



CAPITA

Energy Master-Planning Report Additional Supplement for New Development

October 2016



Quality Management

Job No	N/A		
Project	DECCHNDU Energy Master-Planning & District Heating Feasibility Study		
Location	North Tyneside		
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Authorised by	Brett Devenish	14/10/16	

Revision Status / History

Rev	Date	Issue / Purpose/ Comment	Prepared	Checked	Authorised
V1.1a	20/06/16	Additional Supplement including known new development detail	NR	MT	BD

Contact

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Note: This report supplement document provides technical and financial detail with supporting graphics to accompany the proposal analysis sections of the main Energy Master-Planning Report document (Doc re: EMDH-EM:V2.3.

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1. A19 Potential Phase 2 Extension to include Murton Gap development site - Technical Overview and Financial Performance Summary



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Energy Details

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Heat Demand
Cluster Monthly Heat Consumption (MWH)	3,572.53	3,275.38	2,924.89	2,124.69	1,774.76	1,152.80	687.13	545.64	1,467.89	1,921.30	2,341.70	2,621.89	24,410.60

System Technical Details

Monthly CHP Capacity Requirement	7.68	7.04	6.29	4.57	3.81	2.48	1.48	1.17	3.15	4.13	5.03	5.63
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Baseload CHP Capacity Requirement	1.29
Average load CHP Capacity Requirement	4.37

Gas Back-up boiler capacity requirement (MW)	5.52
Bimoass Back-up boiler capacity requirement (MW)	6.00

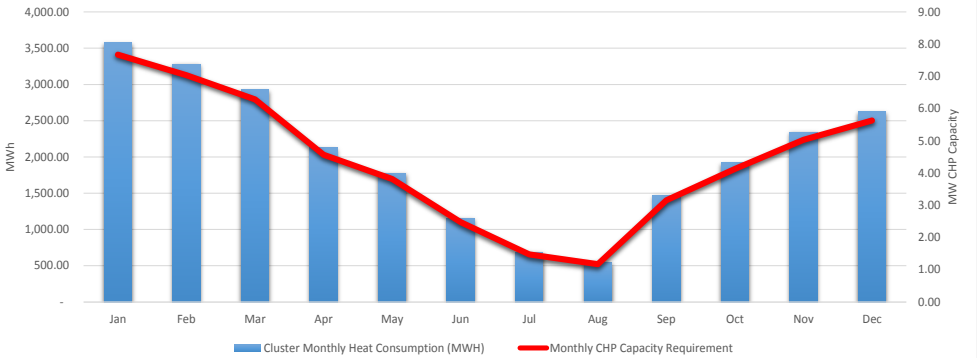
Network Details

Transmission Mains (m)	5691.00
Distribution Mains (m)	18331.00
Network m3	402.30
MWh Thermal Storage Potential	18.29
System run hrs storage potential	1.99

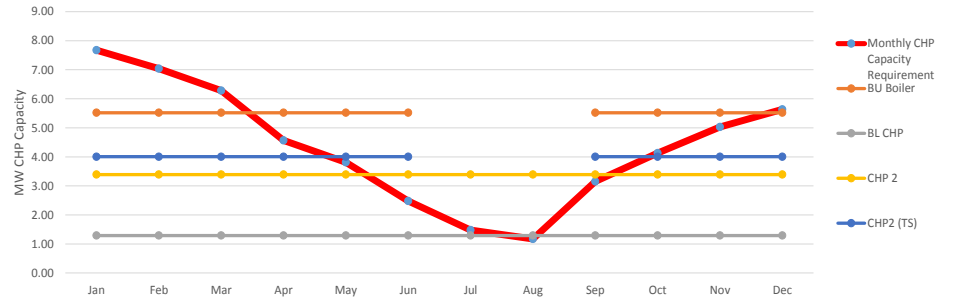
CHP Details

	Dual CHP			Dual CHP (TS)			BL CHP		BL CHP (TS)	
	CHP1	CHP2	Totals	CHP1	CHP2	Totals	CHP1	CHP2	CHP1	CHP2
Average Electrical output (Mwe)	1.00	2.64	3.64	1.00	3.12	4.12	1.01	-	3.16	-
Average Heat output (MWt)	1.29	3.39	4.68	1.29	4.01	5.30	1.30	-	4.06	-
Overall CHP Efficiency (%)	80%	80%	1.60	80%	80%	1.60	80%	-	80%	-
Fuel input (gross CV basis) (MW)	2.87	7.53	10.40	2.87	8.90	11.77	2.89	-	9.03	-
CHP hours run per year (hrs)	5,585	5,585		5,585	6,570		5,585	-	6,570	-
Annual CHP Displaced Electricity (MWH)	5,602	14,723	20,324	5,602	20,470	26,072	5,658	-	20,759	-
Annual Electricity Generated (parasitic network load adj)	4,566	10,950	15,515	3,196	15,260	18,456	5,534	-	20,302	-
Monthly Electricity Generated (parasitic network load adj)	457	1,217	1,673	457	1,696	2,152	461	-	1,692	-
Monthly CHP Delivered Heat (network heat-loss adj)	540	1,420	1,960	540	1,974	2,514	546	-	2,002	-
Input Fuel (MWH)	13,338	31,548	44,886	9,337	43,864	53,200	16,166	-	59,311	-
Annual Net CO2 Saving p/a (tonnes)	1,333	3,503	4,836	1,334	4,871	6,205	1,346	-	4,937	-
Annual Net CO2 Saving p/a (£)	21,325	56,055	77,380	21,337	77,938	99,275	21,530	-	78,994	-
Combined heat Capacity (MW) (CHP & Back-up)	6.81	3.39	10.20	4.91	4.01	8.92	11.66	-	9.44	-

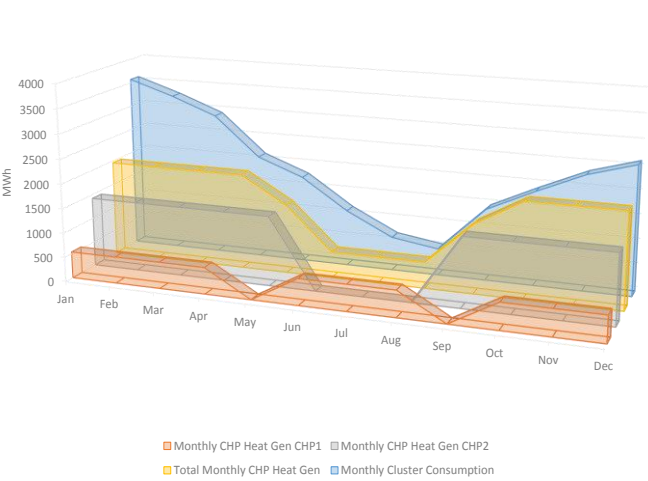
Cluster Demand and CHP Capacity Requirement



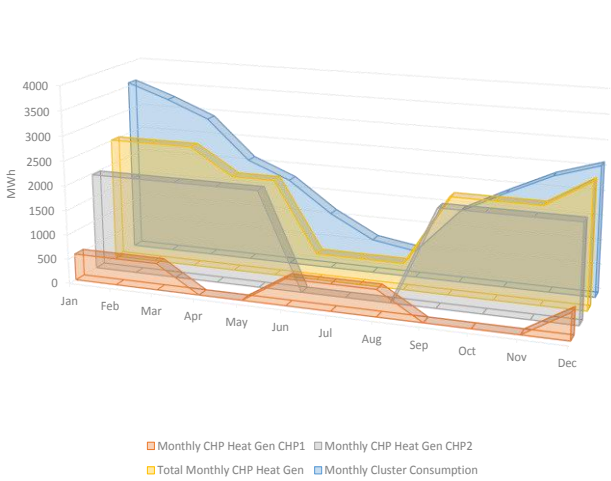
CHP Load Matching



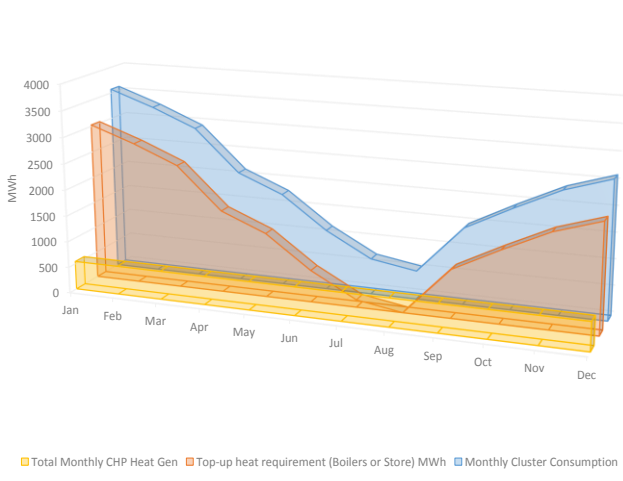
Dual CHP Cluster Demand vs. CHP Output



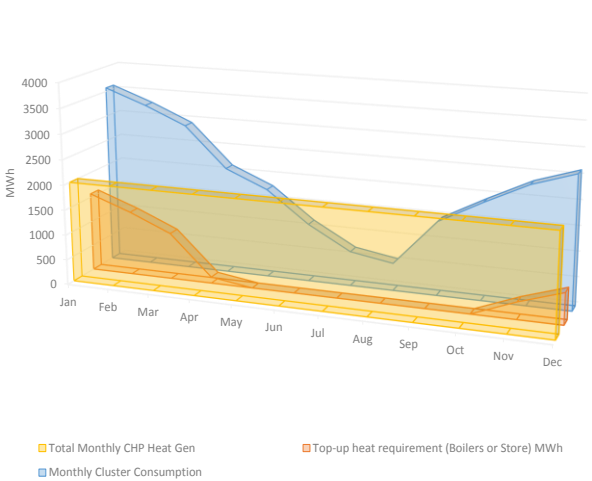
Dual CHP TS Cluster Demand vs. CHP Output



BL CHP Cluster Demand vs. CHP Output



BL CHP TS Cluster Demand vs. CHP Output



System CAPEX Costs	Dual CHP					Dual CHP (TS)					BL CHP					BL CHP (TS)				
	Gas Only	Biomass BU	3rd Party BU	WSHP BU		Gas Only	Biomass BU	3rd Party BU	WSHP BU		Gas Only	Biomass BU	3rd Party BU	WSHP BU		Gas Only	Biomass BU	3rd Party BU	WSHP BU	
CHP	1,819,718	1,819,718	1,819,718	1,819,718		2,059,383	2,059,383	2,059,383	2,059,383		506,576	506,576	506,576	506,576		1,579,812	1,579,812	1,579,812	1,579,812	
Boiler	165,587	-	-	-		108,683	-	-	-		310,802	-	-	-		161,287	-	-	-	
WSHP	-	-	-	5,399,587		-	-	-	3,543,998		-	-	-	10,134,859		-	-	-	5,258,369	
Biomass Boiler, store & assc. plant	-	2,099,839	-	-		-	1,378,221	-	-		-	3,941,334	-	-		-	2,045,310	-	-	
Plant BOS (Balance of System)	-	587,934	272,958	1,082,896		-	515,641	308,907	840,507		-	667,187	75,986	1,596,215		-	543,768	236,972	1,025,877	
Thermal Store	-	-	-	-		-	-	-	-		-	-	-	-		876,579	876,579	876,579	876,579	
Network Transmission	5,599,944	5,599,944	5,599,944	5,599,944		5,599,944	5,599,944	5,599,944	5,599,944		5,599,944	5,599,944	5,599,944	5,599,944		5,599,944	5,599,944	5,599,944	5,599,944	
Network Distribution	10,998,600	10,998,600	10,998,600	10,998,600		10,998,600	10,998,600	10,998,600	10,998,600		10,998,600	10,998,600	10,998,600	10,998,600		10,998,600	10,998,600	10,998,600	10,998,600	
Building Connections	611,229	611,229	611,229	611,229		611,229	611,229	611,229	611,229		611,229	611,229	611,229	611,229		611,229	611,229	611,229	611,229	
WSHP Network & Cables	-	-	-	-		-	-	-	-		-	-	-	-		-	-	-	-	
EC Building Cost	1,160,629	1,392,755	532,502	1,624,881		1,014,904	1,217,884	602,634	1,420,865		1,327,216	1,592,659	148,239	1,858,102		1,074,115	1,288,938	462,298	1,503,760	
Total Capital (£)	20,653,504	23,110,020	19,834,951	27,136,855		20,717,951	22,380,903	20,180,698	25,074,526		19,476,974	23,917,529	17,940,575	31,305,525		21,162,791	23,544,180	20,365,434	27,455,171	

System OPEX & Revenue	Dual CHP						Dual CHP (TS)						BL CHP						BL CHP (TS)						
	Revenue			Opex Costs			Revenue			Opex Costs			Revenue			Opex Costs			Revenue			Opex Costs			
	Price/Cost (MWh)	Energy Sales (MWh)	Income non-energy	Energy Direct costs	Overhead Costs	Net	Price/Cost (MWh)	Energy Sales (MWh)	Income non-energy	Energy Direct costs	Overhead Costs	Net	Price/Cost (MWh)	Energy Sales (MWh)	Income non-energy	Energy Direct costs	Overhead Costs	Net	Price/Cost (MWh)	Energy Sales (MWh)	Income non-energy	Energy Direct costs	Overhead Costs	Net	
Private Wire Elec Sales	116.85	1,835,731				1,091,231	116.85	2,175,763				1,316,614	116.85	661,132				291,864	116.85	2,425,657				1,456,008	
Export Elec Sales	45	706,957				37,544	45	837,096				21,242	45	254,608				114,659	45	934,143				35,506	
Standing Charge			45,323						45,323						45,323						45,323				
Heat Sales (CHP)	52.00	945,302					52.00	1,120,400					52.00	340,447					52.00	1,249,082					
Heat Sales (Boiler)	52.00	325,988					52.00	187,981					52.00	928,904					52.00	252,202					
Input Fuel (CHP)	25.3			1,135,619.60			25.3		1,345,969.72				25.3		408,989.07				25.3		1,500,559.37				
Input Fuel (Boiler)	25.2			189,574.70			25.2		109,518.28				25.2		540,193.57				25.2		146,665.34				
Biomass Fuel Costs	46		360,467.76			1,248,834	46		207,863.80			1,407,496	46		740,954			1,577,939	46		278,877.55			86,424	
Biomass RHI income T1	52.4		279,221			120,059	52.4		161,013			69,639	52.4		795,642			334,430	52.4		216,021				
Biomass RHI income T2	22.7		49,274				22.7		28,414				22.7		140,407				22.7		38,121				
WSHP RHI																									
WSHP RHI income T1	89.5		476,915				89.5		275,013				89.5		1,358,969				89.5		368,967				
WSHP RHI income T2	26.7		25,107				26.7		14,478				26.7		71,543				26.7		19,424				
OPEX Overhead:																									
Network maintenance	13				317,839.12		13				327,187.51		13					317,337.83	13					375,329.32	
Bureau Costs	11.1				271,385.71		11.1				279,367.80		11.1					270,957.68	11.1					320,473.50	
Business rates	6				146,694.98		6				151,009.62		6					146,463.61	6					173,228.92	

	Income - Electricity	Income - Heat	Income - non-energy	Energy Direct costs	Overhead	Net income	Income - Electricity	Income - Heat	Income - non-energy	Energy Direct costs	Overhead	Net income	Income - Electricity	Income - Heat	Income - non-energy	Energy Direct costs	Overhead	Net income	Income - Electricity	Income - Heat	Income - non-energy	Energy Direct costs	Overhead	Net income
Gas only PW	1,835,731	1,271,291		45,323	1,325,194.30	735,919.80	1,091,230.97	2,175,763	1,308,381	234,750	1,553,833.52	757,564.93	1,661,132	1,269,351	981,373	1,436,142.84	734,759.12	291,864.35	2,425,657	1,501,285	299,465	1,779,436.92	869,031.74	1,577,938.57
Biomass PW	1,835,731	1,271,291	373,819	1,496,087		1,248,834	2,175,763	1,308,381	234,750	1,553,833.52	757,564.93	1,407,495.89	1,661,132	1,269,351	981,373	1,436,142.84	734,759.12	740,954.84	2,425,657	1,501,285	299,465	1,779,436.92	869,031.74	1,577,938.57
3rd Party BU PW	1,835,731	945,302	45,323	1,135,619.60	547,184.61	1,143,552.62	2,175,763	1,120,400	45,323	1,345,969.72	648,539.27	1,346,976.98	1,661,132	340,447	45,323	408,989.07	197,066.45	440,846.31	2,425,657	1,249,082	45,323	1,500,559.37	723,026.43	1,496,476.93
WSHP BU PW	1,542,718	1,271,291	547,345	1,325,194.30	735,919.80	1,300,239.58	2,006,797	1,308,381	334,814	1,455,288.00	757,564.93	1,437,139.08	1,733,810	1,269,351	1,475,836	949,182.64	734,759.12	887,434.90	2,198,966	1,501,285	433,715	1,647,224.71	869,031.74	1,617,708.93
Gas only Exp	706,957	1,271,291		45,323	1,325,194.30	735,919.80	37,544.92	837,096	1,308,381	45,323	1,455,288.00	757,564.93	254,608	1,269,351	981,373	1,436,142.84	734,759.12	114,659.47	2,425,657	1,501,285	299,465	1,779,436.92	869,031.74	1,577,938.57
Biomass Exp	706,957	1,271,291	373,819	1,496,087		1,248,834	837,096	1,308,381	234,750	1,553,833.52	757,564.93	69,639.21	254,608	1,269,351	981,373	1,436,142.84	734,759.12	334,430.02	2,425,657	1,501,285	299,465	1,779,436.92	869,031.74	1,577,938.57

System Financial Performance (NPV, IRR, Capex Offset)

		Dual CHP											
NR/IRR		GAS PW (Option 1)		GAS EXP (Option 2)		GAS BIO PW (Option 3)		GAS BIO EXP (Option 4)		3rd Party BU PW (Option 5)		WSHP BU PW (Option 6)	
		NPV 25	NPV 40	NPV 25	NPV 40	NPV 25	NPV 40	NPV 25	NPV 40	NPV 25	NPV 40	NPV 25	NPV 40
1%		2,502,909	14,300,798	21,238,669	21,644,572	3,385,583	16,887,387	20,355,994	19,057,970	4,413,842	16,777,396	479,839	14,537,419
2%		1,317,977	8,532,779	20,444,705	21,238,747	500,322	10,281,217	20,430,616	19,490,309	1,798,940	10,715,270	-2,494,314	7,689,172
3%		2,109,627	4,112,162	20,669,246	20,883,305	-1,903,246	5,217,135	20,462,865	19,778,332	-454,628	6,065,479	-4,967,566	2,445,912
4%		3,861,102	690,089	20,409,547	20,566,129	-3,912,594	1,295,009	20,461,039	19,960,309	-2,306,967	2,462,441	-7,030,914	-1,608,012
5%		5,329,523	-1,984,745	20,163,384	20,278,461	-5,597,914	-1,770,062	20,431,776	20,063,779	-3,862,360	-357,209	-8,757,443	-4,772,024
6%		6,564,367	-4,094,919	20,028,954	20,043,155	-7,062,746	-4,899,728	20,380,409	19,968,782	-5,173,490	-2,344,449	-10,339,092	-7,261,609
7%		7,505,431	-5,774,200	19,704,769	19,767,772	-8,211,896	-6,115,196	20,311,234	20,109,759	-6,279,592	-4,360,567	-11,424,274	-9,242,309
8%		8,485,368	-7,121,507	19,489,621	19,536,544	-9,223,473	-7,662,634	20,227,727	20,077,672	-7,217,372	-5,788,117	-12,450,877	-10,825,789
9%		9,230,595	-8,210,534	19,282,499	19,317,594	-10,080,803	-8,913,418	20,132,707	20,020,478	-8,013,697	-6,944,726	-13,317,371	-12,101,932
10%		9,949,299	-9,049,798	19,089,586	19,109,698	-10,894,948	-9,749,418	20,028,471	19,944,196	-8,891,494	-7,949,798	-14,049,938	-12,638,298
11%		10,599,783	-9,822,150	18,899,119	18,908,901	-11,427,554	-10,765,539	19,916,891	19,853,345	-9,268,644	-8,663,555	-14,668,719	-13,980,454
12%		10,856,266	-10,419,078	18,701,567	18,716,608	-11,954,200	-11,453,870	19,799,500	19,751,400	-9,761,764	-9,303,614	-15,192,303	-14,671,378
13%		11,244,422	-10,912,261	18,519,406	18,530,834	-12,402,575	-12,022,442	19,677,559	19,641,015	-10,182,824	-9,834,737	-15,634,834	-15,239,053
14%		11,574,378	-11,321,089	18,342,210	18,350,928	-12,784,272	-12,494,400	19,552,104	19,524,236	-10,542,642	-10,277,308	-16,008,368	-15,706,365
15%		11,854,046	-11,660,761	18,169,609	18,176,270	-13,106,964	-12,887,135	19,423,988	19,402,660	-10,850,082	-10,646,954	-16,322,966	-16,092,005

		Dual Exp (TS)											
NR/IRR		GAS PW (Option 1)		GAS EXP (Option 2)		GAS BIO PW (Option 3)		GAS BIO EXP (Option 4)		3rd Party BU PW (Option 5)		WSHP BU PW (Option 6)	
		NPV 25	NPV 40	NPV 25	NPV 40	NPV 25	NPV 40	NPV 25	NPV 40	NPV 25	NPV 40	NPV 25	NPV 40
	1	7,179,597	21,414,212	-90,959,618	21,189,284	4,744,623	22,661,814	20,694,584	-19,941,678	8,350,154	22,913,036	5,401,164	20,938,837
	2	4,102,344	14,414,097	-80,781,986	20,871,999	1,477,325	15,980,785	-20,650,577	-20,105,277	5,192,085	15,741,637	2,066,093	13,121,799
	3	1,533,940	9,020,401	-75,948,491	20,594,491	1,413,401	15,882,401	-20,650,577	-20,105,277	5,192,085	15,741,637	2,066,093	13,121,799
	4	-61,831	872,364	-70,232,534	-20,121,138	-885,447	15,880,785	-20,499,150	-20,105,277	3,484,924	5,760,321	-3,040,884	2,952,983
	5	-2,429,014	1,606,595	-70,232,534	20,075,654	-2,818,449	1,495,726	-20,399,977	-186,133	-1,518,329	2,610,347	-4,994,247	-589,212
	6	-6,656,576	-19,941,678	-70,232,534	20,075,654	-2,818,449	1,495,726	-20,399,977	-186,133	-1,518,329	2,610,347	-4,994,247	-589,212
	7	-25,480,760	-3,040,136	-10,590,270	-19,925,518	-8,278,734	-3,487,833	-20,702,269	-20,053,405	-40,245,124	-2,161,818	-8,029,438	-5,617,738
	8	-6,847,814	-4,702,261	-19,390,379	-19,416,929	-7,001,591	-5,242,451	-20,044,156	-19,947,018	-11,554,355	-3,870,853	-9,206,700	-7,410,511
	9	-7,282,515	-6,051,905	-19,196,463	-19,216,120	-7,998,992	-6,682,279	-19,512,791	-19,947,018	-5,015,132	-5,260,244	-10,206,216	-8,862,806
	10	-7,864,576	-7,181,165	-19,196,463	-19,216,120	-7,998,992	-6,682,279	-19,512,791	-19,947,018	-5,015,132	-5,260,244	-10,206,216	-8,862,806
	11	-8,762,772	-8,065,880	-18,824,853	-18,835,827	-5,717,419	-8,832,422	-19,639,230	-19,602,369	-6,050,406	-7,337,443	-11,781,165	-11,020,478
	12	-9,347,332	-8,819,847	-18,824,853	-18,854,134	-10,200,456	-9,636,550	-19,498,937	-19,471,037	-6,656,611	-8,116,961	-12,399,448	-11,823,676
	13	-9,746,576	-9,477,738	-18,824,853	-18,877,039	-10,200,456	-9,636,550	-19,498,937	-19,471,037	-6,656,611	-8,116,961	-12,399,448	-11,823,676
	14	-10,275,573	-9,973,605	-18,301,007	-18,305,327	-11,153,399	-10,866,700	-19,214,833	-19,198,668	-6,626,251	-9,139,599	-13,378,494	-13,044,951
	15	-10,649,702	-10,172,032	-18,134,354	-18,305,327	-11,587,301	-11,337,294	-19,072,052	-19,059,682	-6,620,618	-9,773,395	-13,768,741	-13,508,463

2. Killingworth Potential Phase 2 Extension to include Killingworth Moor development site - Technical Overview and Financial Performance Summary

KILLINGWORTH MOOR DEVELOPMENT

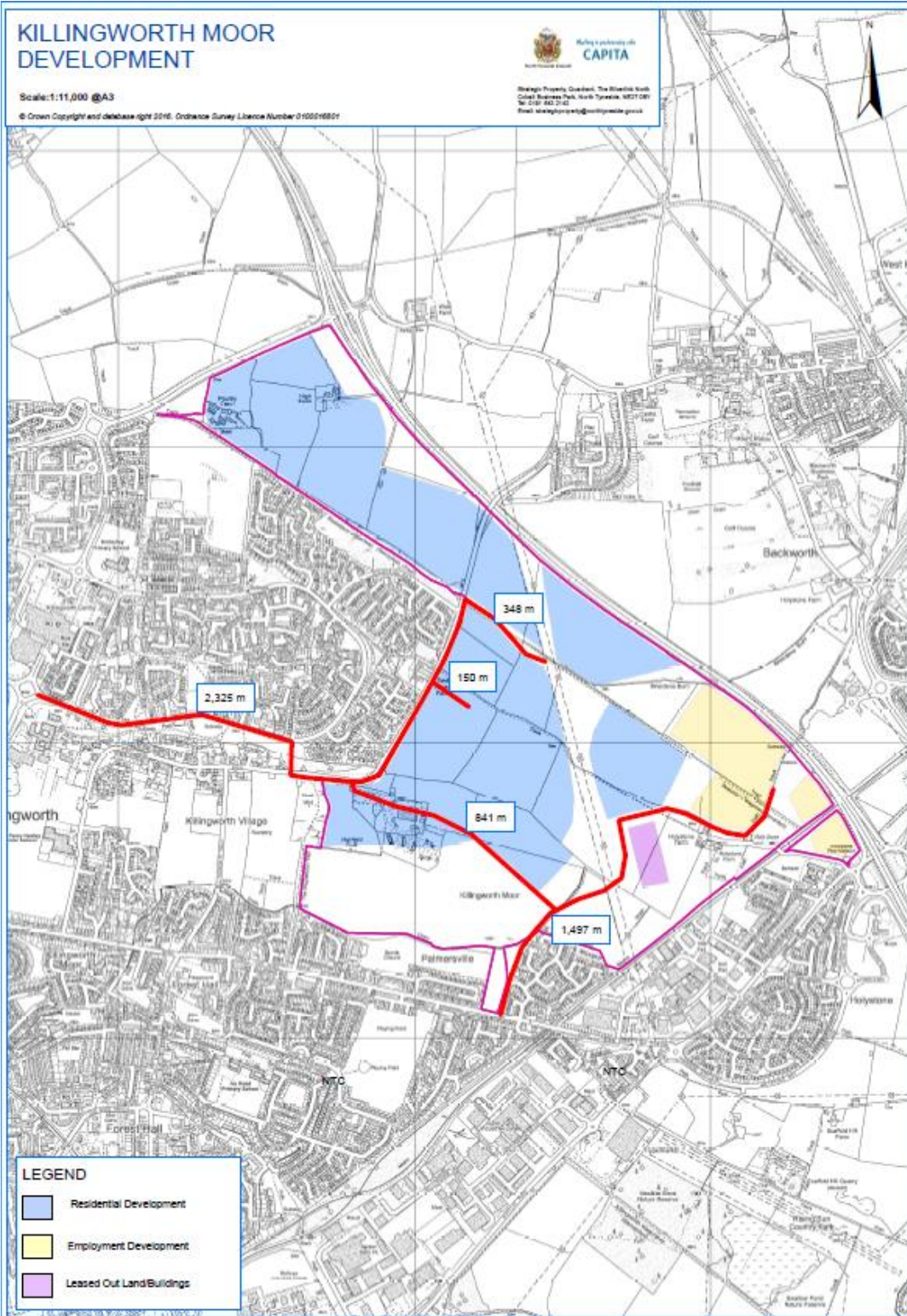
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Energy Details

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Heat Demand
Cluster Monthly Heat Consumption (MWh)	2,556.57	2,293.85	2,153.25	1,506.84	1,222.72	770.58	437.62	288.80	905.29	1,254.42	1,633.94	1,813.35	16,837.23

System Technical Details

Monthly CHP Capacity Requirement	5.49	4.93	4.63	3.24	2.63	1.66	0.94	0.62	1.95	2.70	3.51	3.90
Baseload CHP Capacity Requirement	0.68											
Average load CHP Capacity Requirement	3.01											

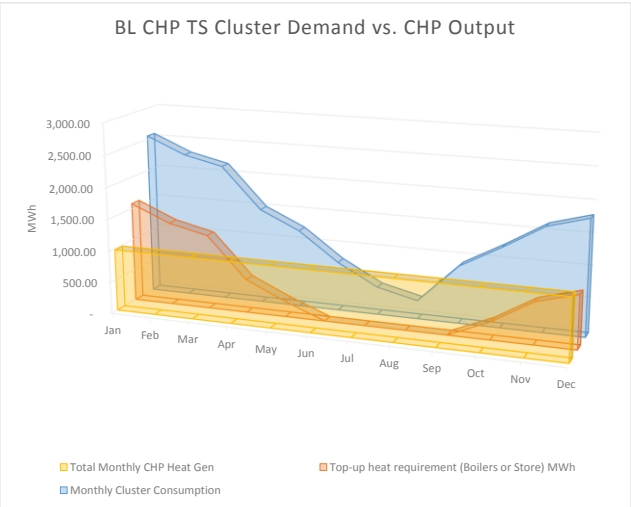
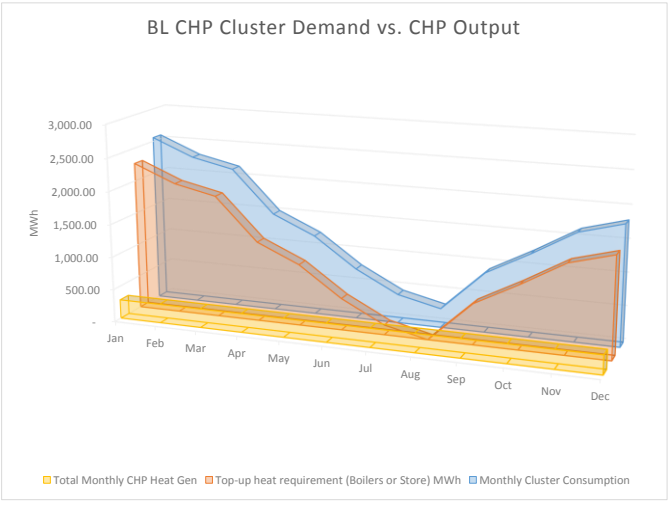
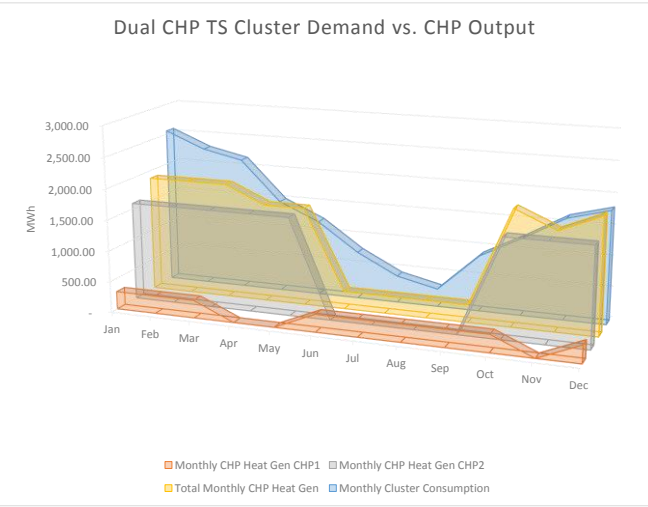
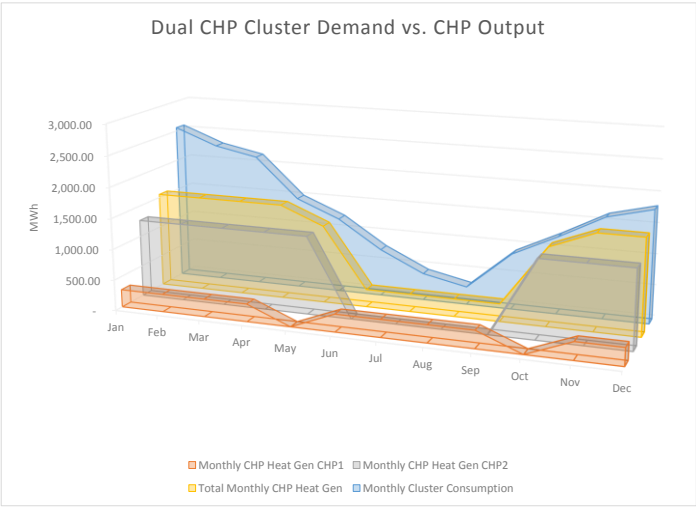
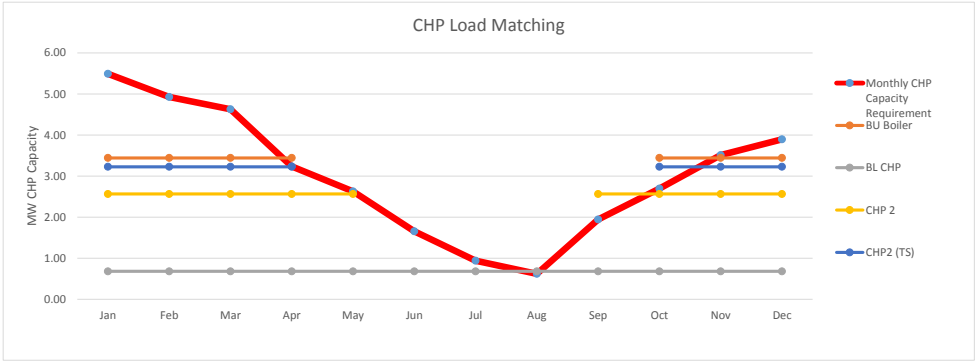
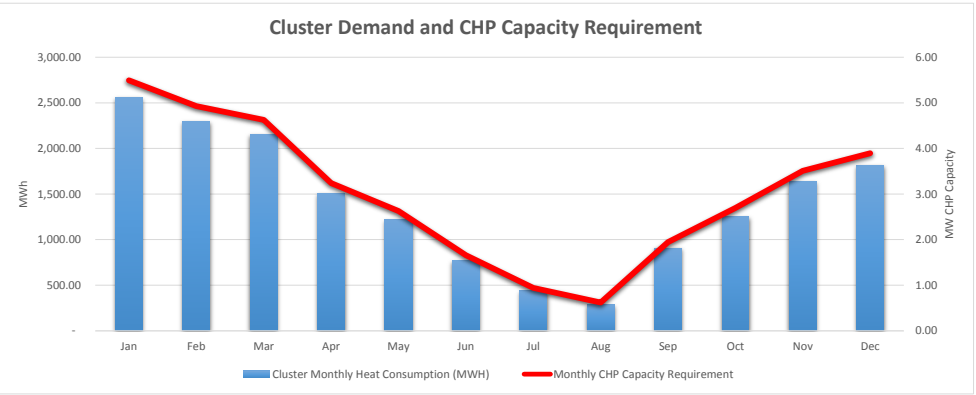
Gas Back-up boiler capacity requirement (MW)	3.44
Bimoass Back-up boiler capacity requirement (MW)	3.74

Network Details

Transmission Mains (m)	5523.00
Distribution Mains (m)	12279.00
Network m3	390.42
MWh Thermal Storage Potential	17.75
System run hrs storage potential	2.95

CHP Details

	Dual CHP			Dual CHP (TS)			BL CHP		BL CHP (TS)	
	CHP1	CHP2	Totals	CHP1	CHP2	Totals	CHP1	CHP2	CHP1	CHP2
Average Electrical output (Mwe)	0.53	2.00	2.53	0.53	2.51	3.04	0.54	-	1.54	-
Average Heat output (MWt)	0.68	2.57	3.25	0.68	3.23	3.91	0.69	-	1.98	-
Overall CHP Efficiency (%)	80%	80%	1.60	80%	80%	1.60	80%	-	80%	-
Fuel input (gross CV basis) (MW)	1.52	5.70	7.22	1.52	7.17	8.69	1.53	-	4.41	-
CHP hours run per year (hrs)	5,585	6,570		5,585	6,570		5,585	-	6,570	-
Annual CHP Displaced Electricity (MWh)	2,965	13,110	16,075	2,965	16,491	19,456	2,995	-	10,141	-
Annual Electricity Generated (parasitic network load adj)	2,417	8,697	11,113	2,175	10,951	13,126	2,929	-	9,918	-
Monthly Electricity Generated (parasitic network load adj)	242	1,087	1,329	242	1,369	1,610	244	-	826	-
Monthly CHP Delivered Heat (network heat-loss adj)	286	1,264	1,550	286	1,590	1,876	289	-	978	-
Input Fuel (MWh)	7,060	24,972	32,031	6,354	31,412	37,766	8,556	-	28,973	-
Annual Net CO2 Saving p/a (tonnes)	705	3,120	3,826	706	3,925	4,631	712	-	2,412	-
Annual Net CO2 Saving p/a (£)	11,287	49,926	61,213	11,289	62,801	74,091	11,396	-	38,589	-
Combined heat Capacity (MW) (CHP & Back-up)	4.13	2.57	6.69	3.01	3.23	6.24	8.45	-	7.39	-



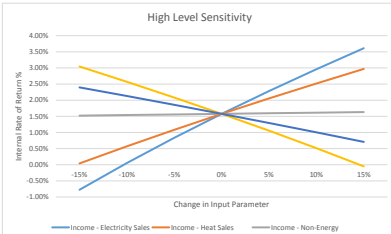
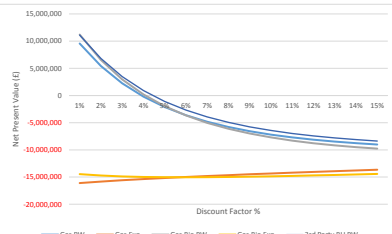
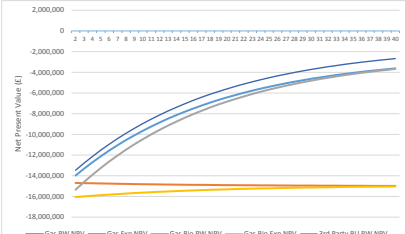
System CAPEX Costs											
	Dual CHP					Dual CHP (TS)					
	Gas Only	Biomass BU	3rd Party BU	WSHP BU	Gas Only	Biomass BU	3rd Party BU	WSHP BU	Gas Only	Biomass BU	
CHP	1,263,200	1,263,200	1,263,200	1,263,200	1,263,200	1,263,200	1,263,200	1,263,200	1,263,200	1,263,200	1,263,200
Boiler	103,143	-	-	-	69,865	-	-	-	232,854	-	-
WSHP	-	-	-	3,369,842	-	-	-	2,278,205	-	-	5,285,874
Biomass Boiler, store & assoc. plant	-	1,310,494	-	-	-	885,968	-	-	-	2,055,618	-
Plant BOS (Balance of System)	-	386,054	189,480	694,956	-	360,972	228,077	569,808	-	483,147	115,762
Thermal Store	-	-	-	-	-	-	-	-	-	-	409,271
Network Transmission	5,434,632	5,434,632	5,434,632	5,434,632	5,434,632	5,434,632	5,434,632	5,434,632	5,434,632	5,434,632	5,434,632
Network Distribution	7,367,400	7,367,400	7,367,400	7,367,400	7,367,400	7,367,400	7,367,400	7,367,400	7,367,400	7,367,400	7,367,400
Building Connections	423,294	423,294	423,294	423,294	423,294	423,294	423,294	423,294	423,294	423,294	423,294
WSHP Network & Civils	-	-	-	-	-	-	-	-	-	-	-
EC Building Cost	761,658	913,990	369,648	1,066,322	709,967	851,960	444,946	993,954	961,754	1,154,104	78,461
EC Building Cost	761,658	913,990	369,648	1,066,322	709,967	851,960	444,946	993,954	961,754	1,154,104	78,461
Total Capital (£)	15,558,507	17,099,064	15,047,654	19,619,646	15,558,507	16,844,741	15,418,863	18,587,806	14,763,206	18,083,560	13,612,131

System OPEX & Revenue											
	Dual CHP					Dual CHP (TS)					
	Price/Cost (MWh)	Energy Sales (MWh)	Income non-energy	Energy Direct costs	Overhead Costs	Price/Cost (MWh)	Energy Sales (MWh)	Income non-energy	Energy Direct costs	Overhead Costs	
Private Wire Elec Sales	116.85	1,310,003	-	-	-	116.85	1,310,003	-	-	-	686,733
Export Elec Sales	45	504,494	-	-	-	45	594,808	-	-	-	41,877
Standing Charge	-	-	33,053	-	-	-	-	33,053	-	-	-
Heat Sales (CHP)	52.00	674,583	-	-	-	52.00	795,344	-	-	-	-
Heat Sales (Boiler)	52.00	205,797	-	-	-	52.00	138,601	-	-	-	-
Input Fuel (CHP)	25.3	-	-	810,393.55	-	25.3	-	-	955,470.02	-	-
Input Fuel (Boiler)	25.2	-	-	119,678.87	-	25.2	-	-	80,601.94	-	-
Biomass Fuel Costs	46	-	-	227,563.98	-	46	-	-	153,260.96	-	-
Biomass RH Income T1	52.4	176,273	-	-	-	52.4	118,717	-	-	-	-
Biomass RH Income T2	22.7	31,107	-	-	-	22.7	20,950	-	-	-	-
WSHP RH Income T1	89.5	303,077	-	-	-	89.5	202,771	-	-	-	-
WSHP RH Income T2	26.7	15,850	-	-	-	26.7	10,675	-	-	-	-
OPEX Overhead	-	-	-	-	-	-	-	-	-	-	-
Network maintenance	13	-	-	-	220,112.72	13	-	-	-	218,883.99	-
Bureau costs	11.1	-	-	-	187,942.40	11.1	-	-	-	199,496.44	-
Business rates	6	-	-	-	101,590.48	6	-	-	-	107,835.92	-

System Financial Performance (NPV, IRR, Capex Offset)											
	Dual CHP					Dual CHP (TS)					
	Income - Electricity	Income - Heat	Income - non-energy	Energy Direct costs	Overhead	Income - Electricity	Income - Heat	Income - non-energy	Energy Direct costs	Overhead	
Gas only PW	1,310,003	880,378	33,053	930,072.41	509,645.60	783,714.82	1,544,519	933,945	1,036,071.96	540,976.84	934,467.93
Biomass PW	1,310,003	880,378	33,053	930,072.41	509,645.60	783,714.82	1,544,519	933,945	1,036,071.96	540,976.84	934,467.93
3rd Party BU PW	1,310,003	880,378	33,053	930,072.41	509,645.60	783,714.82	1,544,519	933,945	1,036,071.96	540,976.84	934,467.93
WSHP BU PW	1,310,003	880,378	33,053	930,072.41	509,645.60	783,714.82	1,544,519	933,945	1,036,071.96	540,976.84	934,467.93
Gas only Exp	504,494	880,378	33,053	930,072.41	509,645.60	783,714.82	1,544,519	933,945	1,036,071.96	540,976.84	934,467.93
Biomass Exp	504,494	880,378	33,053	930,072.41	509,645.60	783,714.82	1,544,519	933,945	1,036,071.96	540,976.84	934,467.93

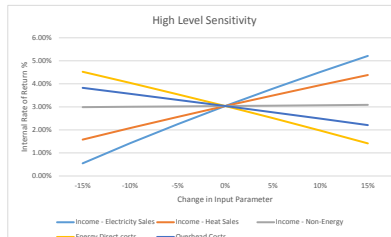
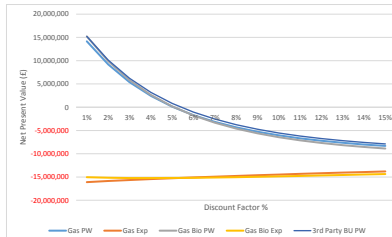
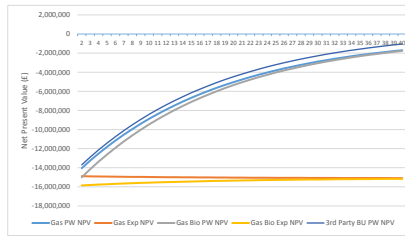
System Financial Performance (NPV, IRR, Capex Offset)

RR/IRR	Dual CHP					Dual CHP (TS)				
	NPV 25	NPV 40	NPV 25	NPV 40	NPV 25	NPV 40	NPV 25	NPV 40	NPV 25	NPV 40
1%	1,079,456	9,552,612	-15,862,856	-16,096,480	1,646,834	11,195,684	-15,295,477	-14,455,411	2,280,375	11,110,843
2%	720,964	5,417,108	-15,697,565	-15,824,256	186,373	6,530,946	-15,322,974	-14,714,418	392,704	6,789,618
3%	229,293	2,240,154	-15,587,950	-15,697,056	2,079,056	2,956,674	-15,302,452	-14,880,431	1,179,917	3,476,964
4%	-3,470,420	-201,785	-15,279,614	-15,370,510	-3,493,075	190,523	-15,302,269	-14,978,202	-2,494,697	911,776
5%	-4,518,388	-2,116,191	-15,104,033	-15,170,834	-4,678,066	-1,970,903	-15,263,711	-15,025,546	-3,597,544	-6,652,142
6%	-5,936,686	-3,625,185	-14,935,857	-14,986,595	-5,974,924	-3,875,375	-15,211,236	-15,059,341	-4,526,448	-8,277,146
7%	-6,140,019	-4,824,841	-14,762,470	-14,810,841	-6,511,305	-5,031,164	-15,147,527	-15,017,145	-5,708,333	-9,917,700
8%	-6,765,707	-5,786,191	-14,618,917	-14,645,730	-7,222,187	-6,118,319	-15,074,971	-14,977,858	-6,970,504	-11,228,134
9%	-7,294,763	-6,562,162	-14,467,938	-14,488,311	-7,822,101	-6,996,493	-14,995,276	-14,922,643	-7,531,783	-12,286,288
10%	-7,742,755	-7,189,575	-14,312,109	-14,317,405	-8,336,591	-7,716,656	-14,909,946	-14,859,595	-7,986,959	-13,356,958
11%	-8,122,476	-7,707,651	-14,160,562	-14,152,114	-8,762,080	-8,294,501	-14,820,185	-14,779,058	-8,451,129	-14,484,533
12%	-8,444,485	-8,130,500	-14,042,998	-14,055,730	-9,128,465	-8,774,618	-14,726,978	-14,695,844	-8,758,666	-15,153,429
13%	-8,717,526	-8,478,970	-13,909,053	-13,915,687	-9,439,602	-9,170,762	-14,631,130	-14,607,479	-9,052,441	-16,141,048
14%	-8,948,887	-8,746,957	-13,778,448	-13,785,549	-9,703,688	-9,496,683	-14,533,505	-14,515,249	-9,302,597	-17,120,147
15%	-9,144,578	-9,005,366	-13,651,065	-13,654,936	-9,927,560	-9,770,676	-14,434,047	-14,420,235	-9,535,462	-18,170,381



Capital Of	Gas Only	Gas Biomass	3rd Party BU	WSHP BU PW
10%	1,555,851	1,709,906	1,044,965	1,961,865
20%	1,111,701	1,418,813	1,009,531	1,923,926
30%	4,667,552	5,129,719	4,514,296	5,885,894

RR/IRR	Dual CHP					Dual CHP (TS)				
	NPV 25	NPV 40	NPV 25	NPV 40	NPV 25	NPV 40	NPV 25	NPV 40	NPV 25	NPV 40
1%	1,079,456	9,552,612	-15,862,856	-16,096,480	1,646,834	11,195,684	-15,295,477	-14,455,411	2,280,375	11,110,843
2%	720,964	5,417,108	-15,697,565	-15,824,256	186,373	6,530,946	-15,322,974	-14,714,418	392,704	6,789,618
3%	229,293	2,240,154	-15,587,950	-15,697,056	2,079,056	2,956,674	-15,302,452	-14,880,431	1,179,917	3,476,964
4%	-3,470,420	-201,785	-15,279,614	-15,370,510	-3,493,075	190,523	-15,302,269	-14,978,202	-2,494,697	911,776
5%	-4,518,388	-2,116,191	-15,104,033	-15,170,834	-4,678,066	-1,970,903	-15,263,711	-15,025,546	-3,597,544	-6,652,142
6%	-5,936,686	-3,625,185	-14,935,857	-14,986,595	-5,974,924	-3,875,375	-15,211,236	-15,059,341	-4,526,448	-8,277,146
7%	-6,140,019	-4,824,841	-14,762,470	-14,810,841	-6,511,305	-5,031,164	-15,147,527	-15,017,145	-5,708,333	-9,917,700
8%	-6,765,707	-5,786,191	-14,618,917	-14,645,730	-7,222,187	-6,118,319	-15,074,971	-14,977,858	-6,970,504	-11,228,134
9%	-7,294,763	-6,562,162	-14,467,938	-14,488,311	-7,822,101	-6,996,493	-14,995,276	-14,922,643	-7,531,783	-12,286,288
10%	-7,742,755	-7,189,575	-14,312,109	-14,317,405	-8,336,591	-7,716,656	-14,909,946	-14,859,595	-7,986,959	-13,356,958
11%	-8,122,476	-7,707,651	-14,160,562	-14,152,114	-8,762,080	-8,294,501	-14,820,185	-14,779,058	-8,451,129	-14,484,533
12%	-8,444,485	-8,130,500	-14,042,998	-14,055,730	-9,128,465	-8,774,618	-14,726,978	-14,695,844	-8,758,666	-15,153,429
13%	-8,717,526	-8,478,970	-13,909,053	-13,915,687	-9,439,602	-9,170,762	-14,631,130	-14,607,479	-9,052,441	-16,141,048
14%	-8,948,887	-8,746,957	-13,778,448	-13,785,549	-9,703,688	-9,496,683	-14,533,505	-14,515,249	-9,302,597	-17,120,147
15%	-9,144,578	-9,005,366	-13,651,065	-13,654,936	-9,927,560	-9,770,676	-14,434,047	-14,420,235	-9,535,462	-18,170,381



Capital Of	Gas Only	Gas Biomass	3rd Party BU	WSHP BU PW
10%	1,576,923	1,684,474	1,541,886	1,858,781
20%	1,112,846	1,368,948	1,083,773	1,712,563
30%	4,729,269	5,053,422	4,625,659	5,576,342

BL CHP									
RR/IRR	GAS BIO (Option 1)			GAS EXP (Option 2)			GAS BIO PW (Option 3)		
	NPV 25	NPV 40	NPV 40	NPV 25	NPV 40	NPV 25	NPV 40	NPV 25	NPV 40
9	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
10	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
11	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
12	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
13	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
14	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
15	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
16	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
17	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
18	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
19	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
20	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
21	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
22	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
23	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
24	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
25	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
26	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
27	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
28	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
29	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
30	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
31	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
32	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
33	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
34	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
35	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
36	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
37	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
38	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
39	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
40	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
41	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
42	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
43	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
44	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
45	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
46	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
47	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
48	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
49	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
50	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
51	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
52	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
53	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
54	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
55	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
56	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
57	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
58	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
59	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
60	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
61	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
62	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
63	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
64	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
65	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
66	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
67	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
68	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
69	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
70	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
71	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
72	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
73	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
74	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
75	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
76	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
77	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
78	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
79	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
80	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
81	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
82	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
83	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
84	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
85	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
86	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
87	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
88	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
89	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
90	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
91	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
92	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
93	-12,046.875	-10,214.845	-10,635.764	-16,696.941	-9,068.491	-5,410.568	-13,068.380	-11,085.662	-8,500.411
94	-12,046.875	-10,214.845	-10,635.764	-16					

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