Table 1. Parameters for MGs in test system 1

| MG | Bus | $p_i^{g,min}$ (MW) | $p_i^{g,max}$ (MW) | $q_i^{g,min}$ (MVar) | $q_i^{g,max}$ (MVar) | $a_i$ ($/MW$^2$) | $b_i$ ($/MW) | $em_i^{PDS}$ (ton/MWh) | CER (ton) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 10 | -10 | 10 | 312 | 9.45 | 0.865 | 0.1 |
| 2 | 16 | 0 | 0.8 | -0.5 | 0.5 | 256 | 6.22 | 0.312 | 0.05 |
| 3 | 22 | 0 | 0.8 | -0.5 | 0.5 | 298 | 8.28 | 0.865 | 0.1 |
| 4 | 26 | 0 | 0.2 | -0.2 | 0.2 | 0 | 0 | 0 | 0.05 |
| 5 | 33 | 0 | 0.2 | -0.2 | 0.2 | 0 | 0 | 0 | 0.05 |

Table 2. Average traffic demand in test system 1

| Number | Origin | Destination | $q_{rs}$ |
|---|---|---|---|
| 1 | 1 | 10 | 15 |
| 2 | 1 | 12 | 10 |
| 3 | 3 | 10 | 15 |
| 4 | 3 | 12 | 15 |
| 5 | 4 | 9 | 10 |
| 6 | 4 | 10 | 10 |
| 7 | 4 | 12 | 5 |

Table 3. Parameters for TS in test system 1

| Link | Origin | Destination | $c_a$ | $t_a^0$ (min) | Length (km) |
|---|---|---|---|---|---|
| 1 | 1 | 3 | 18 | 6 | 3 |
| 2 | 1 | 2 | 18 | 3 | 1 |
| 3 | 2 | 6 | 18 | 6 | 3 |
| 4 | 1 | 4 | 10 | 5 | 2 |
| 5 | 2 | 5 | 10 | 5 | 2 |
| 6 | 3 | 4 | 10 | 5 | 2 |
| 7 | 4 | 5 | 12 | 6 | 3 |
| 8 | 5 | 6 | 10 | 5 | 2 |
| 9 | 3 | 7 | 18 | 3 | 1 |
| 10 | 4 | 8 | 12 | 6 | 3 |
| 11 | 5 | 9 | 12 | 6 | 3 |
| 12 | 6 | 10 | 18 | 3 | 1 |
| 13 | 7 | 8 | 10 | 5 | 2 |
| 14 | 8 | 9 | 12 | 6 | 3 |
| 15 | 9 | 10 | 10 | 5 | 2 |
| 16 | 7 | 11 | 18 | 6 | 3 |
| 17 | 8 | 11 | 10 | 5 | 2 |

| | | | | | |
|---|---|---|---|---|---|
| 18 | 9 | 12 | 10 | 5 | 2 |
| 19 | 10 | 12 | 18 | 6 | 3 |
| 20 | 11 | 12 | 18 | 3 | 1 |

Table 4. Parameters for MGs in test system 2

| MG | Bus | $p_i^{g,min}$ (MW) | $p_i^{g,max}$ (MW) | $q_i^{g,min}$ (MVar) | $q_i^{g,max}$ (MVar) | $a_i$ ($/MW$^2$) | $b_i$ ($/MW) | $em_i^{PDS}$ (ton/MWh) | CER (ton) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 10 | -10 | 10 | 82 | 9.45 | 0.865 | 0.4 |
| 2 | 13 | 0 | 5 | -5 | 5 | 26 | 6.22 | 0.312 | 0.2 |
| 3 | 22 | 0 | 2 | -2 | 2 | 0 | 0 | 0 | 0.2 |
| 4 | 31 | 0 | 5 | -5 | 5 | 26 | 6.22 | 0.312 | 0.2 |
| 5 | 43 | 0 | 2 | -2 | 2 | 0 | 0 | 0 | 0.2 |
| 6 | 59 | 0 | 2 | -2 | 2 | 0 | 0 | 0 | 0.2 |
| 7 | 92 | 0 | 5 | -5 | 5 | 82 | 9.45 | 0.865 | 0.4 |
| 8 | 111 | 0 | 3 | -2 | 2 | 0 | 0 | 0 | 0.2 |

Table 5. Average traffic demand in test system 2

| Number | Origin | Destination | $q_{rs}$ |
|---|---|---|---|
| 1 | 1 | 19 | 300 |
| 2 | 1 | 20 | 300 |
| 3 | 2 | 19 | 100 |
| 4 | 2 | 20 | 100 |
| 5 | 2 | 21 | 200 |
| 6 | 3 | 19 | 200 |
| 7 | 3 | 20 | 300 |
| 8 | 3 | 21 | 100 |

Table 6. Parameters for TS in test system 2

| Link | Origin | Destination | $c_a$ | $t_a^0$ (min) | Length (km) |
|---|---|---|---|---|---|
| 1 | 1 | 2 | 2500 | 6 | 6 |
| 2 | 1 | 3 | 2300 | 4 | 4 |
| 3 | 2 | 6 | 500 | 5 | 5 |
| 4 | 3 | 4 | 1700 | 4 | 4 |
| 5 | 3 | 12 | 2300 | 4 | 4 |
| 6 | 4 | 5 | 1700 | 2 | 2 |
| 7 | 4 | 11 | 500 | 6 | 6 |
| 8 | 5 | 6 | 500 | 4 | 4 |

| | | | | | |
|---|---|---|---|---|---|
| 9 | 5 | 9 | 1000 | 5 | 5 |
| 10 | 6 | 8 | 500 | 2 | 2 |
| 11 | 7 | 18 | 2300 | 2 | 2 |
| 12 | 8 | 7 | 750 | 3 | 3 |
| 13 | 8 | 9 | 500 | 10 | 10 |
| 14 | 8 | 16 | 500 | 5 | 5 |
| 15 | 9 | 10 | 1400 | 3 | 3 |
| 16 | 10 | 11 | 1000 | 5 | 5 |
| 17 | 10 | 15 | 1400 | 6 | 6 |
| 18 | 10 | 16 | 500 | 4 | 4 |
| 19 | 10 | 17 | 500 | 8 | 8 |
| 20 | 11 | 12 | 500 | 6 | 6 |
| 21 | 11 | 14 | 500 | 4 | 4 |
| 22 | 12 | 13 | 2500 | 3 | 3 |
| 23 | 13 | 24 | 500 | 4 | 4 |
| 24 | 14 | 15 | 500 | 5 | 5 |
| 25 | 14 | 23 | 500 | 4 | 4 |
| 26 | 15 | 19 | 1500 | 3 | 3 |
| 27 | 15 | 22 | 1000 | 3 | 3 |
| 28 | 16 | 17 | 500 | 2 | 2 |
| 29 | 16 | 18 | 2000 | 3 | 3 |
| 30 | 17 | 19 | 500 | 2 | 2 |
| 31 | 18 | 20 | 2300 | 4 | 4 |
| 32 | 19 | 20 | 500 | 4 | 4 |
| 33 | 20 | 21 | 500 | 6 | 6 |
| 34 | 20 | 22 | 500 | 5 | 5 |
| 35 | 21 | 22 | 500 | 2 | 2 |
| 36 | 21 | 24 | 500 | 3 | 3 |
| 37 | 22 | 23 | 500 | 4 | 4 |
| 38 | 23 | 24 | 500 | 2 | 2 |