

Industrial District Energy

Net-Zero Way and Supporting suggestion

2024.04.26. The Korea Co-Generation Association

Ilhwan Kang

I. What is District Heat?

District Energy

(District(House) /
Industrial Estate)

LAW

- Heat + Power supply to Multiple User
(LAW : 집단에너지 사업법)
- Main Installation : Combined Heat and Power + Peak Load Boiler
Heat and Power Design Regulation (Heat Capacity > Power Capacity)
- Operation : Heat(Steam for Industrial, Hot water for houses) priority
- Energy Efficiency : Combined Heat and Power → (80% over)

(집단에너지 사업법)

제1장 총칙 <개정 2010. 1. 18.>

□ 제1조(목적) 이 법은 분산형전원으로서의 집단에너지공급을 확대하고, 집단에너지사업을 합리적으로 운영하며, 집단에너지시설의 설치·운용 및 안전에 관한 사항을 정함으로써 「기후변화에 관한 국제연합 기본 협약」에 능동적으로 대응하고 에너지 절약과 국민생활의 편의증진에 이바지함을 목적으로 한다. <개정 2017. 11. 28.>

[전문개정 2010. 1. 18.]

□ 제2조(정의) 이 법에서 사용하는 용어의 뜻은 다음과 같다. <개정 2017. 11. 28.>

1. “집단에너지”란 2개 이상의 사용자를 대상으로 공급되는 열 또는 열과 전기를 말한다.
2. “사업”이란 집단 에너지를 공급하는 사업으로서 대통령령으로 정하는 기준에 맞는 사업을 말한다.
3. “사업자”란 제9조에 따라 사업의 허가를 받은 자를 말한다.
4. “사용자”란 사업자로부터 집단 에너지를 공급받아 사용하는 자(집단 에너지를 공급받으려는 자를 포함한다)를 말한다.
5. “집단에너지시설”이란 집단 에너지의 생산·수송·분배 또는 사용을 위한 시설로서 공급시설과 사용시설을 말한다.
6. “공급시설”이란 집단 에너지의 생산·수송 또는 분배를 위한 시설로서 사업자의 관리에 속하는 시설을 말한다.
7. “사용시설”이란 집단 에너지의 사용을 위한 시설로서 사업자의 관리에 속하는 시설을 말한다.
8. “열생산자”란 열을 생산하거나 발생시키는 자를 말한다.

[전문개정 2010. 1. 18.]

I. What is District Heat? - Status

District Energy Business Permission & Supply (2022.Dec.)

		Company	Workplace	Permission		Supply	
				House	Manufacturer	House	Manufacturer
District	Running	29	58	4,183,753	-	3,574,573	-
	Under-Const	-	-	-	-	-	-
	Sub.TTL	29	58	4,183,753	-	3,574,573	-
Industrial	Running	39	41	-	936	-	906
	Under-Const	4	4	-	9	-	-
	Sub.TTL	43	45	-	945	-	906
Both	Running	6	6	159,929	113	103,213	113
	Under-Const	1	1	-	8	-	-
	Sub.TTL	7	7	159,929	121	103,213	113
Total	Running	74	105	4,343,682	1,049	3,677,786	1,019
	Under-Const	5	5	-	17	-	-
	Gross.TTL	79	110	4,343,682	1,066	3,677,786	1,019

* Source : 2023 District Heat Handbook, Korea Energy Agency(한국에너지공단)

I. What is District Heat? - Status

District Energy Facility Permission & Installation (2022.Dec.)

		Permission		Installation	
		Heat(Gcal/H)	Power(MW)	Heat(Gcal/H)	Power(MW)
District	Running	26,864	10,747	20,350	8,149
	Under-Const	-	-	-	-
	Sub.TTL	26,864	10,747	20,350	8,149
Industrial	Running	17,626	3,172	17,388	2,675
	Under-Const	969	609	-	-
	Sub.TTL	18,595	3,781	17,388	2,675
Both	Running	3,311	994	2,132	911
	Under-Const	172	32	-	-
	Sub.TTL	3,483	1,026	2,132	911
Total	Running	47,801	14,913	39,870	11,735
	Under-Const	1,141	641	-	-
	Gross.TTL	48,942	15,554	39,870	11,735

* Source : 2023District Heat Handbook, Korea Energy Agency(한국에너지공단)

I. What is District Heat? – Status

District Energy Fuel Usage (2022.Dec.)

		Fuel Usage (toe)				Ration (%)			Fuel Usage (toe)				Ration (%)
		District	Industrial	Both	Total				District	Industrial	Both	Total	
Petroleum	Kerosene	51,309	-	-	51,309	0.3	Bio	Bio Gas	-	457,109	-	457,109	2.5
	Diesel	449	212	-	661	0.0		Landfill Gas	1,907	-	4,427	6,334	0.0
	B-A	-	-	-	-	0.0		Wood Chip	11,821	208,644	85,432	305,897	1.7
	B-C	95,073	323,405	82,848	501,326	2.8		Wood Pallet	-	386,402	280,079	666,481	3.7
	Petroleum Coke		637,026	-	637,026	3.5		Bio Heavyoil	36,355	-	-	36,355	0.2
	Byproduct oil 1	-	290	1,294	1,584	0.0		Unused Wood	-	178,791	-	178,791	1.0
	Byproduct oil 2	-	1,291	-	1,291	0.0		Sewage Sluge	-	6,879	-	6,879	0.0
	ETC	-	115,601	-	115,601	0.6		Bio-SRF	-	97,158	-	97,158	0.5
Sub Total		146,831	1,077,825	84,142	1,308,798	7.2	Sub Total		50,083	1,334,983	369,938	1,755,004	9.6
Gas	LNG	8,074,481	440,361	560,396	9,075,238	50.0	Waste	Waste Gas	-	52,530	-	52,530	0.3
	LPG	990	82,607	70,126	153,723	0.8		Industrial Wase	-	219,092	-	219,092	1.2
	ETC	2,006	1,179,831	-	1,181,837	6.5		SRF	7,976	274,640	-	282,616	1.6
Sub Total		8,077,477	1,702,799	630,522	10,410,798	57.3	Sub Total		7,976	546,262	-	554,238	3.1
Coal	Bituminos Coal	-	3,797,673	316,257	4,113,930	22.7	Gross Total		8,282,366	8,459,541	1,400,858	18,142,765	100.0
Sub Total		-	3,797,673	316,257	4,113,930	22.7	Ration (%)		45.7	46.6	7.7	100	

* Source : 2023District Heat Handbook, Korea Energy Agency(한국에너지공단)

II. Differences and Efficiency of District Energy

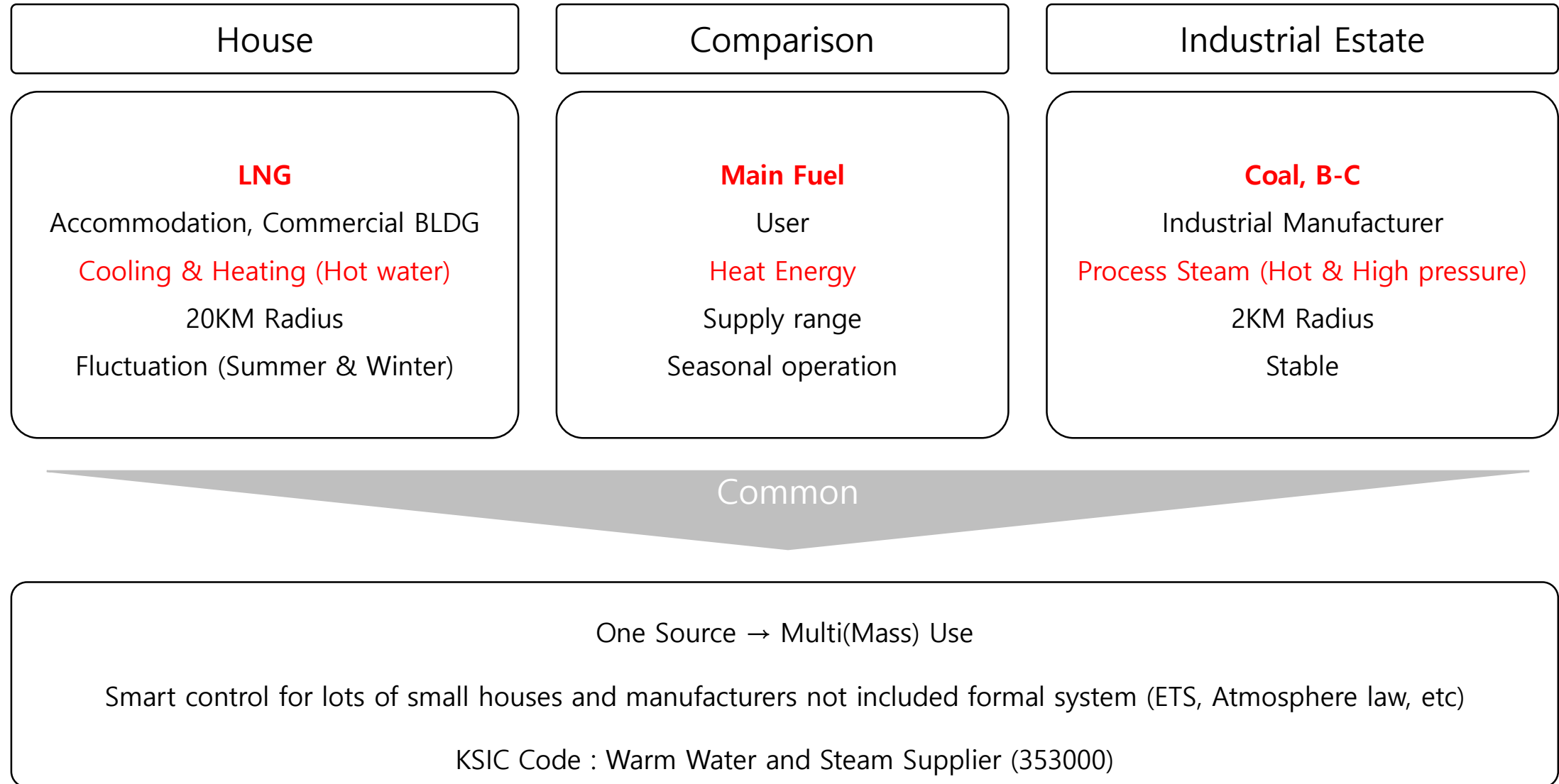
Differences

Houses	Supply energies(Heat and Power) to Houses or Commercial buildings located in a designated area. Its energies are hot water for cooling or heating and electricity.
Industrial Estates	Supply energies(Heat and Power) to Manufacturers located in a Industrial estate. Its energies are hot & high pressure water steam for manufacturing and electricity.

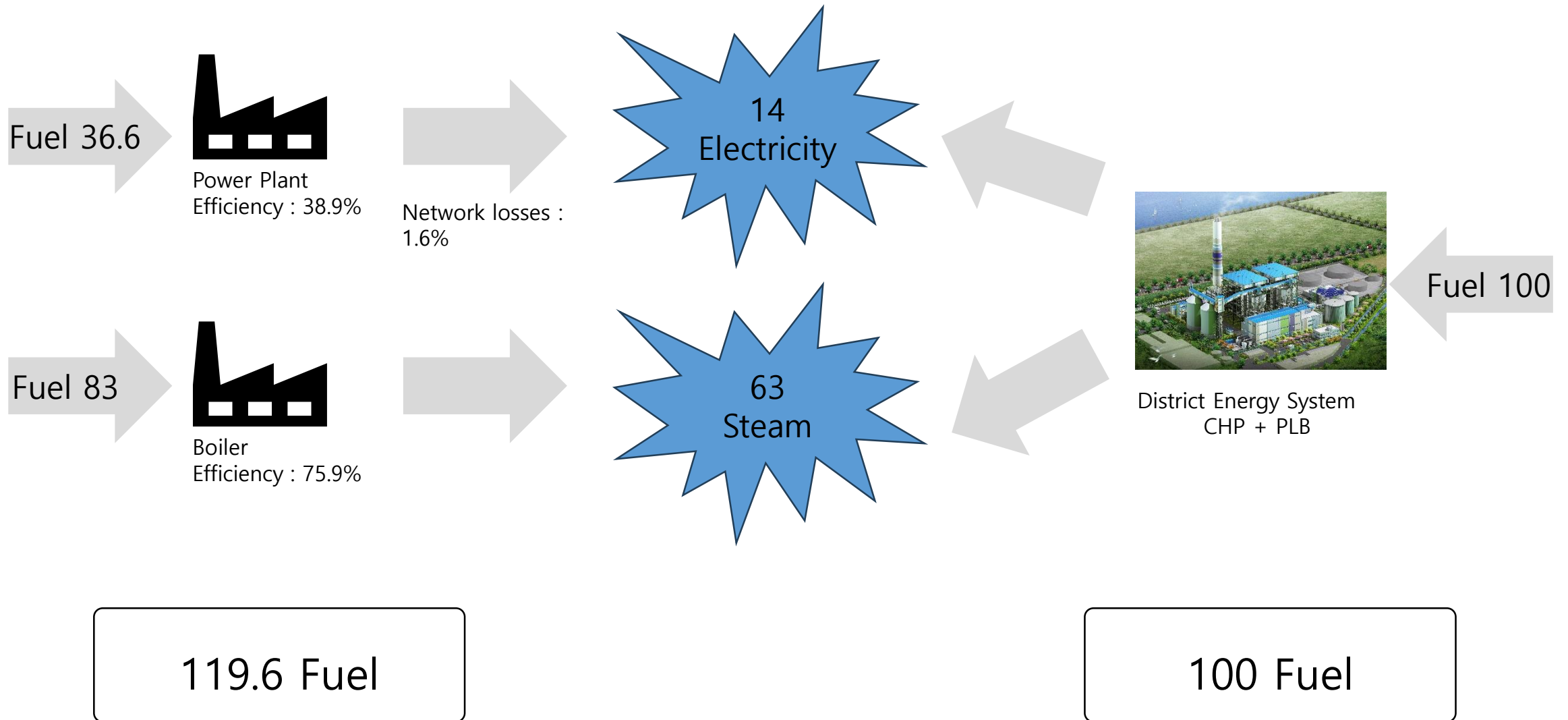
Efficiency

- ▶ Increased energy efficiency system → Fuel usage and GHG decrease
- ▶ Convenience
 - Accommodation : 7-24 continuous warm & cool supply
 - Industrial complex : Qualified **cost competitive energy (Coal)**
- ▶ Resilience role at the National Power supply chain as a Dispersion Energy

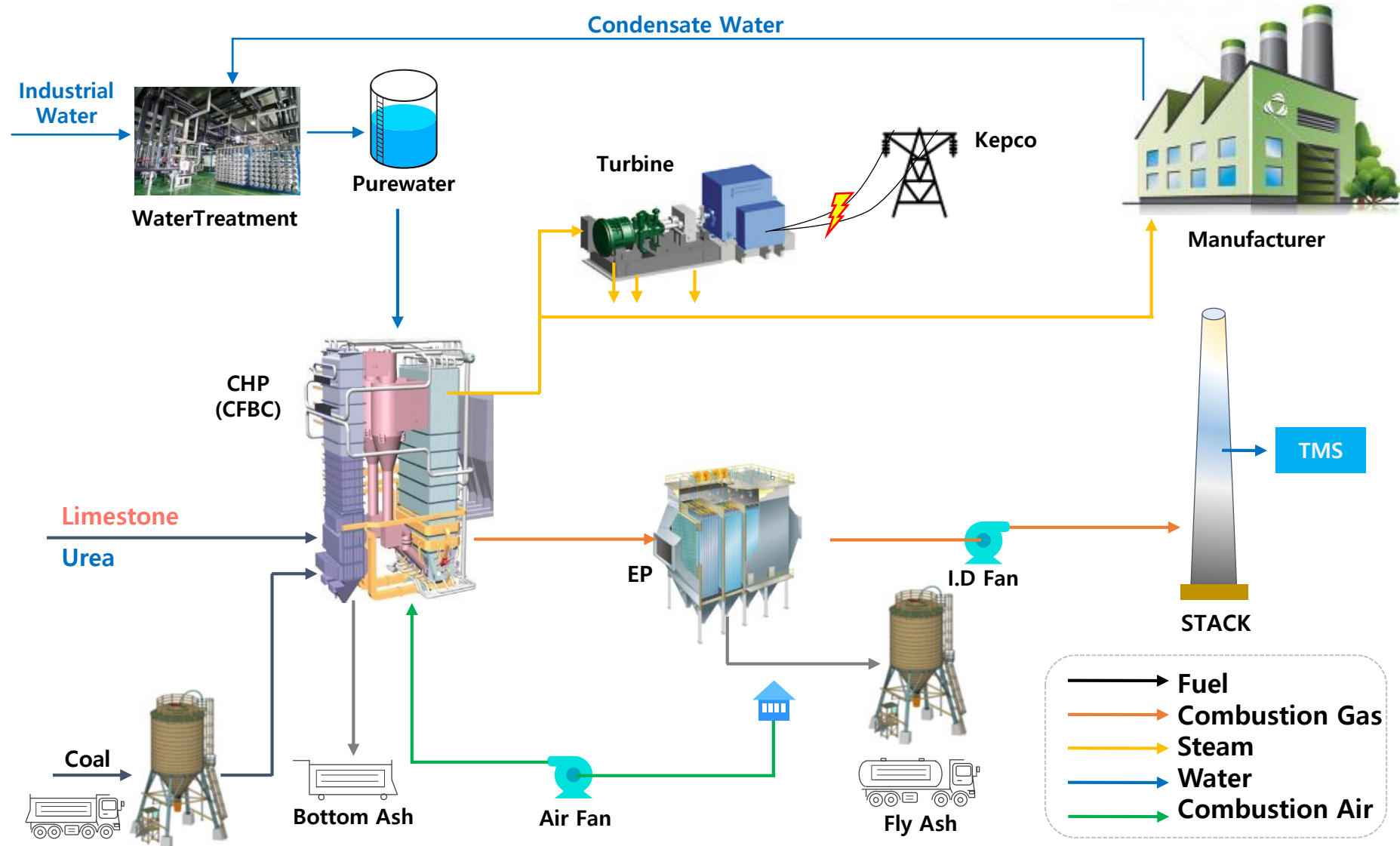
II. Differences and Efficiency of District Energy



III. Industrial Estate District Energy



III. Industrial Estate District Energy - Plant Process



IV. Net Zero Process and Supporting Suggestion

Fuel change planning Direction

- **Low GHG fuel (From Coal)**
 - LNG
 - Biomass (Woodchip, Wood pallet, Biogas, etc)
 - Waste energy (Bio SRF, Sewage Sludge, Livestock Excreta, etc)
- **System change method**
 - LNG : Gas turbine combined plant
 - Biomass : Biomass boiler + steam turbine
 - Waste energy : Waste fuel Boiler + steam turbine

IV. Net Zero Process and Supporting Suggestion

Fuel Change from Coal to LNG

- Steam(Heat) supply amount maintain → Bigger Gas Turbine capacity needed
- Total 14GW (300MW ~ 800MW each Plant)
- **Efficiency and economic considering**

Changing Plan(2023) * Especially Coal use company

	Company	Location	Installation As is			Installation Future			Remarks
			Fuel	Heat (t/h)	Power (MW)	Fuel	Heat (t/h)	Power (MW)	
1	HH	Yeosu	Coal	1,450	259.9	LNG Hydro	1,135	720	CHP
2	HJ	Ulsan	Coal	207.5	40	LNG	232.4	200	CHP
3	SG	Gunsan	Coal	333	55	LNG	250	400	CHP
4	PF	Busan	Coal	80x2	19	LNG	160	20	CHP
5	BI	Yeosu	Coal	289.1	24.2	Biomass	289.1	102	CHP
6	GE	Ansan	Coal	400 240	63 14	LNG	510	800	CHP

IV. Net Zero Process and Supporting Suggestion

Fuel Change Model	Obstacles and Considerations
LNG Combine	<ul style="list-style-type: none">• Installation full change• Secure site (Saturated space)• Bigger Turbine• High cost
Biomass	<ul style="list-style-type: none">• Installation modify available• RPS regulation• Fuel supply chain secure
Waste Energy	<ul style="list-style-type: none">• Not incineration• *Regional acceptance• *Waste energy cognition

Supporting Suggestion

- Evaluation and Licensing support
- Net zero + Regional waste problem solve
- Nation + Regional Government GHG Reduction process participation
- Changing and land purchasing high cost support

- SMR High resist : Acceptance and Cognition at the both side (Company & Region)
Qualified Safety control and stability should be approved (by what?)



Thankyou