APPENDIX - A

Test Systems for Deregulated Power System

A.1: Three Unit 12 Hour Test System [54]

Table A.1.1 Unit data for Three unit test system

<table>
<thead>
<tr>
<th>Quantities</th>
<th>Unit-1</th>
<th>Unit-2</th>
<th>Unit-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_{\text{max}}$ (MW)</td>
<td>600</td>
<td>400</td>
<td>200</td>
</tr>
<tr>
<td>$P_{\text{min}}$ (MW)</td>
<td>100</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>$a$ ($/h$)</td>
<td>500</td>
<td>300</td>
<td>100</td>
</tr>
<tr>
<td>$b$ ($/\text{MWh}$)</td>
<td>10</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>$c$ ($/\text{MW}^2\text{h}$)</td>
<td>0.002</td>
<td>0.0025</td>
<td>0.005</td>
</tr>
<tr>
<td>Min up time (h)</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Min down time (h)</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Startup cost ($)</td>
<td>450</td>
<td>400</td>
<td>300</td>
</tr>
<tr>
<td>Initial status (h)</td>
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<td>3</td>
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Table A.1.2 Forecasted demand and Market prices for Three unit test system

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<thead>
<tr>
<th>Hour (h)</th>
<th>Forecasted Demand (MW)</th>
<th>Forecasted market Price ($/\text{MWh}$)</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>170</td>
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<td>520</td>
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<td>700</td>
<td>10.00</td>
</tr>
<tr>
<td>6</td>
<td>1050</td>
<td>11.25</td>
</tr>
<tr>
<td>7</td>
<td>1100</td>
<td>11.30</td>
</tr>
<tr>
<td>8</td>
<td>800</td>
<td>10.65</td>
</tr>
<tr>
<td>9</td>
<td>650</td>
<td>10.35</td>
</tr>
<tr>
<td>10</td>
<td>330</td>
<td>11.20</td>
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<tr>
<td>11</td>
<td>400</td>
<td>10.75</td>
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<tr>
<td>12</td>
<td>550</td>
<td>10.60</td>
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A.2: Three Unit 12 Hour Test System with Reserve Power Generation [76]

<table>
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<td>Quantities</td>
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<tr>
<td>P_{\text{max}} (MW)</td>
</tr>
<tr>
<td>P_{\text{min}} (MW)</td>
</tr>
<tr>
<td>a ($/h)</td>
</tr>
<tr>
<td>b ($/MWh)</td>
</tr>
<tr>
<td>c ($/MW^2h)</td>
</tr>
<tr>
<td>Min up time (h)</td>
</tr>
<tr>
<td>Min down time (h)</td>
</tr>
<tr>
<td>Startup cost ($)</td>
</tr>
<tr>
<td>Initial status (h)</td>
</tr>
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<th>Table A.2.2 Forecasted load demand, Reserve demand and Market prices for Three unit test system</th>
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<td>Hour (h)</td>
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<td>----------</td>
</tr>
<tr>
<td>1</td>
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<td>2</td>
</tr>
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<td>3</td>
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<tr>
<td>4</td>
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<tr>
<td>10</td>
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<td>11</td>
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<tr>
<td>12</td>
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A.3: Six Unit 12 Hour (IEEE 30- Bus) Test System [62]

Table A.3.1 Unit data for Six unit test system

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<tr>
<th>Quantities</th>
<th>Unit 1</th>
<th>Unit 2</th>
<th>Unit 3</th>
<th>Unit 4</th>
<th>Unit 5</th>
<th>Unit 6</th>
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<tbody>
<tr>
<td>$P_{\text{max}}$ (MW)</td>
<td>50</td>
<td>50</td>
<td>150</td>
<td>200</td>
<td>350</td>
<td>400</td>
</tr>
<tr>
<td>$P_{\text{min}}$ (MW)</td>
<td>5</td>
<td>10</td>
<td>10</td>
<td>20</td>
<td>140</td>
<td>100</td>
</tr>
<tr>
<td>a ($/h)</td>
<td>118.82</td>
<td>118.11</td>
<td>218.34</td>
<td>142.73</td>
<td>176.06</td>
<td>313.91</td>
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<tr>
<td>b ($/\text{MWh})</td>
<td>27.896</td>
<td>24.664</td>
<td>18.100</td>
<td>10.694</td>
<td>10.662</td>
<td>7.612</td>
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<tr>
<td>c ($/\text{MW}^2h$)</td>
<td>0.0143</td>
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<td>0.0081</td>
<td>0.0046</td>
<td>0.0014</td>
<td>0.0020</td>
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<td>Min up time (h)</td>
<td>1</td>
<td>1</td>
<td>5</td>
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<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Min down time (h)</td>
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<td>-1</td>
<td>-5</td>
<td>-8</td>
<td>-5</td>
<td>-5</td>
</tr>
<tr>
<td>Initial status (h)</td>
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<td>-1</td>
<td>-5</td>
<td>8</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Ramp up (MW)</td>
<td>50</td>
<td>50</td>
<td>750</td>
<td>100</td>
<td>175</td>
<td>200</td>
</tr>
<tr>
<td>Ramp down (MW)</td>
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<td>50</td>
<td>75</td>
<td>100</td>
<td>175</td>
<td>200</td>
</tr>
<tr>
<td>Startup cost ($)</td>
<td>0</td>
<td>0</td>
<td>50</td>
<td>50</td>
<td>500</td>
<td>800</td>
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Table A.3.2 Market prices for Six unit test system

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<tr>
<th>Hour (h)</th>
<th>Energy price ($/\text{MWh}$)</th>
<th>Spinning Reserve price ($/\text{MWh}$)</th>
<th>Non-spinning Reserve price ($/\text{MWh}$)</th>
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<td>1</td>
<td>13.720</td>
<td>14.720</td>
<td>15.020</td>
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<td>6.000</td>
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<td>13.540</td>
<td>13.840</td>
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<td>23.800</td>
<td>24.800</td>
<td>25.100</td>
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<td>28.325</td>
<td>29.325</td>
<td>29.626</td>
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<td>7</td>
<td>26.665</td>
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<tr>
<td>9</td>
<td>28.630</td>
<td>29.630</td>
<td>29.930</td>
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<td>10</td>
<td>26.980</td>
<td>27.980</td>
<td>28.280</td>
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<td>11</td>
<td>16.520</td>
<td>17.520</td>
<td>17.820</td>
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<tr>
<td>12</td>
<td>7.250</td>
<td>8.250</td>
<td>8.550</td>
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Table A.4.1 Unit data for Standard Ten unit test system

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<th>Quantities</th>
<th>Unit 1</th>
<th>Unit 2</th>
<th>Unit 3</th>
<th>Unit 4</th>
<th>Unit 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_{\text{max}}$ (MW)</td>
<td>455</td>
<td>455</td>
<td>130</td>
<td>130</td>
<td>162</td>
</tr>
<tr>
<td>$P_{\text{min}}$ (MW)</td>
<td>150</td>
<td>150</td>
<td>20</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>$a$ ($/h$)</td>
<td>1000</td>
<td>970</td>
<td>700</td>
<td>680</td>
<td>450</td>
</tr>
<tr>
<td>$b$ ($/\text{MWh}$)</td>
<td>16.19</td>
<td>17.26</td>
<td>16.60</td>
<td>16.50</td>
<td>19.70</td>
</tr>
<tr>
<td>$c$ ($/\text{MW}^2/h$)</td>
<td>0.00048</td>
<td>0.00031</td>
<td>0.00200</td>
<td>0.00211</td>
<td>0.00398</td>
</tr>
<tr>
<td>Min up time (h)</td>
<td>8</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Min down time (h)</td>
<td>8</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Startup cost ($)</td>
<td>4500</td>
<td>5000</td>
<td>550</td>
<td>560</td>
<td>900</td>
</tr>
<tr>
<td>Initial status (h)</td>
<td>8</td>
<td>8</td>
<td>-5</td>
<td>-5</td>
<td>-6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quantities</th>
<th>Unit 6</th>
<th>Unit 7</th>
<th>Unit 8</th>
<th>Unit 9</th>
<th>Unit 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_{\text{max}}$ (MW)</td>
<td>80</td>
<td>85</td>
<td>55</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>$P_{\text{min}}$ (MW)</td>
<td>20</td>
<td>25</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>$a$ ($/h$)</td>
<td>370</td>
<td>480</td>
<td>660</td>
<td>665</td>
<td>670</td>
</tr>
<tr>
<td>$b$ ($/\text{MWh}$)</td>
<td>22.26</td>
<td>27.74</td>
<td>25.92</td>
<td>27.27</td>
<td>27.79</td>
</tr>
<tr>
<td>$c$ ($/\text{MW}^2/h$)</td>
<td>0.00712</td>
<td>0.00079</td>
<td>0.00413</td>
<td>0.00222</td>
<td>0.00173</td>
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<tr>
<td>Min up time (h)</td>
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<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Min down time (h)</td>
<td>3</td>
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<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Startup cost ($)</td>
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<td>260</td>
<td>30</td>
<td>30</td>
<td>30</td>
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<tr>
<td>Initial status (h)</td>
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<td>-1</td>
<td>-1</td>
<td>-1</td>
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</table>
Table A.4.2 Forecasted Load demand and Market price for Standard Ten unit test system

<table>
<thead>
<tr>
<th>Hour (h)</th>
<th>Forecasted Demand (MW)</th>
<th>Forecasted Market Price ($/MWh)</th>
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<tbody>
<tr>
<td>1</td>
<td>700</td>
<td>22.15</td>
</tr>
<tr>
<td>2</td>
<td>750</td>
<td>22.00</td>
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<td>23.10</td>
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<td>4</td>
<td>950</td>
<td>23.65</td>
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<tr>
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<td>1000</td>
<td>22.25</td>
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<tr>
<td>6</td>
<td>1100</td>
<td>22.95</td>
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<td>1150</td>
<td>22.50</td>
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<td>1300</td>
<td>22.80</td>
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<td>10</td>
<td>1400</td>
<td>29.35</td>
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<td>30.15</td>
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<td>24.60</td>
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<td>14</td>
<td>1300</td>
<td>24.50</td>
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<tr>
<td>15</td>
<td>1200</td>
<td>22.50</td>
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<tr>
<td>16</td>
<td>1050</td>
<td>22.30</td>
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<tr>
<td>17</td>
<td>1000</td>
<td>22.25</td>
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<td>1100</td>
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<td>1200</td>
<td>22.20</td>
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<td>900</td>
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<td>24</td>
<td>800</td>
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# A.5: Standard Ten Unit 24 Hour Test System with Reserve Power Generation [76]

### Table A.5.1 Unit data for Standard Ten unit test system

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<th>Quantities</th>
<th>Unit 1</th>
<th>Unit 2</th>
<th>Unit 3</th>
<th>Unit 4</th>
<th>Unit 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P_{\text{max}} ) (MW)</td>
<td>455</td>
<td>455</td>
<td>130</td>
<td>130</td>
<td>162</td>
</tr>
<tr>
<td>( P_{\text{min}} ) (MW)</td>
<td>150</td>
<td>150</td>
<td>20</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>( a ) ($/h)</td>
<td>1000</td>
<td>970</td>
<td>700</td>
<td>680</td>
<td>450</td>
</tr>
<tr>
<td>( b ) ($/MWh)</td>
<td>16.19</td>
<td>17.26</td>
<td>16.60</td>
<td>16.50</td>
<td>19.70</td>
</tr>
<tr>
<td>( c ) ($/MW^2h)</td>
<td>0.00048</td>
<td>0.00031</td>
<td>0.00200</td>
<td>0.00211</td>
<td>0.00398</td>
</tr>
<tr>
<td>Min up time (h)</td>
<td>8</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Min down time (h)</td>
<td>8</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Startup cost ($)</td>
<td>4500</td>
<td>5000</td>
<td>550</td>
<td>560</td>
<td>900</td>
</tr>
<tr>
<td>Initial status (h)</td>
<td>8</td>
<td>8</td>
<td>-5</td>
<td>-5</td>
<td>-6</td>
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</tbody>
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<table>
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<th>Unit 6</th>
<th>Unit 7</th>
<th>Unit 8</th>
<th>Unit 9</th>
<th>Unit 10</th>
</tr>
</thead>
<tbody>
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<td>( P_{\text{max}} ) (MW)</td>
<td>80</td>
<td>85</td>
<td>55</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>( P_{\text{min}} ) (MW)</td>
<td>20</td>
<td>25</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>( a ) ($/h)</td>
<td>370</td>
<td>480</td>
<td>660</td>
<td>665</td>
<td>670</td>
</tr>
<tr>
<td>( b ) ($/MWh)</td>
<td>22.26</td>
<td>27.74</td>
<td>25.92</td>
<td>27.27</td>
<td>27.79</td>
</tr>
<tr>
<td>( c ) ($/MW^2h)</td>
<td>0.00712</td>
<td>0.00079</td>
<td>0.00413</td>
<td>0.00222</td>
<td>0.00173</td>
</tr>
<tr>
<td>Min up time (h)</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Min down time (h)</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Startup cost ($)</td>
<td>170</td>
<td>260</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Initial status (h)</td>
<td>-3</td>
<td>-3</td>
<td>-1</td>
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Table B.5.2 Forecasted load demand, Reserve demand and Market price for Standard Ten unit test system

<table>
<thead>
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<th>Hour (h)</th>
<th>Forecasted Demand (MW)</th>
<th>Forecasted Reserve (MW)</th>
<th>Forecasted Market Price ($/MWh)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>700</td>
<td>70</td>
<td>22.15</td>
</tr>
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<td>2</td>
<td>750</td>
<td>75</td>
<td>22.00</td>
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<td>950</td>
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<td>23.65</td>
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<td>1000</td>
<td>100</td>
<td>22.25</td>
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<td>110</td>
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# A.6: Ten Unit 24 Hour Test System [45]
(Traditional UC)

Table A.6.1 Unit data for Ten unit test system

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Table A.6.2 System demand for Ten unit test system

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A.7: Multiple Units 24 hour Test System [65]

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<td></td>
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</tr>
<tr>
<td>22</td>
<td>4500</td>
<td>22.75</td>
<td>9000</td>
<td>22.75</td>
<td>45000</td>
<td>22.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>4000</td>
<td>22.55</td>
<td>8000</td>
<td>22.55</td>
<td>40000</td>
<td>22.55</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>24</td>
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<td></td>
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<td></td>
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</tr>
</tbody>
</table>
A.8: Ten Unit 24 Hour (IEEE 39- Bus) Test System [97]

Fig. A.8.1. Single line diagram of IEEE-39 Bus System
### Table A.8.1 Unit data for Ten unit (IEEE 39) bus test system

<table>
<thead>
<tr>
<th>Quantities</th>
<th>Unit 1</th>
<th>Unit 2</th>
<th>Unit 3</th>
<th>Unit 4</th>
<th>Unit 5</th>
<th>Unit 6</th>
<th>Unit 7</th>
<th>Unit 8</th>
<th>Unit 9</th>
<th>Unit 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_{\text{max}}$ (MW)</td>
<td>455</td>
<td>455</td>
<td>130</td>
<td>130</td>
<td>162</td>
<td>80</td>
<td>85</td>
<td>55</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>$P_{\text{min}}$ (MW)</td>
<td>150</td>
<td>150</td>
<td>20</td>
<td>20</td>
<td>25</td>
<td>20</td>
<td>25</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>a ($/h)</td>
<td>1000</td>
<td>970</td>
<td>700</td>
<td>680</td>
<td>450</td>
<td>370</td>
<td>480</td>
<td>660</td>
<td>665</td>
<td>670</td>
</tr>
<tr>
<td>b ($/\text{MWh})</td>
<td>16.19</td>
<td>17.26</td>
<td>16.60</td>
<td>16.50</td>
<td>19.70</td>
<td>22.26</td>
<td>27.74</td>
<td>25.92</td>
<td>27.27</td>
<td>27.79</td>
</tr>
<tr>
<td>c ($/\text{MW}^2\text{h})</td>
<td>0.00048</td>
<td>0.00031</td>
<td>0.00200</td>
<td>0.00211</td>
<td>0.00398</td>
<td>0.00712</td>
<td>0.00079</td>
<td>0.00413</td>
<td>0.00222</td>
<td>0.00173</td>
</tr>
<tr>
<td>Min up time (h)</td>
<td>8</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Min down time (h)</td>
<td>8</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>$H_{\text{cost}}$ ($)</td>
<td>4500</td>
<td>5000</td>
<td>550</td>
<td>560</td>
<td>900</td>
<td>170</td>
<td>260</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>$C_{\text{cost}}$ ($)</td>
<td>9000</td>
<td>10,000</td>
<td>1100</td>
<td>1120</td>
<td>1800</td>
<td>340</td>
<td>520</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Initial status (h)</td>
<td>8</td>
<td>8</td>
<td>-5</td>
<td>-5</td>
<td>-6</td>
<td>-3</td>
<td>-3</td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
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</table>

### Table A.8.2 Emission Coefficients for Ten unit (IEEE 39 bus) test system

<table>
<thead>
<tr>
<th>Units</th>
<th>$\alpha_i$ (ton/h)</th>
<th>$\beta_i$ (ton/MW h)</th>
<th>$\gamma_i$ (ton/MW$^2$ h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 1</td>
<td>10.33908</td>
<td>-0.24444</td>
<td>0.00312</td>
</tr>
<tr>
<td>Unit 2</td>
<td>10.33908</td>
<td>-0.24444</td>
<td>0.00312</td>
</tr>
<tr>
<td>Unit 3</td>
<td>30.03910</td>
<td>-0.40695</td>
<td>0.00509</td>
</tr>
<tr>
<td>Unit 4</td>
<td>30.03910</td>
<td>-0.40695</td>
<td>0.00509</td>
</tr>
<tr>
<td>Unit 5</td>
<td>32.00006</td>
<td>-0.38132</td>
<td>0.00344</td>
</tr>
<tr>
<td>Unit 6</td>
<td>32.00006</td>
<td>-0.38132</td>
<td>0.00344</td>
</tr>
<tr>
<td>Unit 7</td>
<td>33.00056</td>
<td>-0.39023</td>
<td>0.00465</td>
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<tr>
<td>Unit 8</td>
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<td>-0.39023</td>
<td>0.00465</td>
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<tr>
<td>Unit 9</td>
<td>33.00056</td>
<td>-0.39524</td>
<td>0.00465</td>
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<tr>
<td>Unit 10</td>
<td>36.00012</td>
<td>-0.39864</td>
<td>0.00470</td>
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</table>
Table A.8.3 Forecasted load demand and Market price for Ten unit (IEEE 39 bus) test system

<table>
<thead>
<tr>
<th>Hour (h)</th>
<th>Forecasted Demand (MW)</th>
<th>Forecasted Market Price (Rs/MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>700</td>
<td>996.75</td>
</tr>
<tr>
<td>2</td>
<td>750</td>
<td>990.00</td>
</tr>
<tr>
<td>3</td>
<td>850</td>
<td>1039.50</td>
</tr>
<tr>
<td>4</td>
<td>950</td>
<td>1019.25</td>
</tr>
<tr>
<td>5</td>
<td>1000</td>
<td>1046.25</td>
</tr>
<tr>
<td>6</td>
<td>1100</td>
<td>1032.75</td>
</tr>
<tr>
<td>7</td>
<td>1150</td>
<td>1012.50</td>
</tr>
<tr>
<td>8</td>
<td>1200</td>
<td>996.75</td>
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<tr>
<td>9</td>
<td>1300</td>
<td>1026.00</td>
</tr>
<tr>
<td>10</td>
<td>1400</td>
<td>1320.75</td>
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<td>11</td>
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<td>1107.00</td>
</tr>
<tr>
<td>14</td>
<td>1300</td>
<td>1102.50</td>
</tr>
<tr>
<td>15</td>
<td>1200</td>
<td>1012.50</td>
</tr>
<tr>
<td>16</td>
<td>1050</td>
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<tr>
<td>17</td>
<td>1000</td>
<td>1001.25</td>
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<td>18</td>
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<td>992.25</td>
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<td>19</td>
<td>1200</td>
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<td>1400</td>
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<td>21</td>
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<td>22</td>
<td>1100</td>
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<tr>
<td>23</td>
<td>900</td>
<td>1023.75</td>
</tr>
<tr>
<td>24</td>
<td>800</td>
<td>1014.75</td>
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</table>
### A.9: Six Power Suppliers Test System [122]

Table A.9.1 Data for Power suppliers

<table>
<thead>
<tr>
<th>GENCOs</th>
<th>$e$ ($/h$)</th>
<th>$f$ ($$/MWh$)</th>
<th>$P_{\text{min}}$ (MW)</th>
<th>$P_{\text{max}}$ (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.0</td>
<td>0.00875</td>
<td>50</td>
<td>160</td>
</tr>
<tr>
<td>2</td>
<td>1.75</td>
<td>0.035</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>1.0</td>
<td>0.0625</td>
<td>30</td>
<td>80</td>
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<tr>
<td>4</td>
<td>3.15</td>
<td>0.00334</td>
<td>30</td>
<td>80</td>
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<td>5</td>
<td>3.0</td>
<td>0.015</td>
<td>10</td>
<td>60</td>
</tr>
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<td>6</td>
<td>3.0</td>
<td>0.015</td>
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<td>60</td>
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</tbody>
</table>

### A.10: Six Power Suppliers (IEEE 30- bus) Test System [121]

Table A.10.1 Data of Power suppliers for IEEE 30 bus test system

<table>
<thead>
<tr>
<th>GENCOs</th>
<th>$e$ ($/h$)</th>
<th>$f$ ($$/MWh$)</th>
<th>$P_{\text{min}}$ (MW)</th>
<th>$P_{\text{max}}$ (MW)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<td>0.00375</td>
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<td>160</td>
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</tr>
<tr>
<td>3</td>
<td>1.0</td>
<td>0.0625</td>
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<td>120</td>
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<tr>
<td>4</td>
<td>3.25</td>
<td>0.00834</td>
<td>10</td>
<td>100</td>
</tr>
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<td>5</td>
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<td>0.025</td>
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<td>130</td>
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<tr>
<td>6</td>
<td>3.0</td>
<td>0.025</td>
<td>10</td>
<td>130</td>
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</table>
### A.11: Six Power Suppliers and Two Large Consumers Test System [103]

#### Table A.11.1 Data for Six Power suppliers

<table>
<thead>
<tr>
<th>GENCOs</th>
<th>$e$ ($/h$)</th>
<th>$f$ ($/\text{MWh}$)</th>
<th>$P_{i\min}$ (MW)</th>
<th>$P_{i\max}$ (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.00</td>
<td>0.01125</td>
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<td>5.25</td>
<td>0.05250</td>
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<td>130</td>
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<td>3</td>
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<td>0.13750</td>
<td>20</td>
<td>90</td>
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<tr>
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<td>9.75</td>
<td>0.02532</td>
<td>20</td>
<td>120</td>
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<td>5</td>
<td>9.00</td>
<td>0.07500</td>
<td>20</td>
<td>100</td>
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<tr>
<td>6</td>
<td>9.00</td>
<td>0.07500</td>
<td>20</td>
<td>100</td>
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</table>

#### Table A.11.2 Data for Two large Consumers

<table>
<thead>
<tr>
<th>Large Consumers</th>
<th>$g$ ($/h$)</th>
<th>$h$ ($/\text{MWh}$)</th>
<th>$P_{i\min}$ (MW)</th>
<th>$P_{i\max}$ (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>0.04</td>
<td>0</td>
<td>200</td>
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<tr>
<td>2</td>
<td>25</td>
<td>0.03</td>
<td>0</td>
<td>150</td>
</tr>
</tbody>
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References


[114] A. Azadeh, S. F. Ghadery, B. P. Nokhandan and M. Sheikhalishahi, “A new genetic algorithm approach for optimizing bidding strategy view point of


List of Publications

International Journals


**National conference**


**International conference**

