# Appendix G: Sensitivity analysis

**Table 17: Financial summary sensitivity analysis – base case**

| Base qualifications<br>$2/W<br>$2,000 p.a. for land costs<br>10-year loan duration | | 100kW | 1MW | 5MW |
|---|---|---|---|---|
| | Output (MWh) | 175.8 | 1752 | 8410 |
| | Capital Cost | $139,926 | $1,750,000 | $8,750,000 |
| | NPV (25yrs) | -$122,462 | $267,974 | $790,106 |
| | IRR (25yrs) | 2% | 14% | 13% |
| | Payback (years) | 23 | 13 | 13 |

Table 18 shows the impact of varying the $/W price between $1.5/W and $2/W. The lower $/W positively impacts the financial outcome for all solar farm cases.

**Table 18: Financial summary sensitivity analysis – CAPEX price $/W**

| Power price | | 100kW | 1MW | 5MW |
|---|---|---|---|---|
| **$1.5/W** | Capital Cost | $115,000 | $1,500,000 | $7,500,000 |
| | NPV (25yrs) | $75,000 | $740,000 | $3,140,000 |
| | IRR (25yrs) | 5% | 19% | 18% |
| | Payback (years) | 19 | 11 | 11 |
| **$2/W** | Capital Cost | $165,000 | $2,000,000 | $10,000,000 |
| | NPV (25yrs) | -$170,000 | -$200,000 | -$1,550,000 |
| | IRR (25yrs) | 0% | 11% | 10% |
| | Payback (years) | 26 | 14 | 15 |

Table 19 shows the impact of increasing the annual land price. The lower land costs positively impact the NPV and IRR.

**Table 19: Financial summary sensitivity analysis – land price**

| Land price | | 100kW | 1MW | 5MW |
|---|---|---|---|---|
| **$1000 p.a.** | Capital Cost | $140,000 | $1,750,000 | $8,750,000 |
| | NPV (25yrs) | -$100,000 | $290,000 | $800,000 |
| | IRR (25yrs) | 4% | 14% | 13% |
| | Payback (years) | 20 | 13 | 13 |
| **$5000 p.a.** | Capital Cost | $140,000 | $1,750,000 | $8,750,000 |
| | NPV (25yrs) | -$190,000 | $200,000 | $725,000 |
| | IRR (25yrs) | -5% | 14% | 13% |
| | Payback (years) | 39 | 13 | 13 |

Table 20 shows the impact of the loan duration on the payback period. A shorter loan duration reduces the payback years.

**Table 20: Financial summary sensitivity analysis – loan duration**

| Loan duration | | 100kW | 1MW | 5MW |
|---|---|---|---|---|
| **5 years** | Capital Cost | $140,000 | $1,750,000 | $8,750,000 |
| | NPV (25yrs) | -$120,000 | $275,000 | $820,000 |
| | IRR (25yrs) | 3% | 11% | 11% |
| | Payback (years) | 21 | 11 | 12 |
| **15 years** | Capital Cost | $140,000 | $1,750,000 | $8,750,000 |
| | NPV (25yrs) | -$120,000 | $260,000 | $770,000 |
| | IRR (25yrs) | 1% | 20% | 18% |
| | Payback (years) | 25 | 13 | 14 |

# Appendix H: Helioscope modelling

# 100kW - 100 Gap Rd (copy) Phillip Island, gap rd phillip island vic

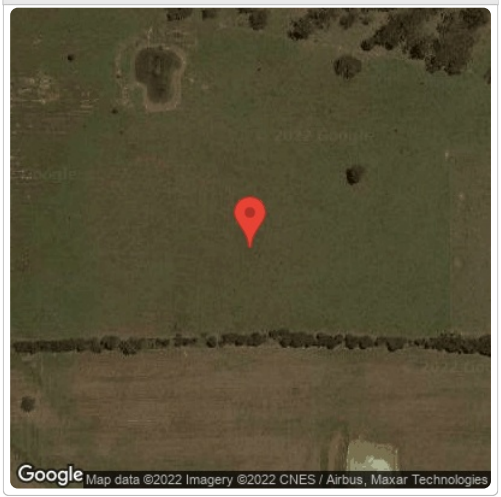
## Report

| | |
|---|---|
| Project Name | Phillip Island |
| Project Address | gap rd phillip island vic |
| Prepared By | Middleton Group<br>roger.brown@middletongroup.com.au |

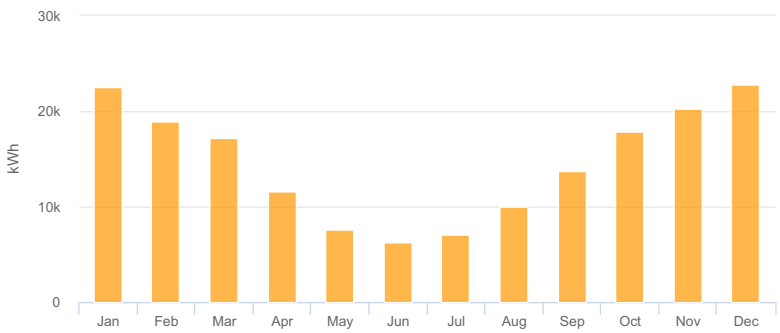
## System Metrics

| | |
|---|---|
| Design | 100kW - 100 Gap Rd (copy) |
| Module DC Nameplate | 98.4 kW |
| Inverter AC Nameplate | 100.0 kW<br>Load Ratio: 0.98 |
| Annual Production | 175.8 MWh |
| Performance Ratio | 85.4% |
| kWh/kWp | 1,786.9 |
| Weather Dataset | TMY, 10km Grid, meteonorm (meteonorm) |
| Simulator Version | 26c513b886-2f17bc8804-b418a4e336-5b608c73c1 |

## Project Location

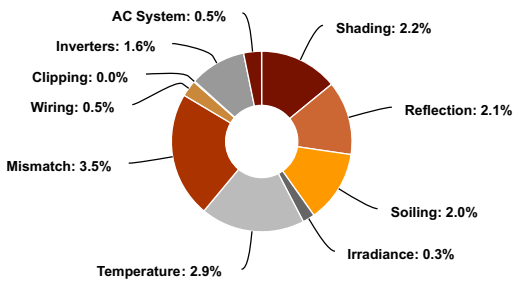



## Monthly Production




| Month | GHI (kWh/m²) | POA (kWh/m²) | Shaded (kWh/m²) | Nameplate (kWh) | Grid (kWh) |
|---|---|---|---|---|---|
| January | 205.2 | 272.9 | 266.5 | 25,318.0 | 22,529.6 |
| February | 168.3 | 226.2 | 221.8 | 21,014.0 | 18,871.0 |
| March | 150.8 | 205.4 | 200.8 | 18,989.5 | 17,181.6 |
| April | 100.2 | 137.9 | 134.8 | 12,665.3 | 11,662.1 |
| May | 65.8 | 90.4 | 88.1 | 8,208.7 | 7,630.6 |
| June | 53.1 | 73.9 | 72.3 | 6,696.3 | 6,286.2 |
| July | 59.6 | 82.5 | 80.8 | 7,500.9 | 7,053.3 |
| August | 84.2 | 116.9 | 114.0 | 10,704.1 | 9,982.5 |
| September | 114.4 | 160.7 | 157.2 | 14,847.7 | 13,723.4 |
| October | 157.3 | 210.4 | 205.5 | 19,471.9 | 17,843.6 |
| November | 182.8 | 241.7 | 236.9 | 22,458.6 | 20,307.7 |
| December | 209.0 | 272.5 | 266.8 | 25,307.4 | 22,759.1 |

## Sources of System Loss



## Annual Production

| | Description | Output | % Delta |
|---|---|---|---|
| Irradiance (kWh/m²) | Annual Global Horizontal Irradiance | 1,550.8 | |
| | POA Irradiance | 2,091.3 | 34.9% |
| | Shaded Irradiance | 2,045.5 | -2.2% |
| | Irradiance after Reflection | 2,003.5 | -2.1% |
| | Irradiance after Soiling | 1,963.4 | -2.0% |
| | **Total Collector Irradiance** | **1,963.4** | **0.0%** |
| Energy (kWh) | Nameplate | 193,182.5 | |
| | Output at Irradiance Levels | 192,527.5 | -0.3% |
| | Output at Cell Temperature Derate | 186,941.0 | -2.9% |
| | Output After Mismatch | 180,408.5 | -3.5% |
| | Optimal DC Output | 179,583.7 | -0.5% |
| | Constrained DC Output | 179,536.1 | 0.0% |
| | Inverter Output | 176,714.3 | -1.6% |
| | **Energy to Grid** | **175,830.8** | **-0.5%** |
| Temperature Metrics | | | |
| | Avg. Operating Ambient Temp | | 16.3 °C |
| | Avg. Operating Cell Temp | | 26.5 °C |
| Simulation Metrics | | | |
| | Operating Hours | | 4565 |
| | Solved Hours | | 4565 |

## Condition Set

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Description | Condition Set 1 | | | | | | | | | | | |
| Weather Dataset | TMY, 10km Grid, meteonorm (meteonorm) | | | | | | | | | | | |
| Solar Angle Location | Meteo Lat/Lng | | | | | | | | | | | |
| Transposition Model | Perez Model | | | | | | | | | | | |
| Temperature Model | Sandia Model | | | | | | | | | | | |
| Temperature Model Parameters | Rack Type | a | b | Temperature Delta | | | | | | | | |
| | Fixed Tilt | -3.56 | -0.075 | 3°C | | | | | | | | |
| | Flush Mount | -2.81 | -0.0455 | 0°C | | | | | | | | |
| 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 | 0.50% | | | | | | | | | | | |
| Trackers | Maximum Angle | Backtracking | | | | | | | | | | |
| | 60° | Enabled | | | | | | | | | | |
| Module Characterizations | Module | Uploaded By | Characterization | | | | | | | | | |
| | TSM-DE20-600W (Trina Solar) | HelioScope | Spec Sheet Characterization, PAN | | | | | | | | | |
| Component Characterizations | Device | Uploaded By | Characterization | | | | | | | | | |

## Components

| Component | Name | Count |
|---|---|---|
| Inverters | SG50CX (2021) (Sungrow) | 2 (100.0 kW) |
| Strings | 10 AWG (Copper) | 8 (281.2 m) |
| Module | Trina Solar, TSM-DE20-600W (600W) | 164 (98.4 kW) |

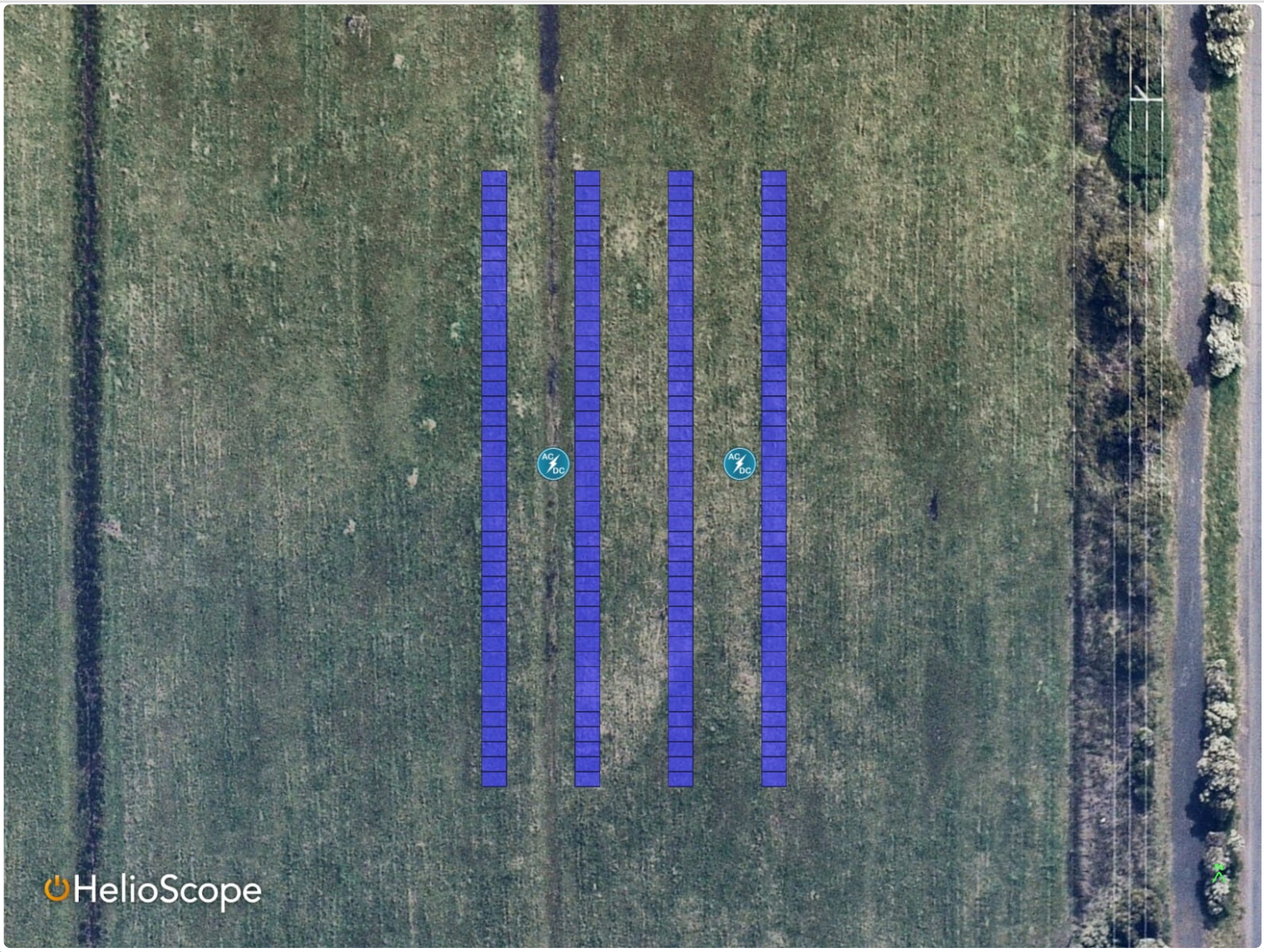
## Wiring Zones

| Description | Combiner Poles | String Size | Stringing Strategy |
|---|---|---|---|
| Wiring Zone | - | 6-22 | Along Racking |

## Field Segments

| Description | Racking | Orientation | Tilt | Azimuth | Intrarow Spacing | Frame Size | Frames | Modules | Power |
|---|---|---|---|---|---|---|---|---|---|
| Field Segment 1 | Single-axis Trackers (N/S) | Portrait (Vertical) | 15° | 0° | 6.0 m | 1x1 | 164 | 164 | 98.4 kW |

Detailed Layout



# 1MW - 100 Gap Rd Phillip Island, gap rd phillip island vic

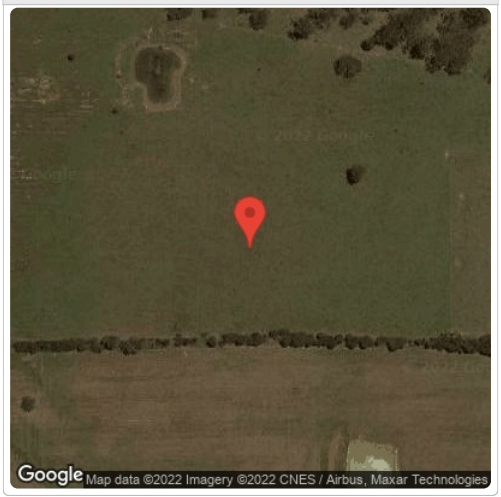
## Report

| | |
|---|---|
| Project Name | Phillip Island |
| Project Address | gap rd phillip island vic |
| Prepared By | Middleton Group<br>roger.brown@middletongroup.com.au |

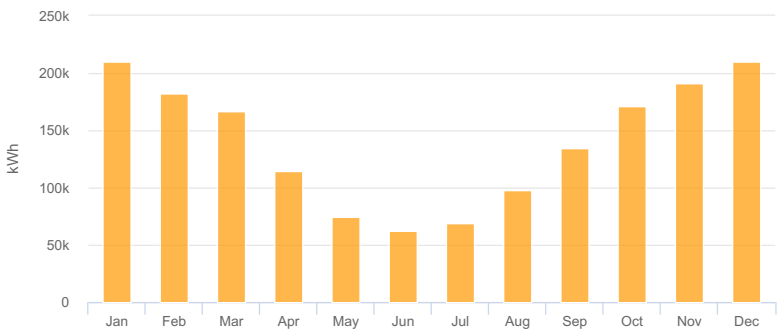
## System Metrics

| | |
|---|---|
| Design | 1MW - 100 Gap Rd |
| Module DC Nameplate | 982.8 kW |
| Inverter AC Nameplate | 750.0 kW<br>Load Ratio: 1.31 |
| Annual Production | 1.684 GWh |
| Performance Ratio | 81.9% |
| kWh/kWp | 1,713.7 |
| Weather Dataset | TMY, 10km Grid, meteonorm (meteonorm) |
| Simulator Version | 26c513b886-2f17bc8804-b418a4e336-5b608c73c1 |

## Project Location

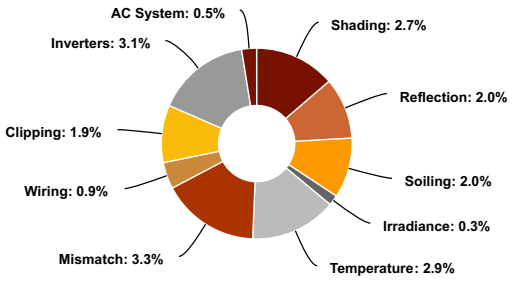



## Monthly Production




| Month | GHI (kWh/m²) | POA (kWh/m²) | Shaded (kWh/m²) | Nameplate (kWh) | Grid (kWh) |
|---|---|---|---|---|---|
| January | 205.2 | 272.9 | 265.0 | 251,472.0 | 209,454.4 |
| February | 168.3 | 226.2 | 220.8 | 208,973.5 | 182,312.0 |
| March | 150.8 | 205.4 | 199.7 | 188,667.6 | 166,954.7 |
| April | 100.2 | 137.9 | 134.1 | 125,828.5 | 114,262.4 |
| May | 65.8 | 90.4 | 87.5 | 81,495.6 | 74,936.3 |
| June | 53.1 | 73.9 | 71.9 | 66,549.5 | 61,808.5 |
| July | 59.6 | 82.5 | 80.4 | 74,567.1 | 69,380.3 |
| August | 84.2 | 116.9 | 113.3 | 106,254.1 | 97,777.3 |
| September | 114.4 | 160.7 | 156.4 | 147,528.3 | 133,995.0 |
| October | 157.3 | 210.4 | 204.4 | 193,418.7 | 171,434.5 |
| November | 182.8 | 241.7 | 235.8 | 223,318.1 | 191,531.8 |
| December | 209.0 | 272.5 | 265.5 | 251,625.1 | 210,352.1 |

## Sources of System Loss



## Annual Production

| | Description | Output | % Delta |
|---|---|---|---|
| Irradiance (kWh/m²) | Annual Global Horizontal Irradiance | 1,550.8 | |
| | POA Irradiance | 2,091.3 | 34.9% |
| | Shaded Irradiance | 2,034.9 | -2.7% |
| | Irradiance after Reflection | 1,993.4 | -2.0% |
| | Irradiance after Soiling | 1,953.5 | -2.0% |
| | **Total Collector Irradiance** | **1,953.5** | **0.0%** |
| Energy (kWh) | Nameplate | 1,919,698.0 | |
| | Output at Irradiance Levels | 1,913,101.1 | -0.3% |
| | Output at Cell Temperature Derate | 1,857,942.5 | -2.9% |
| | Output After Mismatch | 1,797,375.6 | -3.3% |
| | Optimal DC Output | 1,781,421.8 | -0.9% |
| | Constrained DC Output | 1,747,339.8 | -1.9% |
| | Inverter Output | 1,692,662.6 | -3.1% |
| | **Energy to Grid** | **1,684,199.3** | **-0.5%** |
| Temperature Metrics | | | |
| | Avg. Operating Ambient Temp | | 16.3 °C |
| | Avg. Operating Cell Temp | | 26.4 °C |
| Simulation Metrics | | | |
| | Operating Hours | | 4565 |
| | Solved Hours | | 4565 |

## Condition Set

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Description | Condition Set 1 | | | | | | | | | | | |
| Weather Dataset | TMY, 10km Grid, meteonorm (meteonorm) | | | | | | | | | | | |
| Solar Angle Location | Meteo Lat/Lng | | | | | | | | | | | |
| Transposition Model | Perez Model | | | | | | | | | | | |
| Temperature Model | Sandia Model | | | | | | | | | | | |
| Temperature Model Parameters | Rack Type | a | b | Temperature Delta | | | | | | | | |
| | Fixed Tilt | -3.56 | -0.075 | 3°C | | | | | | | | |
| | Flush Mount | -2.81 | -0.0455 | 0°C | | | | | | | | |
| 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 | 0.50% | | | | | | | | | | | |
| Trackers | Maximum Angle | Backtracking | | | | | | | | | | |
| | 60° | Enabled | | | | | | | | | | |
| Module Characterizations | Module | Uploaded By | Characterization | | | | | | | | | |
| | TSM-DE20-600W (Trina Solar) | HelioScope | Spec Sheet Characterization, PAN | | | | | | | | | |
| Component Characterizations | Device | Uploaded By | Characterization | | | | | | | | | |

## Components

| Component | Name | Count |
|---|---|---|
| Inverters | SG250KU (Sungrow) | 3 (750.0 kW) |
| Strings | 10 AWG (Copper) | 126 (9,995.7 m) |
| Module | Trina Solar, TSM-DE20-600W (600W) | 1,638 (982.8 kW) |

## Wiring Zones

| Description | Combiner Poles | String Size | Stringing Strategy |
|---|---|---|---|
| Wiring Zone | - | 10-13 | Along Racking |

## Field Segments

| Description | Racking | Orientation | Tilt | Azimuth | Intrarow Spacing | Frame Size | Frames | Modules | Power |
|---|---|---|---|---|---|---|---|---|---|
| Field Segment 1 | Single-axis Trackers (N/S) | Portrait (Vertical) | 15° | 0° | 6.0 m | 1x1 | 1,638 | 1,638 | 982.8 kW |

## Detailed Layout

# 5MW - 100 Gap Rd (single) Phillip Island, gap rd phillip island vic

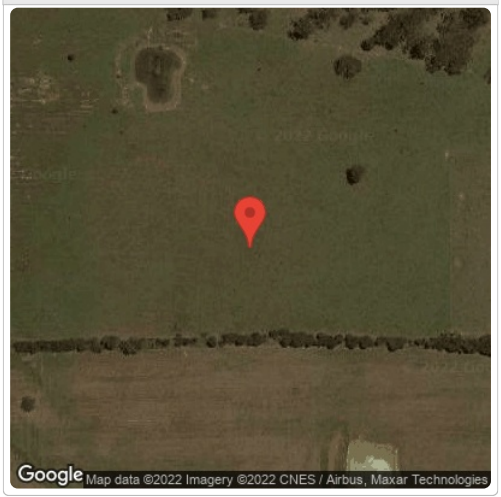
## Report

| | |
|---|---|
| Project Name | Phillip Island |
| Project Address | gap rd phillip island vic |
| Prepared By | Middleton Group<br>roger.brown@middletongroup.com.au |

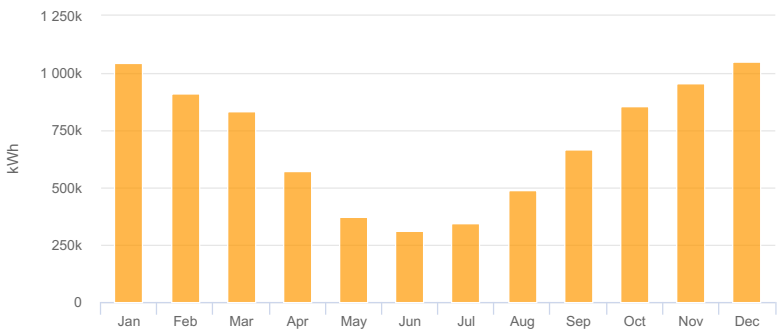
## System Metrics

| | |
|---|---|
| Design | 5MW - 100 Gap Rd (single) |
| Module DC Nameplate | 4.96 MW |
| Inverter AC Nameplate | 3.75 MW<br>Load Ratio: 1.32 |
| Annual Production | 8.408 GWh |
| Performance Ratio | 81.0% |
| kWh/kWp | 1,694.9 |
| Weather Dataset | TMY, 10km Grid, meteonorm (meteonorm) |
| Simulator Version | 26c513b886-2f17bc8804-b418a4e336-5b608c73c1 |

## Project Location




## Monthly Production




| Month | GHI (kWh/m²) | POA (kWh/m²) | Shaded (kWh/m²) | Nameplate (kWh) | Grid (kWh) |
|---|---|---|---|---|---|
| January | 205.2 | 272.9 | 264.8 | 1,268,430.1 | 1,046,331.9 |
| February | 168.3 | 226.2 | 220.7 | 1,053,997.4 | 909,963.5 |
| March | 150.8 | 205.4 | 199.4 | 950,970.2 | 832,832.7 |
| April | 100.2 | 137.9 | 134.0 | 634,469.0 | 570,707.5 |
| May | 65.8 | 90.4 | 87.4 | 410,607.0 | 374,191.0 |
| June | 53.1 | 73.9 | 71.8 | 335,439.4 | 308,718.9 |
| July | 59.6 | 82.5 | 80.3 | 376,169.2 | 346,840.4 |
| August | 84.2 | 116.9 | 113.2 | 535,614.6 | 488,082.3 |
| September | 114.4 | 160.7 | 156.2 | 744,010.6 | 668,382.7 |
| October | 157.3 | 210.4 | 204.1 | 975,072.8 | 855,277.2 |
| November | 182.8 | 241.7 | 235.6 | 1,126,318.4 | 956,121.3 |
| December | 209.0 | 272.5 | 265.3 | 1,268,881.6 | 1,050,776.6 |

## Sources of System Loss