**SUPPLEMENTARY MATERIAL 2**

**TABLE A: Performance comparison of PV-REF and PV-CPC**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | PV-REF | | | | | PV-CPC | | | | |
| Time (h) | Module temperature, T (℃) | Open-circuit voltage, (V) | Short-circuit current, (A) | Module power, P (W) | Energy density, ED (W/m2) | Module temperature, T (℃) | Open-circuit voltage, (V) | Short-circuit current, (A) | Module power, P (W) | Energy density, ED (W/m2) |
| 10.00 | 56.01 | 19.88 | 0.85 | 11.13 | 90.61 | 46.34 | 20.69 | 0.88 | 13.14 | 106.95 |
| 10.33 | 58.82 | 19.76 | 0.91 | 11.73 | 95.49 | 51.84 | 20.47 | 0.97 | 14.22 | 115.72 |
| 10.66 | 61.11 | 19.62 | 0.94 | 12.10 | 98.52 | 53.91 | 20.34 | 1.02 | 15.12 | 123.04 |
| 11.00 | 63.83 | 19.46 | 0.99 | 12.56 | 102.26 | 55.34 | 20.17 | 1.05 | 15.64 | 127.34 |
| 11.33 | 64.71 | 19.47 | 1.01 | 12.60 | 102.56 | 55.31 | 20.17 | 1.07 | 15.71 | 127.88 |
| 11.66 | 65.60 | 19.40 | 1.04 | 13.02 | 105.95 | 54.34 | 20.26 | 1.12 | 16.42 | 133.63 |
| 12.00 | 65.34 | 19.41 | 1.04 | 13.07 | 106.35 | 54.89 | 20.26 | 1.13 | 16.47 | 134.08 |
| 12.33 | 63.38 | 19.58 | 1.04 | 13.17 | 107.21 | 53.51 | 20.40 | 1.10 | 15.66 | 127.47 |
| 12.66 | 62.67 | 19.60 | 1.01 | 12.91 | 105.09 | 53.04 | 20.45 | 1.06 | 15.01 | 122.19 |
| 13.00 | 62.34 | 19.71 | 1.08 | 13.82 | 112.53 | 52.83 | 20.39 | 1.10 | 16.11 | 131.09 |
| 13.33 | 62.20 | 19.69 | 1.07 | 13.74 | 111.86 | 54.39 | 20.35 | 1.10 | 16.29 | 132.59 |
| 13.66 | 63.12 | 19.62 | 1.07 | 13.61 | 110.79 | 53.45 | 20.36 | 1.10 | 16.09 | 131.01 |
| 14.00 | 63.31 | 19.58 | 1.05 | 13.30 | 108.29 | 52.30 | 20.33 | 1.08 | 15.72 | 127.94 |
| 14.33 | 61.36 | 19.71 | 1.00 | 12.80 | 104.19 | 51.12 | 20.41 | 1.03 | 14.96 | 121.80 |
| 14.66 | 59.25 | 19.73 | 0.93 | 11.83 | 96.27 | 50.61 | 20.41 | 0.95 | 13.58 | 110.57 |
| 15.00 | 57.77 | 19.70 | 0.86 | 11.30 | 91.99 | 48.31 | 20.46 | 0.88 | 12.79 | 104.09 |

**Table B: Performance comparison of PV-REF and PV-FNL**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | PV-REF | | | PV-FNL | | | | | | | | |
| Time (h) | Module temperature, T (℃) | Module power, P (W) | Module efficiency, (%) | Module temperature, T (℃) | Module power, P (W) | PV thermal power, (W) | Receiver thermal power, (W) | Module efficiency, (%) | System efficiency, (%) | Water temperature | | |
| PV-IN (℃) | PV-OUT (℃) | REC-OUT (℃) |
| 9.00 | 47.53 | 11.44 | 12.45 | 41.47 | 18.28 | 88.85 | 110.04 | 19.89 | 7.72 | 34.95 | 42.85 | 45.65 |
| 9.33 | 50.72 | 11.71 | 12.46 | 44.17 | 18.65 | 84.64 | 118.13 | 19.84 | 7.82 | 35.15 | 42.67 | 46.26 |
| 9.66 | 52.89 | 12.19 | 12.47 | 45.79 | 19.41 | 86.74 | 139.42 | 19.85 | 8.62 | 35.43 | 43.14 | 48.35 |
| 10.00 | 53.68 | 12.73 | 12.53 | 45.32 | 19.75 | 82.13 | 146.18 | 19.44 | 7.39 | 35.95 | 43.26 | 47.25 |
| 10.33 | 53.77 | 13.01 | 12.47 | 45.83 | 20.19 | 77.49 | 157.09 | 19.35 | 7.85 | 36.13 | 43.01 | 48.54 |
| 10.66 | 57.56 | 13.94 | 13.04 | 50.04 | 20.34 | 131.67 | 171.43 | 19.03 | 11.16 | 36.32 | 48.02 | 55.23 |
| 11.00 | 62.89 | 13.51 | 12.48 | 55.63 | 20.41 | 161.08 | 190.63 | 18.86 | 13.69 | 36.79 | 51.12 | 60.71 |
| 11.33 | 63.28 | 13.65 | 12.48 | 55.48 | 20.62 | 183.60 | 266.11 | 18.86 | 17.93 | 37.17 | 53.49 | 69.39 |
| 11.66 | 62.70 | 13.72 | 12.48 | 56.67 | 20.73 | 239.72 | 278.33 | 18.85 | 23.55 | 37.20 | 58.51 | 80.33 |
| 12.00 | 65.31 | 13.92 | 12.52 | 60.63 | 20.87 | 240.95 | 285.90 | 18.77 | 23.29 | 37.37 | 58.80 | 80.50 |
| 12.33 | 64.87 | 13.99 | 12.61 | 60.61 | 20.67 | 258.99 | 349.15 | 18.63 | 28.13 | 37.23 | 60.25 | 89.59 |
| 12.66 | 63.52 | 13.82 | 12.51 | 67.05 | 20.59 | 245.23 | 438.80 | 18.64 | 31.37 | 40.44 | 62.24 | 98.77 |
| 13.00 | 63.42 | 13.54 | 12.54 | 68.68 | 20.48 | 299.08 | 453.79 | 18.97 | 31.72 | 39.39 | 65.98 | 97.06 |
| 13.33 | 62.83 | 13.34 | 12.51 | 68.03 | 20.42 | 277.48 | 460.70 | 19.15 | 32.02 | 40.13 | 64.80 | 97.62 |
| 13.66 | 62.52 | 13.32 | 12.61 | 69.32 | 20.29 | 289.14 | 477.29 | 19.21 | 33.16 | 39.79 | 65.50 | 98.83 |
| 14.00 | 62.93 | 13.21 | 12.61 | 69.51 | 20.18 | 303.84 | 478.92 | 19.25 | 33.68 | 39.46 | 66.47 | 98.97 |
| 14.33 | 59.83 | 13.24 | 12.83 | 67.46 | 20.12 | 280.14 | 496.87 | 19.49 | 34.37 | 38.99 | 63.90 | 98.81 |
| 14.66 | 59.49 | 12.67 | 12.76 | 67.13 | 19.70 | 272.06 | 490.17 | 19.85 | 35.06 | 40.01 | 64.20 | 98.71 |
| 15.00 | 56.84 | 12.27 | 13.18 | 67.30 | 18.40 | 299.73 | 473.62 | 19.76 | 37.52 | 39.25 | 65.90 | 98.30 |