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TECHNICAL SUBMITTAL – No20
PV Calculations
Document Ref: 63073-ABE-ZZ-XX-TS-E-0020

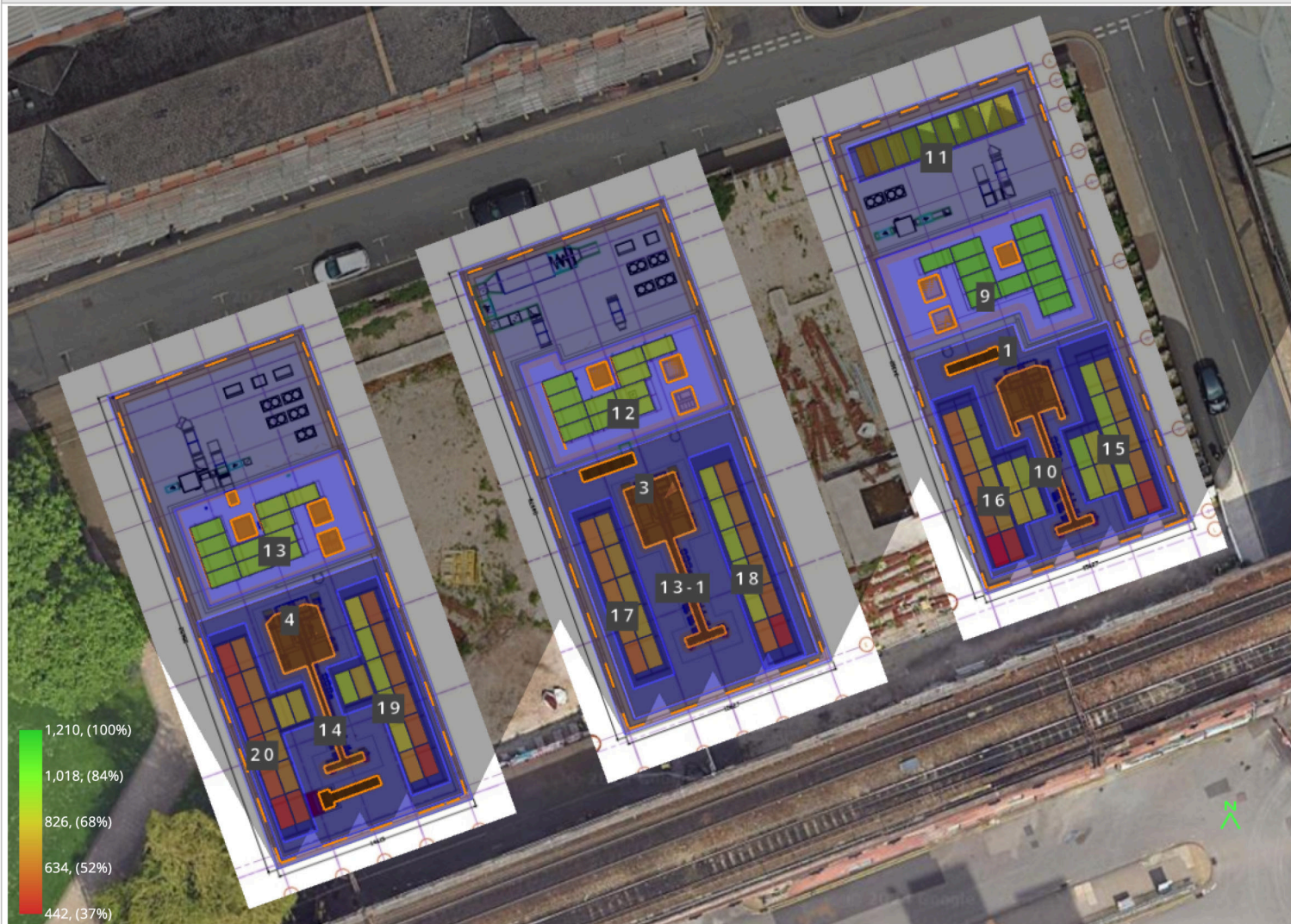
Project:	Echo St		
A&B Contract No:	8889	Date:	30.09.2024
Engineers:	Jordan Thompson		Rev.P01

Proposal:

The following document are the calculations used to base our Proposed PV Array and Spec.

PV Design_(620W Modules) Echo Street, Manchester UK, 53.475968586124814, -2.2323910899542

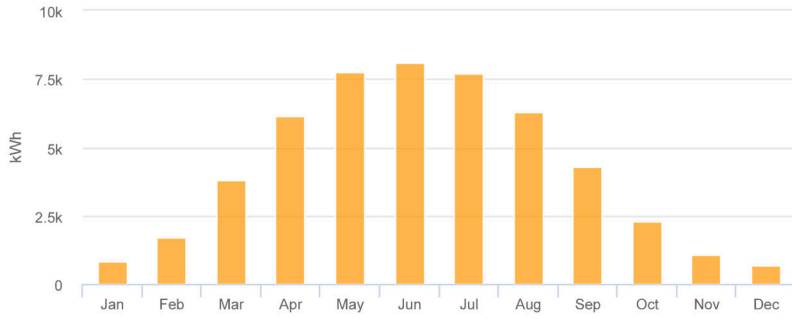
Shading Heatmap



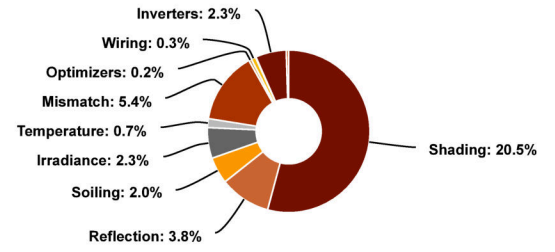
☐☐☐ Shading by Field Segment									
Description	Tilt	Azimuth	Modules	Nameplate	Shaded Irradiance	AC Energy	TOF ²	Solar Access	Avg TSRF ²
13	3.0°	160.2°	11	6.82 kWp	923.5kWh/m²	5.18 MWh ¹	84.4%	90.4%	76.3%
12	3.0°	160.0°	11	6.82 kWp	919.5kWh/m²	5.16 MWh ¹	84.4%	90.0%	76.0%
9	3.0°	160.3°	12	7.44 kWp	1,021.7kWh/m²	6.24 MWh ¹	84.4%	100.0%	84.4%
11	10.0°	160.3°	10	6.20 kWp	841.2kWh/m²	4.32 MWh ¹	89.8%	77.4%	69.5%
15	10.0°	160.4°	14	8.68 kWp	785.8kWh/m²	5.78 MWh ¹	81.3%	79.8%	64.9%
» subarray 1	10.0°	70.4°	7	4.34 kWp	722.1kWh/m²	2.66 MWh ¹	79.0%	75.5%	59.7%
» subarray 2	10.0°	250.4°	7	4.34 kWp	849.5kWh/m²	3.12 MWh ¹	83.7%	83.9%	70.2%
16	10.0°	160.4°	14	8.68 kWp	711.8kWh/m²	5.27 MWh ¹	81.3%	72.3%	58.8%
» subarray 1	10.0°	70.4°	7	4.34 kWp	761.9kWh/m²	2.81 MWh ¹	79.0%	79.7%	63.0%
» subarray 2	10.0°	250.4°	7	4.34 kWp	661.7kWh/m²	2.46 MWh ¹	83.7%	65.3%	54.7%
17	10.0°	160.1°	10	6.20 kWp	705.5kWh/m²	3.73 MWh ¹	81.3%	71.7%	58.3%
» subarray 1	10.0°	70.1°	5	3.10 kWp	741.2kWh/m²	1.95 MWh ¹	79.0%	77.6%	61.2%
» subarray 2	10.0°	250.1°	5	3.10 kWp	669.7kWh/m²	1.78 MWh ¹	83.7%	66.1%	55.3%
18	10.0°	160.1°	12	7.44 kWp	741.7kWh/m²	4.69 MWh ¹	81.3%	75.3%	61.3%
» subarray 1	10.0°	70.1°	6	3.72 kWp	656.5kWh/m²	2.08 MWh ¹	79.0%	68.7%	54.2%
» subarray 2	10.0°	250.1°	6	3.72 kWp	826.9kWh/m²	2.60 MWh ¹	83.7%	81.6%	68.3%
19	10.0°	160.1°	14	8.68 kWp	741.1kWh/m²	5.47 MWh ¹	81.3%	75.3%	61.2%
» subarray 1	10.0°	70.1°	7	4.34 kWp	655.0kWh/m²	2.43 MWh ¹	79.0%	68.5%	54.1%
» subarray 2	10.0°	250.1°	7	4.34 kWp	827.3kWh/m²	3.04 MWh ¹	83.7%	81.6%	68.4%
20	10.0°	160.1°	14	8.68 kWp	651.4kWh/m²	4.84 MWh ¹	81.3%	66.2%	53.8%
» subarray 1	10.0°	70.1°	7	4.34 kWp	690.2kWh/m²	2.55 MWh ¹	79.0%	72.2%	57.0%
» subarray 2	10.0°	250.1°	7	4.34 kWp	612.6kWh/m²	2.28 MWh ¹	83.7%	60.4%	50.6%
Totals, weighted by kWp			122	75.6 kWp	798.1kWh/m²	50.7 MWh	82.9%	79.5%	65.9%
¹ approximate, varies based on inverter performance									
² based on location Optimal POA Irradiance of 1,210.3kWh/m² at 41.0° tilt and 182.3° azimuth									

☐☐☐ Solar Access by Month												
Description	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
13	95%	95%	94%	89%	90%	90%	88%	89%	91%	94%	96%	95%
12	95%	95%	94%	88%	89%	89%	87%	88%	91%	94%	96%	95%
9	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
11	41%	51%	75%	84%	86%	86%	86%	84%	78%	56%	39%	40%
15	62%	74%	79%	82%	83%	84%	82%	82%	78%	72%	60%	59%
16	57%	64%	66%	74%	74%	79%	78%	76%	66%	63%	54%	58%
17	55%	65%	64%	74%	73%	75%	76%	77%	69%	67%	55%	55%
18	62%	72%	75%	77%	79%	79%	76%	76%	74%	70%	62%	59%
19	61%	71%	74%	77%	78%	78%	77%	76%	75%	70%	62%	57%
20	54%	62%	62%	67%	66%	70%	71%	69%	64%	62%	52%	54%
AC Power (kWh)	840.0	1,683.2	3,802.3	6,128.5	7,768.0	8,085.9	7,703.1	6,312.2	4,287.7	2,314.9	1,070.1	673.8

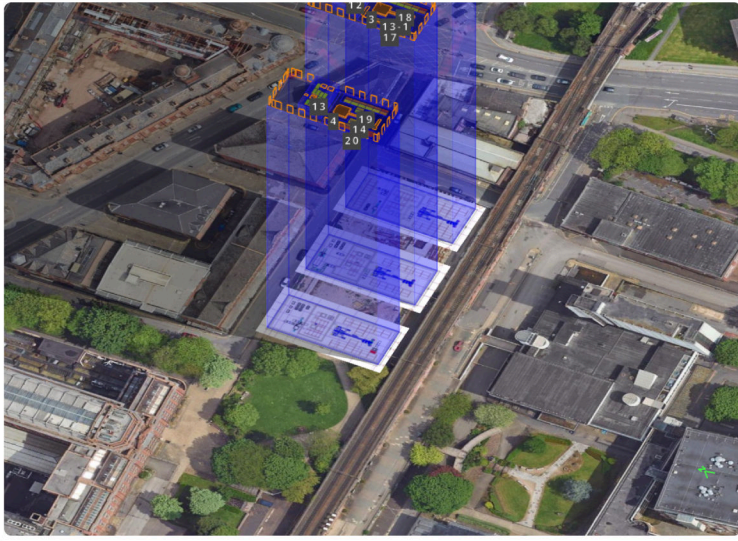
Monthly Production



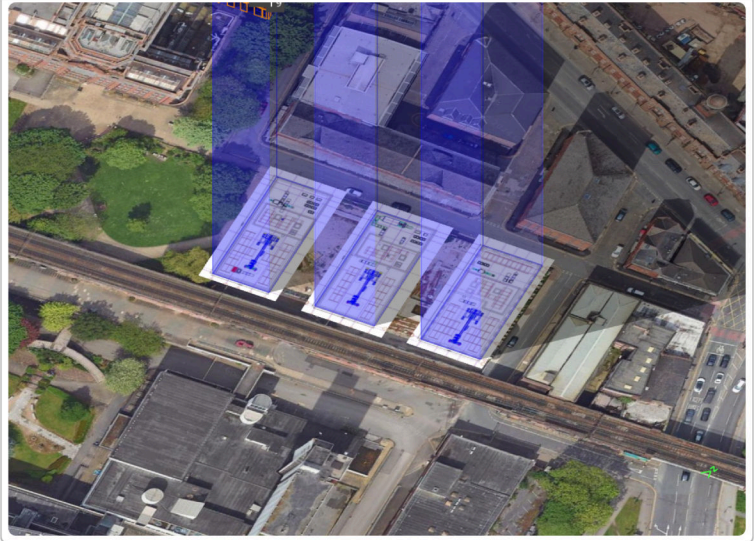
Sources of System Loss



Southwestern Angle



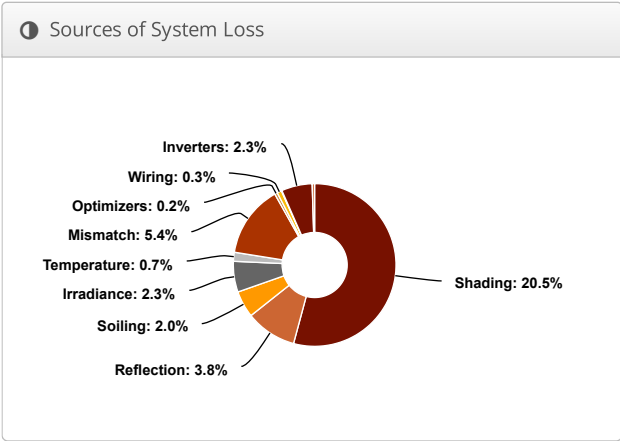
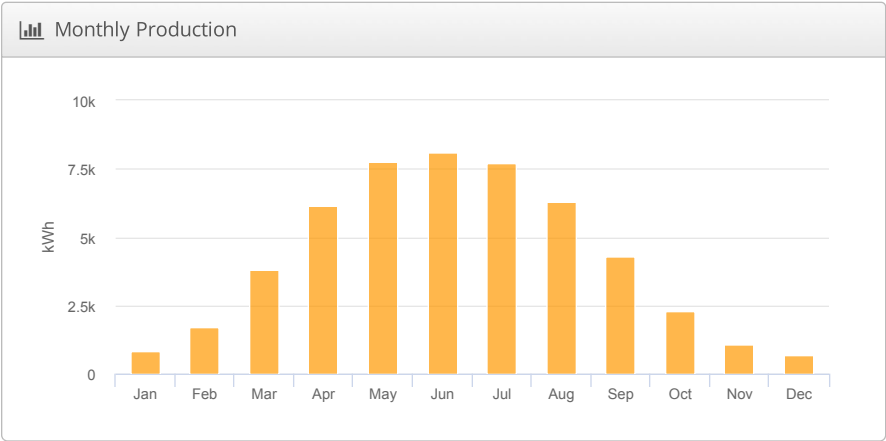
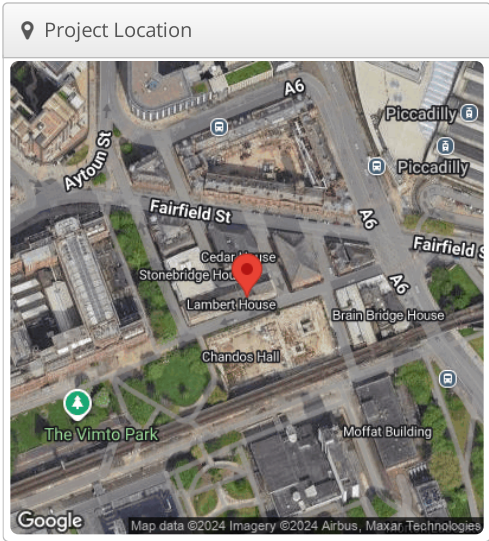
Southeastern Angle



PV Design_(620W Modules) Echo Street, Manchester UK, 53.475968586124814, -2.2323910899542

Report	
Project Name	Echo Street, Manchester UK
Project Address	53.475968586124814, -2.2323910899542
Prepared By	Madusha Dedigamuwa damadusha88@gmail.com

System Metrics	
Design	PV Design_(620W Modules)
Module DC Nameplate	75.6 kW
Inverter AC Nameplate	65.0 kW Load Ratio: 1.16
Annual Production	50.67 MWh
Performance Ratio	66.8%
kWh/kWp	669.9
Weather Dataset	TMY, 10km Grid, Meteonorm 8 (meteonorm_v8)
Simulator Version	5a0ebe3952-7f741f8794-c029a9020c-bb7a0988c2



⚡ Annual Production			
	Description	Output	% Delta
Irradiance (kWh/m²)	Annual Global Horizontal Irradiance	990.2	
	POA Irradiance	1,003.3	1.3%
	Shaded Irradiance	798.1	-20.5%
	Irradiance after Reflection	767.5	-3.8%
	Irradiance after Soiling	752.2	-2.0%
	Total Collector Irradiance	752.4	0.0%
Energy (kWh)	Nameplate	56,945.0	
	Output at Irradiance Levels	55,629.3	-2.3%
	Output at Cell Temperature Derate	55,255.1	-0.7%
	Output After Mismatch	52,264.2	-5.4%
	Optimizer Output	52,159.7	-0.2%
	Optimal DC Output	51,982.5	-0.3%
	Constrained DC Output	51,959.8	0.0%
	Inverter Output	50,762.7	-2.3%
	Energy to Grid	50,669.7	-0.2%
Temperature Metrics			
Avg. Operating Ambient Temp		12.2 °C	
Avg. Operating Cell Temp		17.5 °C	
Simulation Metrics			
Operating Hours		4626	
Solved Hours		4626	

☁ Condition Set												
Description	Condition Set 1											
Weather Dataset	TMY, 10km Grid, Meteonorm 8 (meteonorm_v8)											
Solar Angle Location	Meteo Lat/Lng											
Transposition Model	Perez Model											
Temperature Model	Diffusion Model											
Temperature Model Parameters	Rack Type				U _{const}			U _{wind}				
	Fixed Tilt				29			0				
	Flush Mount				15			0				
	East-West				29			0				
	Carport				29			0				
Soiling (%)	J	F	M	A	M	J	J	A	S	O	N	D
	2	2	2	2	2	2	2	2	2	2	2	2
Irradiation Variance	5%											
Cell Temperature Spread	4° C											
Module Binning Range	-2.5% to 2.5%											
AC System Derate	1.50%											
Module Characterizations	Module				Uploaded By			Characterization				
	AIKO-A620-MAH72Mw (Aiko)				HelioScope			Spec Sheet Characterization, PAN				
Component Characterizations	Device				Uploaded By			Characterization				
	Solis-25K (Ginlong Technologies)				HelioScope			Manufacturer				
	Solis-20K (Ginlong Technologies)				HelioScope			Default Characterization				
	TS4-A-O (Tigo Energy)				HelioScope			Spec Sheet				

📦 Components		
Component	Name	Count
Inverters	Solis-25K (Ginlong Technologies)	1 (25.0 kW)
Inverters	Solis-20K (Ginlong Technologies)	2 (40.0 kW)
AC Home Runs	16 mm2 (Copper)	3 (408.2 m)
Strings	6 mm2 (Copper)	8 (311.3 m)
Optimizers	TS4-A-O (Tigo Energy)	122 (85.4 kW)
Module	Aiko, AIKO-A620-MAH72Mw (620W)	122 (75.6 kW)

👤 Wiring Zones			
Description	Combiner Poles	String Size	Stringing Strategy
Block A	-	5-17	Along Racking
Block C	-	5-17	Along Racking
Block B	-	5-17	Along Racking

🏠 Field Segments									
Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
1	East-West	Landscape (Horizontal)	10°	160.25005°	0.6 m	1x1			0
3	East-West	Landscape (Horizontal)	10°	159.73686°	0.2 m	1x1			0
4	East-West	Landscape (Horizontal)	10°	159.73686°	0.2 m	1x1			0
13	Flush Mount	Landscape (Horizontal)	3°	160.15782°	0.0 m	1x1	11	11	6.82 kW
14	Fixed Tilt	Landscape (Horizontal)	Module: 10°	Module: 160.12543°	0.3 m	1x1			0
12	Flush Mount	Landscape (Horizontal)	3°	160.03°	0.0 m	1x1	11	11	6.82 kW
13-1	Fixed Tilt	Landscape (Horizontal)	Module: 10°	Module: 160.05025°	0.3 m	1x1			0
9	Flush Mount	Landscape (Horizontal)	3°	160.25679°	0.0 m	1x1	12	12	7.44 kW
10	East-West	Landscape (Horizontal)	10°	160.22353°	0.2 m	1x1			0
11	Flush Mount	Portrait (Vertical)	10°	160.27357°	0.0 m	1x1	10	10	6.20 kW
15	East-West	Landscape (Horizontal)	10°	160.41768°	0.2 m	1x1	7	14	8.68 kW
16	East-West	Landscape (Horizontal)	10°	160.41768°	0.2 m	1x1	7	14	8.68 kW
17	East-West	Landscape (Horizontal)	10°	160.12535°	0.2 m	1x1	5	10	6.20 kW
18	East-West	Landscape (Horizontal)	10°	160.12535°	0.2 m	1x1	6	12	7.44 kW
19	East-West	Landscape (Horizontal)	10°	160.12535°	0.2 m	1x1	7	14	8.68 kW
20	East-West	Landscape (Horizontal)	10°	160.12535°	0.2 m	1x1	7	14	8.68 kW

Detailed Layout

