



North Lincolnshire Green Energy Park

Feasibility Study



A vital source for the future

SOLAR | 21

VITAL



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Deliverables

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Heating, cooling & private wire load demands

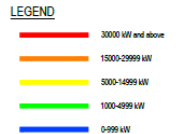
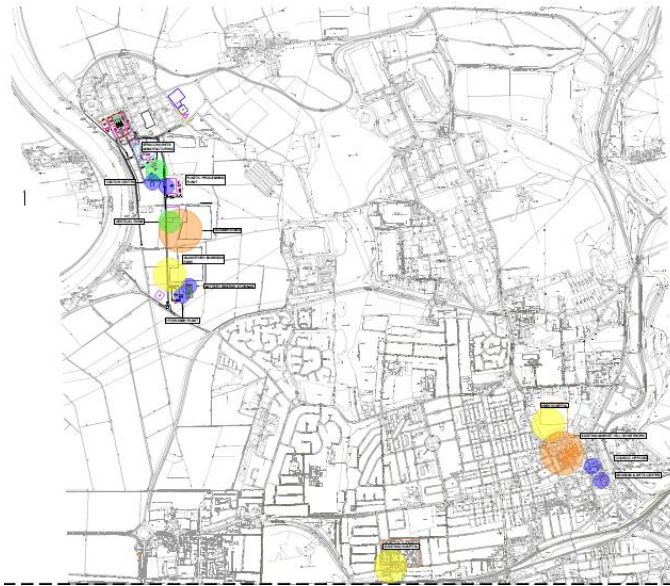
Load Summary - High Estimates	Peak Heating (kW)	Annual Heating (kWh)	Peak Cooling (kW)	Annual Cooling (kWh)	Peak electrical (kW)	Annual Electrical (kWh)
Phase 1						
VISITOR'S CENTRE	200	215,239	-	-	84	126,684
EFW (CONCRETE MANUFACTURING)	1,919	1,980,917	-	-	618	927,668
PLASTICS PROCESSING PLANT	270	244,809	-	-	354	531,440
Glasshouses	16,640	66,300,512	-	-	5,168	7,287,924
Glanford Business Park	8,071	8,665,002	-	-	3,600	5,400,000
CAMBRIDGE VERTICAL FARM (HOK)	-	-	2,822	9,798,877	3,767	21,452,913
HYDROGEN ELECTROLYSIS PLANT	124	59,989	475	385,663	9,000	36,000,000
BATTERY ENERGY STORAGE (BES)	152	126,423	-	-	-	-
EV chargers					1,175	1,762,318
Phase 2						
LINCOLNSHIRE LAKE BUSINESS PARK	31,475	33,793,509	-	-	13,000	19,500,000
DATA CENTRES	-	-	6,000	24,017,093	6,000	52,560,000
Phase 3						
SCUNTHORPE HOSPITAL (NEW)	6,845	18,329,245	-	-	3,947	5,920,000
MUSEUM SPACE (CULTURAL ART & HERITAGE)	242	259,950	-	-	114	171,000
COUNCIL OFFICES (EXISTING)	192	206,054	-	-	86	128,412
BOC	-	-	-	-	2,832	4,248,250
RAINHAM STEEL					881	1,320,950
Tower blocks by new hospital	1,142	1,672,455	-	-	480	720,000
Low rise flats by new hospital	797	1,114,970	-	-	320	480,000
Phases 4,5 & 6 (Residential)						
North Lincolnsire Lakes 1 bed	1,681	2,749,154	-	-	1,150	1,725,000
North Lincolnsire Lakes 2 bed	3,145	5,442,390	-	-	2,376	3,564,000
North Lincolnsire Lakes 3 bed	3,420	5,946,526	-	-	2,303	3,454,500
North Lincolnsire Lakes 4 bed	3,318	5,743,323	-	-	2,051	3,076,000
North Lincolnsire Lakes 5 bed	5,144	9,528,500	-	-	2,200	3,300,000
North Lincolnsire Lakes 6 bed	8,424	13,599,769	-	-	3,140	4,710,000
Phase 7						
SCUNTHORPE HOSPITAL (EXISTING)	8,523	20,240,527	-	-	3,947	5,920,000
Totals	101,726	196,219,261	9,297	34,201,632	68,592	184,287,059
Totals (Diversified + including losses)	83,650	245,205,304	9,986	40,237,215		

- Produced 4 options:
- 100MW (High incl Clg)
- 90MW (High Estimate)
- 45MW (Low incl Clg)
- 40MW (Low estimate)
- Formed basis of:
- DH modelling,
- Energy modelling &
- Commercial costings



Heating & cooling load demands

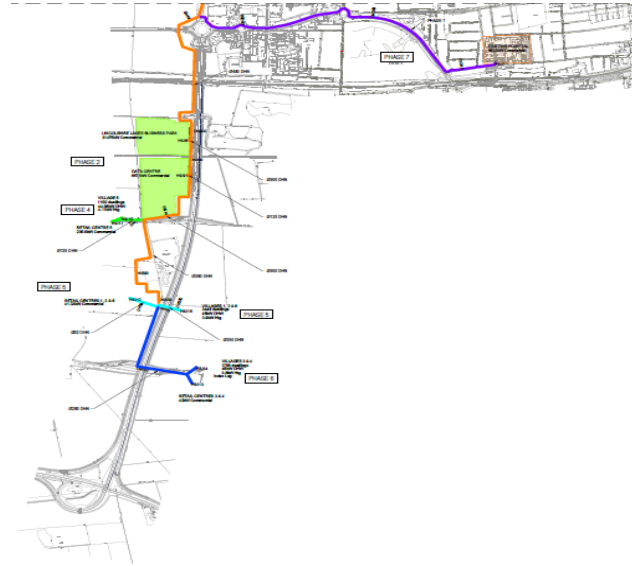
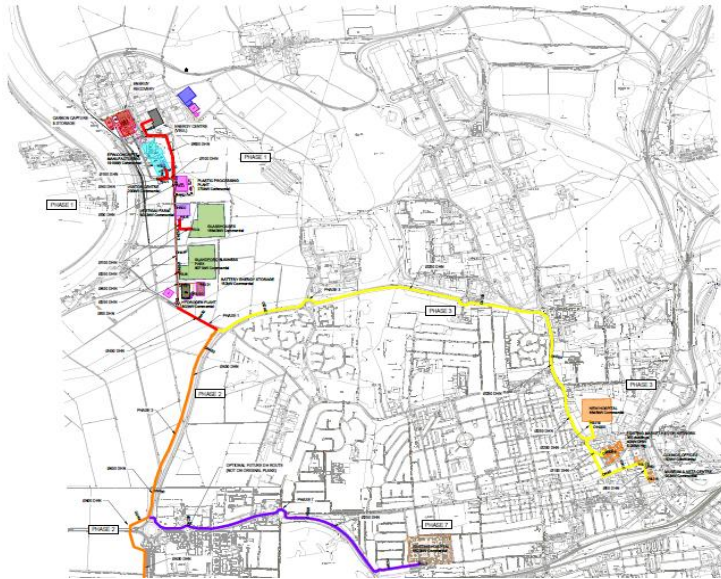
Heat Maps (High & low estimates)





Heat Network Strategy

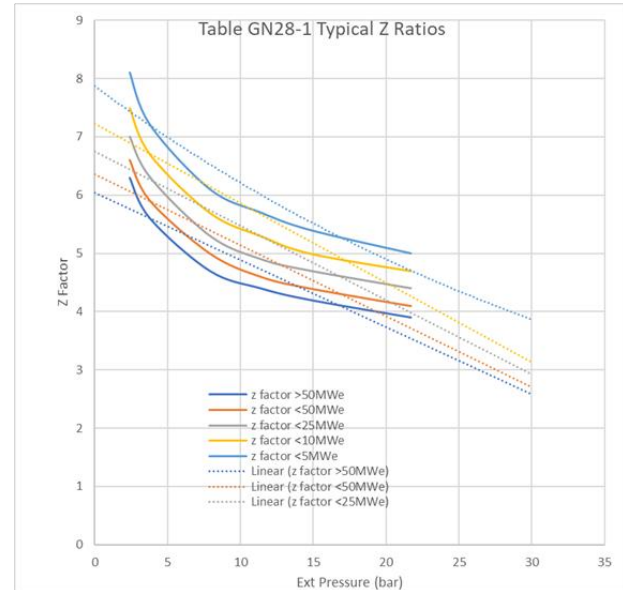
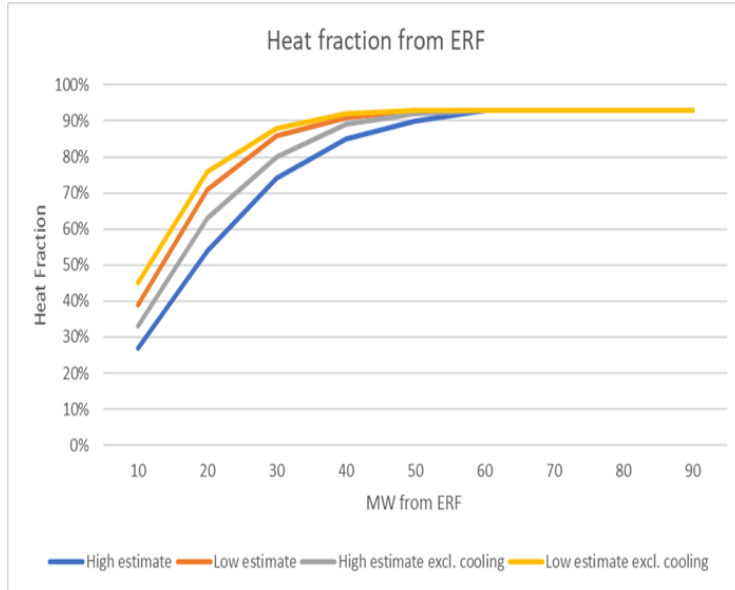
DHN Routes





Energy Modelling

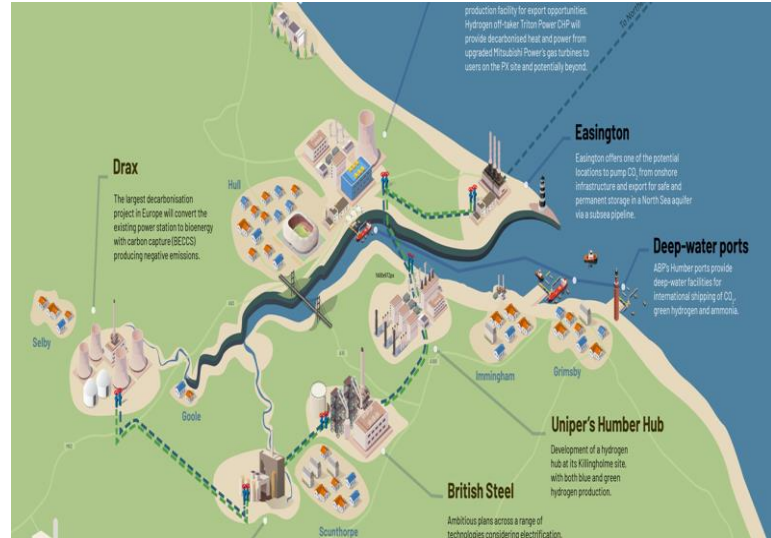
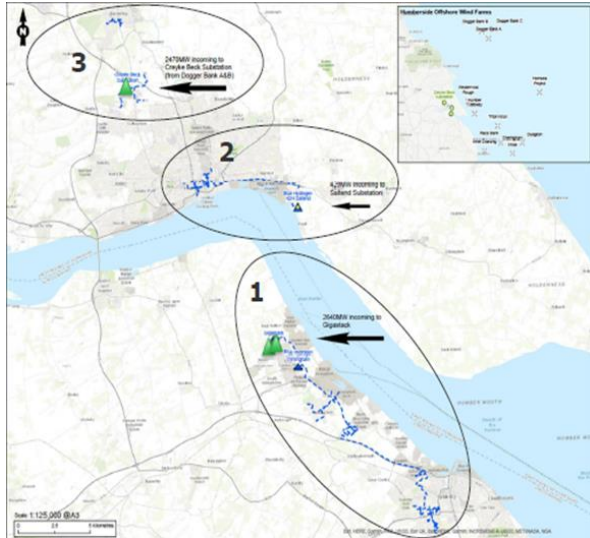
Heat fraction & Z-factor





Technical & Commercial Opportunities for Other Networks

Hydrogen networks – Hull & Humber Region

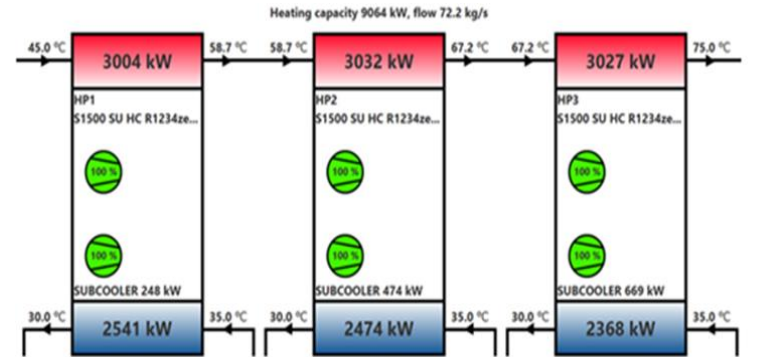




Alternative technologies

Back-up Boiler Options

- *Baseline – PHeX from steam bleed (LTHW)*
- *Gas-fired Boilers (H2 ready, new network incomplete)*
- *Direct Electric Boilers (capacity limitations & operating costs, no flues though)*
- *G/WSHP (local river as water sources but flood plain and high costs to mirror DH route)*
- *ASHP (require space & very high costs for multiple parallel units - circa £26 Million)*





Commercial Model Assumptions and Variables

- > *EFW Heat Price: 1.5p/kWh*
 - > *Gas Price: 3 p/kWh*
 - > *Elec price from EFW: 10p/kWh*
 - > *Elec Price from grid: 15p/kWh*
 - > *EFW availability: 92%*
 - > *Commercial Variable heat charge: 5p/kWh*
 - > *Residential variable heat charge: 7p/kWh*
 - > *Elec charge: 15p/kWh*
 - > *Commercial heat standing charge: £2.50/m²*
 - > *Residential heat standing charge: £400/year*
 - > *Assumed on plot works paid for by developers – ESCo pays for DH spine and energy infrastructure.*
 - > *Business rates exempt until 2035 and then assumed 50% reduction in line with good quality CHP schemes.*
- > *Phases:*
 1. *Visitor Centre, EFW, Plastics, Hydrogen, Battery, Vertical farm, Glasshouses, Glanford BP, EV Chargers*
 2. *Lincolnshire lakes BP + data centres*
 3. *New hospital, existing towers and flats, BOC, Rainham Steel, Museum, Council offices*
 4. *Lincolnshire lakes residential developments*
 5. *Existing Scunthorpe Hospital*



Cost Summary

- Phase 1: £50,755,346
- Phase 2: £46,866,884
- Phase 3: £26,059,693
- Phase 4: £64,663,585
- Phase 5: £11,654,493
- **Total: £200,000,000**

➤ Phases:

1. Visitor Centre, EFW, Plastics, Hydrogen, Battery, Vertical farm, Glasshouses, Glanford BP, EV Chargers
2. Lincolnshire lakes BP + data centres
3. New hospital, existing towers and flats, BOC, Rainham Steel, Museum, Council offices
4. Lincolnshire lakes residential developments
5. Existing Scunthorpe Hospital

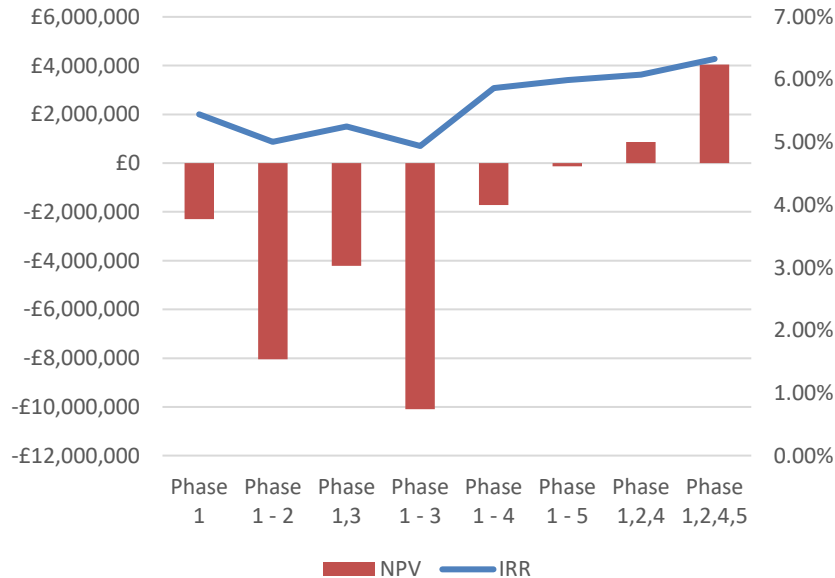
(11.1.22) REV2	Usage	No. res units	Footprint	Heat	Cooling	Electrical	Phased Cost Breakdown							Phase Costs
							Steam Offtake	EC Construction	EC Fit Out	District Heating & Chills (District)	On Plot (DHW & Heat Substation)	Private Wire & Chills	On Plot (Private Wire & Heat)	
			m2	kW	kW (heat)	kWh kW	£	£	£	£	£	£	£	£
PHASE 1							£ 1,564,724	£ 2,813,250	£ 11,184,000	£ 13,468,835		£ 4,890,151		
VISITOR'S CENTRE	Leisure		2,484	200		42					£ 222,730		£ 345,600	
EFW (CONCRETE MANUFACTURING)	Industrial		33,131	1,919		378					£ 1,335,682		£ 345,600	
PLASTICS PROCESSING PLANT	Industrial		10,220	270		121					£ 300,100		£ 345,600	
HYDROGEN ELECTROLYSIS PLANT	Industrial		3,165	124	678	61					£ 128,100		£ 345,600	
BATTERY ENERGY STORAGE (BES)	Industrial		6,670	152		0					£ 160,275		£ 345,600	
CAMBRIDGE VERTICAL FARM (HOK)	Industrial		22,400		4,032	5,365					£ 1,964,198		£ 345,600	
Glasshouses	Glasshouses		124,600	16,640		1,807					£ 5,790,972		£ 345,600	
Glanford Business Park	Office		100,000	8,071		1,807					£ 4,494,128		£ 345,600	
			27,378	4,710	9,581		£ 1,564,724	£ 2,813,250	£ 11,184,000	£ 13,468,835	£ 14,415,183	£ 4,890,151	£ 2,419,200	£ 50,755,346
PHASE 2							£ 1,369,138	£ 2,683,885	£ 4,759,565	£ 17,034,627		£ 6,033,747		
Lincolnshire Lakes Business Park	Office		390,000	31,475		6,500					£ 10,953,777		£ 345,600	
DATA CENTRES	Data centre		1,000	8,571	342						£ 3,340,945		£ 345,600	
				31,475	8,571	6,842	£ 1,369,138	£ 2,683,885	£ 4,759,565	£ 17,034,627	£ 14,294,722	£ 6,033,747	£ 691,200	£ 46,866,884
PHASE 3							£ -	£ 33,550	£ 1,588,405	£ 10,141,310		£ 6,161,538		
MUSEUM SPACE (CULTURAL ART & HERITAGE)	Office		3,000	242		57					£ 269,503		£ 345,600	
SCUNTHORPE HOSPITAL (NEW)	Hospital		80,000	6,845		913					£ 3,811,462		£ 345,600	
COUNCIL OFFICES (EXISTING)	Office		2,278	192		913					£ 213,821		£ 345,600	
BOC	Industrial		84,965			970					?		£ 345,600	
RAINHAM STEEL	Industrial		26,419			302					?		£ 345,600	
Tower blocks by new hospital	Residential		210	1,014		20,050					£ 1,267,262			
Low rise flats by new hospital	Residential		140	710		13,383					£ 844,842			
				9,003	0	36,588	£ -	£ 33,550	£ 1,588,405	£ 10,141,310	£ 6,406,890	£ 6,161,538	£ 1,728,000	£ 26,059,693
PHASE 4							£ -	£ -	£ 495,353	£ 1,103,905		£ 319,478		
North Lincolnshire Lakes Village 5	Retail		300	108		1,356					£ 120,274		£ 345,600	
ANP District Centre - Shopping centre	Retail		3,036	363		424					£ 404,254		£ 345,600	
North Lincolnshire Lakes Village 5 (2 bed)	Residential		220	586		693					£ 1,699,500			
North Lincolnshire Lakes Village 5 (3 bed)	Residential		583	2,006		910					£ 4,503,675			
North Lincolnshire Lakes Village 5 (4 bed)	Residential		297	1,254		1,542					£ 2,294,325			
				4,317	0	1,356	£ -	£ -	£ 495,353	£ 1,103,905	£ 9,022,028	£ 319,478	£ 691,200	£ 11,631,964
PHASE 5							£ -	£ 2,683,885	£ 1,106,200	£ 2,156,769		Excl		
North Lincolnshire Lakes village 1	Retail		300	36		36					£ 50,114			
North Lincolnshire Lakes Village 2	Retail		500	60		60					£ 83,524			
North Lincolnshire Lakes Village 6	Retail		500	60		60					£ 83,524			
North Lincolnshire Lakes village 1 (2 bed)	Residential		138	381		465					£ 1,964,050			
North Lincolnshire Lakes Village 1 (3 bed)	Residential		366	1,300		1,596					£ 2,825,033			
North Lincolnshire Lakes Village 1 (4 bed)	Residential		186	810		1,015					£ 1,439,168			
North Lincolnshire Lakes village 2 (2 bed)	Residential		238	629		781					£ 1,835,460			
North Lincolnshire Lakes Village 2 (3 bed)	Residential		630	2,157		2,634					£ 4,863,969			
North Lincolnshire Lakes Village 2 (4 bed)	Residential		321	1,348		1,659					£ 2,427,871			
North Lincolnshire Lakes village 6 (2 bed)	Residential		314	817		1,015					£ 2,425,650			
North Lincolnshire Lakes Village 6 (3 bed)	Residential		832	2,807		3,488					£ 6,427,973			
North Lincolnshire Lakes Village 6 (4 bed)	Residential		424	1,758		2,182					£ 3,274,628			
				12,162	0	0	£ -	£ 2,683,885	£ 1,106,200	£ 2,156,769	£ 26,875,964	£ -	£ -	£ 32,799,818
PHASE 6							£ -	£ -	£ 1,085,180	£ 5,464,590		Excl		
North Lincolnshire Lakes Village 3	Retail		400	48		48					£ 66,819			
North Lincolnshire Lakes Village 4	Retail		300	36		36					£ 50,114			
North Lincolnshire Lakes Village 2 (3 bed)	Residential		197	530		651					£ 1,524,915			
North Lincolnshire Lakes Village 3 (2 bed)	Residential		523	1,813		2,236					£ 4,041,025			
North Lincolnshire Lakes Village 3 (3 bed)	Residential		266	1,132		1,418					£ 2,058,635			
North Lincolnshire Lakes Village 4 (2 bed)	Residential		154	421		521					£ 1,188,105			
North Lincolnshire Lakes Village 4 (3 bed)	Residential		408	1,437		1,798					£ 3,148,478			
North Lincolnshire Lakes Village 4 (4 bed)	Residential		208	896		1,124					£ 1,603,948			
				6,311	0	0	£ -	£ -	£ 1,085,180	£ 5,464,590	£ 13,682,033	£ -	£ -	£ 20,231,803
PHASE 7							£ -	£ -	£ 612,510	£ 6,296,170		Excl		
SCUNTHORPE HOSPITAL (EXISTING)	Hospital		80,000	8,523		1,015					£ 4,745,813			
				8,523	0	0	£ -	£ -	£ 612,510	£ 6,296,170	£ 4,745,813	£ -	£ -	£ 11,654,493
				99,168	26,561									
			6,654	981,253	125,731	108,737	£ 2,933,862	£ 8,214,570	£ 20,831,213	£ 55,666,206	£ 89,419,635	£ 17,404,914	£ 5,529,600	£ 200,000,000



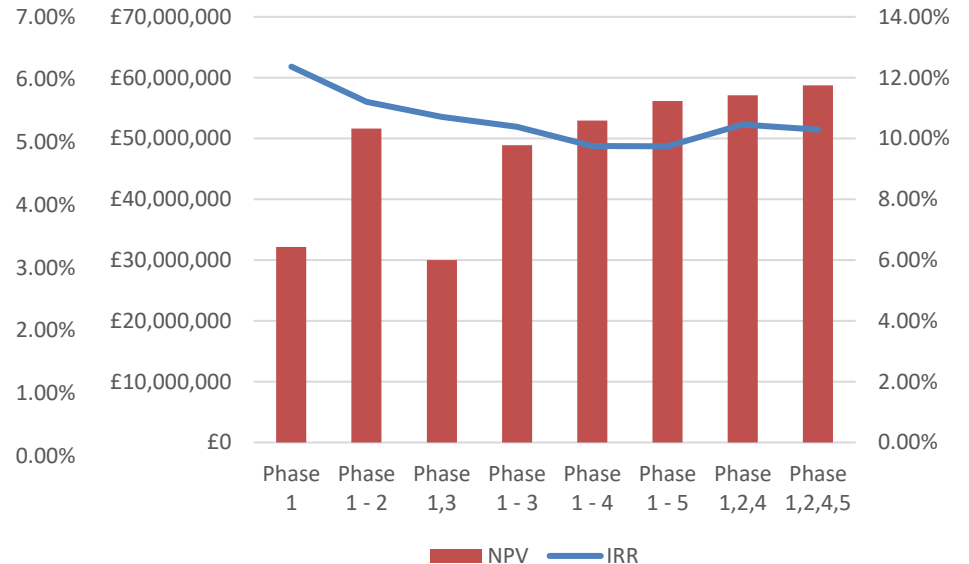
Full Network Commercial Model Results

IRR and NPV over 40 years

Low Demands, Unindexed - Different Phase Options



High Demands, Unindexed - Different Phase Options

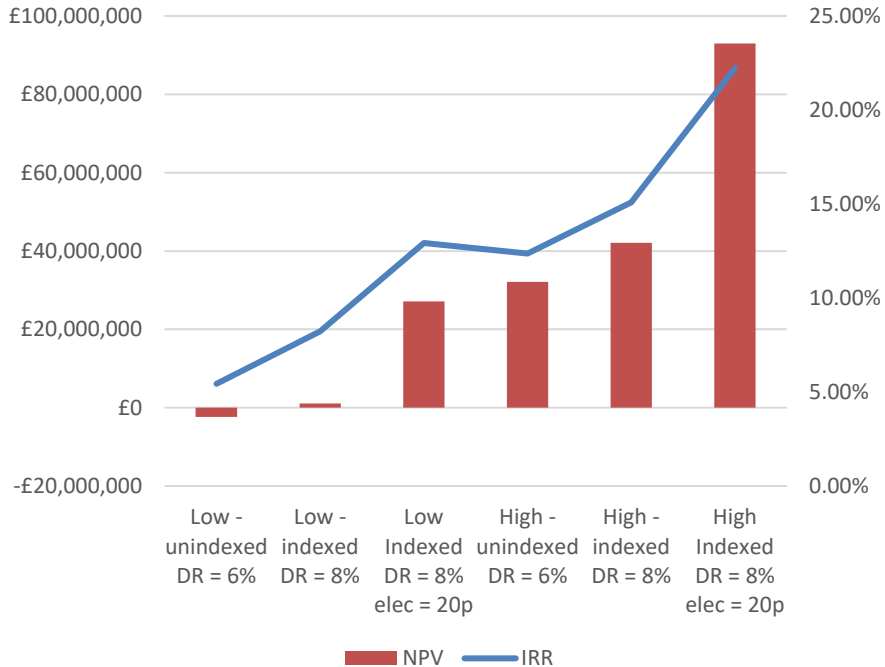




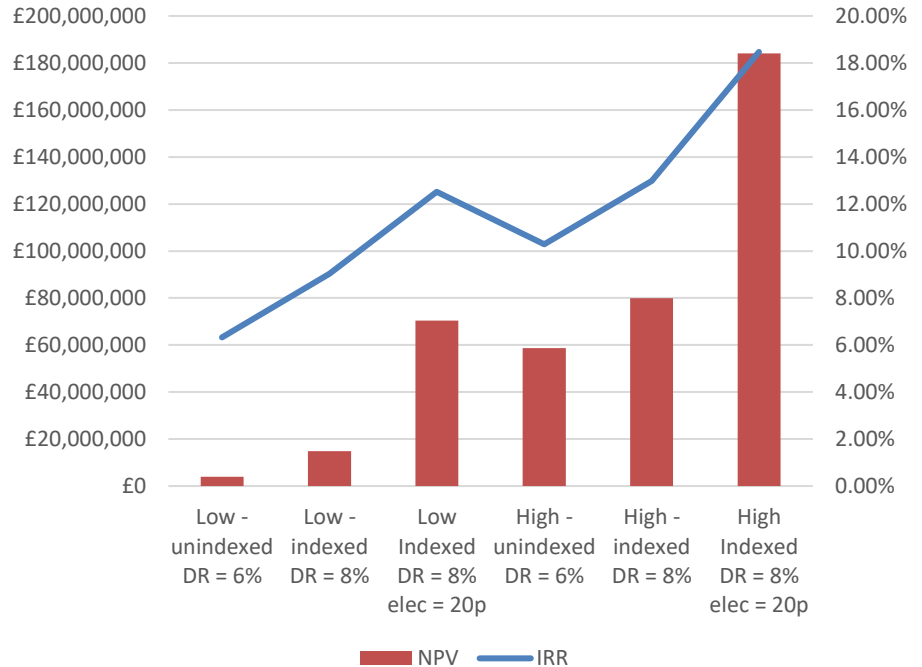
Full Network Commercial Model Results

IRR and NPV over 40 years

Phase 1 Only IRR and NPV



Phase 1,2,4 & 5 IRR and NPV





Possible Funding

- > *Eligible for Green Heat Network Fund*
- > *Based on low demands for Phases 1,2,4 & 5 would be eligible for up to £38.6m of funding.*
- > *Would increase IRR from 5.7% to 9.8% for low demands scenario.*
- > *On high demands scenario IRR would increase from 9.4% to 13.8% with same funding amount.*

> *GHNF Application timelines*

Indicative Full Scheme Rounds	Proposed final submission date for inclusion in Round
Round 1	29 April 2022 (11:59)
Round 2	01 July 2022 (11:59)
Round 3	30 September 2022 (11:59)
Round 4	30 December 2022 (11:59)
Round 5	31 March 2023 (11:59)
Round 6	30 June 2023 (11:59)
Round 7	29 September 2023 (11:59)
Round 8	29 December 2023 (11:59)
Round 9	29 March 2024 (11:59)
Round 10	28 June 2024 (11:59)
Round 11	27 September 2024 (11:59)



Deliverable's summary

- > *Identified variables of EfW total potential heat load and anchor loads*
- > *Developed DHN & DHCN pipework sizes & routes based on a range of potential heat loads*
- > *Secondary Energy Centre back-up system – H2-ready Gas boilers*
- > *Commercial modelling options*
- > *Capital cost of fully phased scheme - £200 Million (Phase 1 - £50 Million)*
- > *Optimum solution - DHN (Phases 1, 2 , 4, 5 & 6) £153 Million*
- > *Best value – 30MW EfW scheme*



Next Steps.....

Developing the scheme from Feasibility to Installation



The Vital Energi Team

A shared vision

One of the largest in-house design teams in the country

Installed some of the UK's first & largest district heating networks

A specialist ESCo team to advise on funding, shareholding, commercial & technical models