gamsworldqformulation

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1 Optimization Models and MCP Formulation

Optimization Models
Here is the firm's problem. Since we have two firms there would be one for each firm:

$$
\begin{array}{lll}
\max & (\lambda^{DA}+\rho)*g_i^{DA}+\rho*e_i+\lambda^{RT}*(g_i^{RT}-g_i^{DA})-Cg_i^{RT}-(\lambda^{RT}-K)*e_i & \\
\text{s/t} & g_i^{DA}\le Q_i^{DA} & [\delta_i] \\
 & g_i^{RT}\le Q_i^{RT} & [\gamma_i] \\
 & e_i\le Q_i^{EIR} & [\zeta_i]
\end{array}
$$

The day ahead problem:

$$
\begin{array}{lll}
[EDDA] & \min\sum_i(C\hat{g}_i^{DA}+R_i\hat{e}_i) & \\
\text{s/t} & \hat{g}_i^{DA}\le Q_i^{DA} & [u_i] \\
 & \hat{e}_i\le Q_i^{EIR} & [\epsilon_i] \\
 & \sum_i\hat{g}_i^{DA}=D^{DA} & [\lambda^{DA}] \\
 & \sum_i\hat{g}_i^{DA}+\sum_i\hat{e}_i=FER & [\rho]
\end{array}
$$

The real time problem is identical to the no option formulation:

$$
\begin{array}{lll}
[EDRT] & \min\sum_i C\hat{g}_i^{RT} & \\
 & \text{s/t } \hat{g}_i^{RT}\le Q_i^{RT} & [v_i] \\
 & \sum\hat{g}_i^{RT}=D^{RT} & [\lambda^{RT}]
\end{array}
$$

MCP

$$
\begin{gathered}
0\le C_i-\lambda^{DA}-\rho-\delta_i\perp g_i^{DA}\ge 0 \\
0\le R_i-\rho-\zeta_i\perp e_i\ge 0 \\
0\le C_i-\lambda^{RT}-\gamma_i\perp g_i^{RT}\ge 0 \\
0\le Q_i^{DA}-g_i^{DA}\perp\delta_i\ge 0 \\
0\le Q_i^{RT}-g_i^{RT}\perp\gamma_i\ge 0 \\
0\le Q_i^{EIR}-e_i\perp\zeta_i\ge 0 \\
\sum_i g_i^{DA}+\sum_i e_i=FER \\
\sum_i g_i^{DA}=D^{DA} \\
\sum_i g_i^{RT}=D^{RT}
\end{gathered}
$$