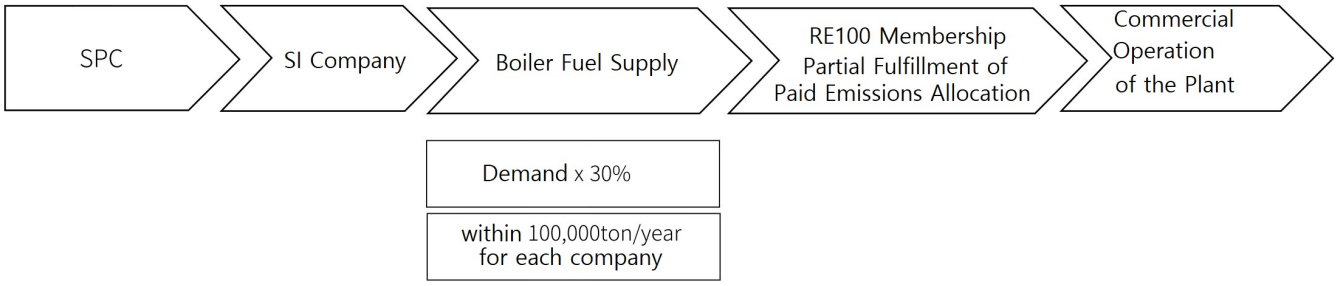
The RE100POWER consortium is talking the lead in rapid research and proactive responses to the revised regulations of international certification bodies.

Energy Source	Raw Material	Domestic Law	International Law			
			Institution		Qualification	Permissible Scope of Liquid Biomass
Palm Oil	Offspec CPO	Bio - Heavy Oil (Law)	CDP	CDP DISCLOSURE INSIGHT ACTION	**Reliable Environment** Dataset Gold Standard **Open System**	Only Biomass that meets strict sustainability criteria is permitted, along with ecologically natural, non-food crops
			EU Round	EU	EU and Commonwealth implementation Standards	Conversion of Food Crops to Non-Food Use Due to Environmental Factors, Sacrificial Planting,
		Liquid Biomass (Environmental Directive)	Green-e Framework	Green-e	Carbon Offset, Clean Energy Sustainabilitv Certification	Approval of Crops Not Usable for Food or Animal Feed Approval for Usage of Offspec CPO

IV.Before Service

RE100 CoGen Before Service

Feed Stock Supply before Commercial Operation of the Power Plant



Demand x 30%

within 100,000ton/year
for each company

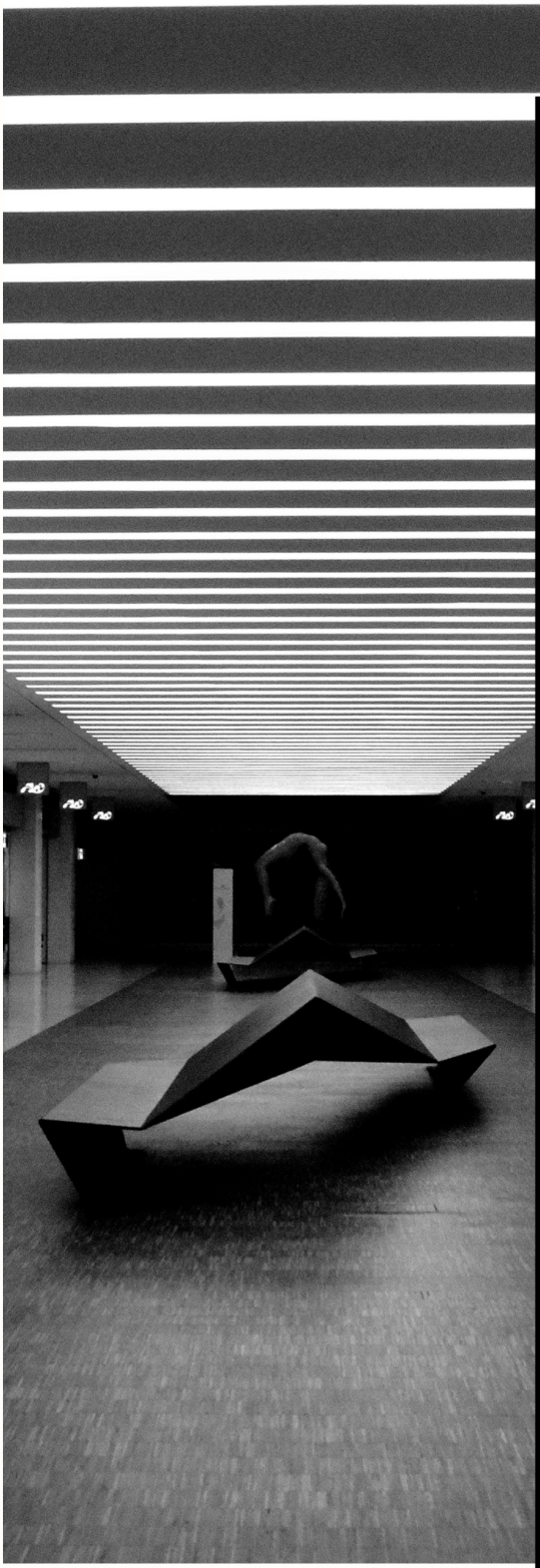
End-user and EPC partner companies participation in the medium- to large - scale combined heat and power (CHP) plant will prioritize the supply of process fuel until the plant is completed, enabling immediate relief from carbon neutrality pressure.

However, since full supply is not immediately feasible, we plan to provide 20% of the required demand as feedback supply for the time being

Achieve Carbon Neutrality with our own technologies

The Republic of Korea, a technological powerhouse built through hard work and perseverance, must not lose its foundation under the pressure of carbon economy policies imposed by global powers.

It is our shared hope to resolve these challenges independently and confidently, so that our workers can continue their efforts with security and peace of mind.



RE100 Power Consortium

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