

Table S1. Performance characteristic of solar – WtE hybrid power plants cases.

| Case no. | $m_{MSW}$                                   | $m_{gas}$   | $Q_{sol,th}$  | $Q_{sol}$  | $m_{nrCO_2,MSW}$   | $m_{nrCO_2,gas}$   |
|----------|---|---|---|--|--|--|
|          | Mass flow rate MSW<br>Mg year <sup>-1</sup> | Mass flow rate natural gas<br>Mg year <sup>-1</sup> | Solar energy collected by the solar field<br>MWh year <sup>-1</sup> | Solar energy acquired by solar salts<br>MWh year <sup>-1</sup> | Non – biogenic CO <sub>2</sub> emission from MSW combustion<br>Mg year <sup>-1</sup> | Non – biogenic CO <sub>2</sub> emission from natural gas combustion<br>Mg year <sup>-1</sup> |
| 0        | 131 446.70                                  | -   | -   | -  | 56 653.5   | -  |
| 1        | 131 446.7                                   | 3 222.0   | 35 927.1  | 35 920.7   | 56 653.5   | 8 526.44   |
| 2        | 131 446.7                                   | 3 221.1   | 35 927.1  | 35 927.1   | 56 653.5   | 8 523.93   |
| 3        | 131 446.7                                   | 3 220.6   | 35 927.1  | 35 927.1   | 56 653.5   | 8 522.66   |
| 4        | 131 446.7                                   | 2 414.0   | 47 854.6  | 45 695.4   | 56 653.5   | 6 388.25   |
| 5        | 131 446.7                                   | 2 258.4   | 47 854.6  | 47 563.7   | 56 653.5   | 5 976.44   |
| 6        | 131 446.7                                   | 2 240.8   | 47 854.6  | 47 768.0   | 56 653.5   | 5 929.69   |
| 7        | 131 446.7                                   | 1 817.3   | 59 782.1  | 52 818.7   | 56 653.5   | 4 809.19   |
| 8        | 131 446.7                                   | 1 561.0   | 59 782.1  | 56 012.9   | 56 653.5   | 4 130.92   |
| 9        | 131 446.7                                   | 1 475.4   | 59 782.1  | 57 039.7   | 56 653.5   | 3 904.37   |
| 10       | 131 446.7                                   | 3 869.7   | 42 582.0  | 42 372.1   | 56 653.5   | 10 240.39  |
| 11       | 131 446.7                                   | 3 841.6   | 42 722.1  | 42 722.1   | 56 653.5   | 10 165.92  |
| 12       | 131 446.7                                   | 3 841.0   | 42 722.1  | 42 722.1   | 56 653.5   | 10 164.24  |
| 13       | 131 446.7                                   | 2 905.6   | 56 962.9  | 54 050.4   | 56 653.5   | 7 689.06   |
| 14       | 131 446.7                                   | 2 697.2   | 56 962.9  | 56 548.3   | 56 653.5   | 7 137.50   |
| 15       | 131 446.7                                   | 2 670.5   | 56 962.9  | 56 859.9   | 56 653.5   | 7 066.83   |
| 16       | 131 446.7                                   | 2 177.6   | 71 203.6  | 62 870.5   | 56 653.5   | 5 762.44   |
| 17       | 131 446.7                                   | 1 856.9   | 71 203.6  | 66 718.5   | 56 653.5   | 4 913.95   |
| 18       | 131 446.7                                   | 1 758.2   | 71 203.6  | 67 896.5   | 56 653.5   | 4 652.74   |
| 19       | 131 446.7                                   | 4 530.5   | 49 858.6  | 49 605.6   | 56 653.5   | 11 989.10  |

|    |           |         |  |          |  |  |  |  |          |           |
|----|-----------|---------|--|----------|--|--|--|--|----------|-----------|
| 20 | 131 446.7 | 4 495.4 |  | 50 023.2 |  |  |  |  | 56 653.5 | 11 896.20 |
| 21 | 131 446.7 | 4 494.8 |  | 50 023.2 |  |  |  |  | 56 653.5 | 11 894.53 |
| 22 | 131 446.7 | 3 400.3 |  | 66 649.4 |  |  |  |  | 56 653.5 | 8 998.19  |
| 23 | 131 446.7 | 3 156.9 |  | 66 649.4 |  |  |  |  | 56 653.5 | 8 353.95  |
| 24 | 131 446.7 | 3 127.6 |  | 66 649.4 |  |  |  |  | 56 653.5 | 8 276.58  |
| 25 | 131 446.7 | 2 536.9 |  | 83 347.9 |  |  |  |  | 56 653.5 | 6 713.23  |
| 26 | 131 446.7 | 2 199.4 |  | 83 347.9 |  |  |  |  | 56 653.5 | 5 820.20  |
| 27 | 131 446.7 | 2 057.2 |  | 83 347.9 |  |  |  |  | 56 653.5 | 5 444.02  |

Table S2. Investment and operational costs of solar – WtE hybrid power plants cases.

| Case no. | $C_{WtE}$  |              | Site  | $C_{CSP}$       |           |           |           |           | Backup | $C_{inv}$<br>Total investment cost | $C_{O\&M}$<br>Total O&M cost |
|----------|------------|--------------|-------|-----------------|-----------|-----------|-----------|-----------|--------|------------------------------------|------------------------------|
|          | Fixed part | Thermal part |       | Heliostat field | Tower     | Receiver  | TES       |           |        |                                    |                              |
|          | thous.EUR  | thous.EUR    |       | thous.EUR       | thous.EUR | thous.EUR | thous.EUR | thous.EUR |        |                                    |                              |
| 0        | 39 357.4   | 55 366.7     |       |                 |           |           |           |           |        | 94 724.1                           | 16 174.5                     |
| 1        | 39 357.4   | 82 802.8     | 344.2 | 10 537.8        | 7 501.3   | 2 935.0   | 2 811.2   | 78.0      |        | 146 512.3                          | 18 395.3                     |
| 2        | 39 357.4   | 82 802.8     | 344.2 | 10 537.8        | 7 501.3   | 2 935.0   | 4 163.0   | 78.0      |        | 147 864.2                          | 18 398.8                     |
| 3        | 39 357.4   | 82 802.8     | 344.2 | 10 537.8        | 7 501.3   | 2 935.0   | 5 457.5   | 78.0      |        | 149 158.6                          | 18 402.4                     |
| 4        | 39 357.4   | 82 802.8     | 426.8 | 14 036.2        | 7 607.9   | 3 589.7   | 2 811.2   | 78.0      |        | 150 902.8                          | 18 006.5                     |
| 5        | 39 357.4   | 82 802.8     | 426.8 | 14 036.2        | 7 607.9   | 3 589.7   | 4 163.0   | 78.0      |        | 152 254.7                          | 17 921.3                     |
| 6        | 39 357.4   | 82 802.8     | 426.8 | 14 036.2        | 7 607.9   | 3 589.7   | 5 457.5   | 78.0      |        | 153 549.1                          | 17 915.0                     |
| 7        | 39 357.4   | 82 802.8     | 507.3 | 17 534.7        | 7 716.0   | 4 196.6   | 2 811.2   | 78.0      |        | 155 244.9                          | 17 738.9                     |
| 8        | 39 357.4   | 82 802.8     | 507.3 | 17 534.7        | 7 716.0   | 4 196.6   | 4 163.0   | 78.0      |        | 156 596.8                          | 17 595.8                     |
| 9        | 39 357.4   | 82 802.8     | 507.3 | 17 534.7        | 7 716.0   | 4 196.6   | 5 457.5   | 78.0      |        | 157 891.2                          | 17 550.6                     |
| 10       | 39 357.4   | 83 160.0     | 402.4 | 12 530.8        | 7 562.1   | 3 316.7   | 3 271.2   | 89.8      |        | 149 862.5                          | 18 832.6                     |

|           |          |          |       |          |         |         |         |       |           |          |
|-----------|----------|----------|-------|----------|---------|---------|---------|-------|-----------|----------|
| <b>11</b> | 39 357.4 | 83 160.0 | 402.4 | 12 530.8 | 7 562.1 | 3 316.7 | 4 851.5 | 89.8  | 151 442.7 | 18 821.2 |
| <b>12</b> | 39 357.4 | 83 160.0 | 402.4 | 12 530.8 | 7 562.1 | 3 316.7 | 6 365.7 | 89.8  | 152 956.9 | 18 825.4 |
| <b>13</b> | 39 357.4 | 83 160.0 | 499.3 | 16 707.7 | 7 690.3 | 4 056.6 | 3 271.2 | 89.8  | 155 061.8 | 18 368.6 |
| <b>14</b> | 39 357.4 | 83 160.0 | 499.3 | 16 707.7 | 7 690.3 | 4 056.6 | 4 851.5 | 89.8  | 156 642.1 | 18 253.8 |
| <b>15</b> | 39 357.4 | 83 160.0 | 499.3 | 16 707.7 | 7 690.3 | 4 056.6 | 6 365.7 | 89.8  | 158 156.3 | 18 243.0 |
| <b>16</b> | 39 357.4 | 83 160.0 | 593.8 | 20 884.7 | 7 820.7 | 4 742.4 | 3 271.2 | 89.8  | 160 206.8 | 18 040.0 |
| <b>17</b> | 39 357.4 | 83 160.0 | 593.8 | 20 884.7 | 7 820.7 | 4 742.4 | 4 851.5 | 89.8  | 161 787.0 | 17 860.7 |
| <b>18</b> | 39 357.4 | 83 160.0 | 593.8 | 20 884.7 | 7 820.7 | 4 742.4 | 6 365.7 | 89.8  | 163 301.3 | 17 808.6 |
| <b>19</b> | 39 357.4 | 83 634.4 | 463.7 | 14 672.3 | 7 627.4 | 3 703.0 | 3 750.8 | 101.8 | 153 512.3 | 19 282.0 |
| <b>20</b> | 39 357.4 | 83 634.4 | 463.7 | 14 672.3 | 7 627.4 | 3 703.0 | 5 570.1 | 101.8 | 155 331.6 | 19 267.3 |
| <b>21</b> | 39 357.4 | 83 634.4 | 463.7 | 14 672.3 | 7 627.4 | 3 703.0 | 7 314.6 | 101.8 | 157 076.1 | 19 272.2 |
| <b>22</b> | 39 357.4 | 83 634.4 | 575.1 | 19 548.9 | 7 778.9 | 4 529.1 | 3 750.8 | 101.8 | 159 544.9 | 18 737.6 |
| <b>23</b> | 39 357.4 | 83 634.4 | 575.1 | 19 548.9 | 7 778.9 | 4 529.1 | 5 570.1 | 101.8 | 161 364.3 | 18 603.3 |
| <b>24</b> | 39 357.4 | 83 634.4 | 575.1 | 19 548.9 | 7 778.9 | 4 529.1 | 7 314.6 | 101.8 | 163 108.8 | 18 591.8 |
| <b>25</b> | 39 357.4 | 83 634.4 | 684.2 | 24 446.7 | 7 933.5 | 5 294.8 | 3 750.8 | 101.8 | 165 539.4 | 18 346.5 |
| <b>26</b> | 39 357.4 | 83 634.4 | 684.2 | 24 446.7 | 7 933.5 | 5 294.8 | 5 570.1 | 101.8 | 167 358.7 | 18 158.3 |
| <b>27</b> | 39 357.4 | 83 634.4 | 684.2 | 24 446.7 | 7 933.5 | 5 294.8 | 7 314.6 | 101.8 | 169 103.2 | 18 081.9 |