A. The nonlinear terms caused by complementarity constraints: Eqs. (8a)-(8cc)

Complementary constraints are linearized through a large nunmber M and binary variables [34]. The form $0 \leqslant \epsilon \perp \varphi \geqslant 0$ is equivalent to:

$$0 \leqslant \epsilon \leqslant M(1-\theta) \tag{10a}$$
$$0 \leqslant \varphi \leqslant M\theta \tag{10b}$$
$$\theta \in \{0,1\} \tag{10c}$$

B. The nonlinear terms caused by strong duality theorem constraints: Eqs. (5h) and (5r)

Strong duality theorem constraints and complementary constraints are equivalent [29]. So, Eq. (5h) is replaced by:

$$0 \leqslant P_{gkt}^{\mathrm{G}} \perp \tau_{gkt}^{\mathrm{Gmin}} \geqslant 0, \forall g, \forall k, \forall t \tag{10d}$$
$$0 \leqslant P_{gk}^{\mathrm{Gmax}} - P_{gkt}^{\mathrm{G}} \perp \tau_{gkt}^{\mathrm{Gmax}} \geqslant 0, \forall g, \forall k, \forall t \tag{10e}$$
$$0 \leqslant P_{dlt}^{\mathrm{D}} \perp \tau_{dlt}^{\mathrm{Dmin}} \geqslant 0, \forall d, \forall l, \forall t \tag{10f}$$
$$0 \leqslant P_{dlt}^{\mathrm{Dmax}} - P_{dlt}^{\mathrm{D}} \perp \tau_{dlt}^{\mathrm{Dmax}} \geqslant 0, \forall i(j), \forall d, \forall l, \forall t \tag{10g}$$
$$0 \leqslant \mathrm{F}_f + \sum_n \mathrm{T}_{fn}\Big(\sum_{g\in\Phi_n^{\mathrm{G}},k} P_{gkt}^{\mathrm{G}} - \sum_{d\in\Phi_n^{\mathrm{D}},l} P_{dlt}^{\mathrm{D}}\Big) \perp \mu_{ft}^{\min} \geqslant 0, \forall f, \forall t \tag{10h}$$
$$0 \leqslant \mathrm{F}_f - \sum_n \mathrm{T}_{fn}\Big(\sum_{g\in\Phi_n^{\mathrm{G}},k} P_{gkt}^{\mathrm{G}} - \sum_{d\in\Phi_n^{\mathrm{D}},l} P_{dlt}^{\mathrm{D}}\Big) \perp \mu_{ft}^{\max} \geqslant 0, \forall f, \forall t \tag{10i}$$

Eq. (5r) is replaced by:

$$0 \leqslant P_{gk}^{\mathrm{ROG}} \perp \tau_{gk}^{\mathrm{RO,Gmin}} \geqslant 0, \forall g, \forall k \tag{10j}$$
$$0 \leqslant P_{gk}^{\mathrm{Gmax}} - P_{gk}^{\mathrm{ROG}} \perp \tau_{gk}^{\mathrm{RO,Gmax}} \geqslant 0, \forall g, \forall k \tag{10k}$$
$$0 \leqslant P_{\Lambda}^{\mathrm{ROD}} \perp \tau_{\Lambda}^{\mathrm{RO,Dmin}} \geqslant 0, \forall \Lambda \tag{10l}$$
$$0 \leqslant P_{\Lambda}^{\mathrm{RO,Dmax}} - P_{\Lambda}^{\mathrm{ROD}} \perp \tau_{\Lambda}^{\mathrm{RO,Dmax}} \geqslant 0, \forall \Lambda \tag{10m}$$

Then, Eqs. (10d)-(10m) are linearized by the method of Eqs. (10a)-(10c).

C. The product of a dual variable and a decision variable in constraints: $\beta_{i(j)t}^{\mathrm{SDT}} a_{gkt}$, $\beta_{i(j)t}^{\mathrm{SDT}} b_{dlt}$, $\beta_{it}^{\mathrm{SDT}} P_{gkt}^{\mathrm{G}}$, $\beta_{jt}^{\mathrm{SDT}} P_{dlt}^{\mathrm{D}}$, $\beta_{i(j)}^{\mathrm{RO,SDT}} x_{gk}$, $\beta_{i}^{\mathrm{RO,SDT}} P_{gk}^{\mathrm{ROG}}$

$\beta_{i(j)t}^{\mathrm{SDT}}$ and $\beta_{i(j)}^{\mathrm{RO,SDT}}$ have high degrees of freedom and they can be parameterized according to some researches [28], [29]. However, in this paper, due to the complexity of the model, in order to avoid reducing the feasible region, the binary expansion method [35] is used instead of parameterization for linearization. Besides, due to the high degrees freedom of these nonlinear terms, the discrete number of binary expansion method need not be large, which ensures the calculation speed. Take $\beta_{i(j)t}^{\mathrm{SDT}} a_{gkt}$ as an example:

$$\beta_{i(j)t}^{\mathrm{SDT}} a_{gkt} = \sum_q \delta_{i(j)tq}^{\mathrm{a}} \chi_{gkti(j)tq}^{\beta,\mathrm{a}}, \forall i(j), \forall g, \forall k, \forall t \tag{10n}$$
$$\beta_{i(j)t}^{\mathrm{SDT}} - \frac{\Delta\delta_{i(j)tq}^{\mathrm{a}}}{2} \leqslant \sum_q \delta_{i(j)tq}^{\mathrm{a}} \theta_{i(j)tq}^{\mathrm{a}} \leqslant \beta_{i(j)t}^{\mathrm{SDT}} + \frac{\Delta\delta_{i(j)tq}^{\mathrm{a}}}{2}, \forall i(j), \forall t \tag{10o}$$
$$\sum_q \theta_{i(j)tq}^{\mathrm{a}} = 1, \forall i(j), \forall t \tag{10p}$$
$$-M(1-\theta_{i(j)tq}^{\mathrm{a}}) \leqslant a_{gkt} - \chi_{gkti(j)q}^{\beta,\mathrm{a}} \leqslant M(1-\theta_{i(j)tq}^{\mathrm{a}}), \forall i(j), \forall g, \forall k, \forall t, \forall q \tag{10q}$$
$$-M\theta_{i(j)tq}^{\mathrm{a}} \leqslant \chi_{gkti(j)q}^{\beta,\mathrm{a}} \leqslant M\theta_{i(j)tq}^{\mathrm{a}}, \forall i(j), \forall g, \forall k, \forall t, \forall q \tag{10r}$$
$$\theta_{i(j)tq}^{\mathrm{a}} \in \{0,1\}, \forall i(j), \forall t, \forall q \tag{10s}$$

where $\delta_{i(j)tq}^{\mathrm{a}}$ is the discrete array of $\beta_{i(j)t}^{\mathrm{SDT}}$, $\Delta\delta_{i(j)t}^{\mathrm{a}} = \delta_{i(j)t(q+1)}^{\mathrm{a}} - \delta_{i(j)tq}^{\mathrm{a}}$ represents the discrete interval of $\delta_{i(j)tq}^{\mathrm{a}}$.

$\beta_{i(j)t}^{\mathrm{SDT}} a_{gkt}$ is linearzied by Eqs. (10n)-(10s) and the same method is used for the linearization of $\beta_{i(j)t}^{\mathrm{SDT}} b_{dlt}$, $\beta_{it}^{\mathrm{SDT}} P_{gkt}^{\mathrm{G}}$, $\beta_{jt}^{\mathrm{SDT}} P_{dlt}^{\mathrm{D}}$, $\beta_{i(j)}^{\mathrm{RO,SDT}} x_{gk}$, $\beta_{i}^{\mathrm{RO,SDT}} P_{gk}^{\mathrm{ROG}}$.

D. The product of two variables in MPECs: $\sum_{g\in S_i^{\mathrm{G}},k,t} \rho_{gt} P_{gkt}^{\mathrm{G}}$, $\sum_{d\in S_j^{\mathrm{D}},l,t} \rho_{dt} P_{dlt}^{\mathrm{D}}$, $\sum_{g\in S_i^{\mathrm{G}},k} \rho^{\mathrm{RO}} P_{gk}^{\mathrm{ROG}}$

They can be linearized by strong duality theorem Eq. (5h) and Eq. (5r):

$$\sum_{g\in S_i^{\mathrm{G}},k,t} \rho_{gt} P_{gkt}^{\mathrm{G}} = \sum_{d,l,t} (b_{dlt} P_{dlt}^{\mathrm{D}} - P_{dlt}^{\mathrm{Dmax}} \tau_{dlt}^{\mathrm{Dmax}}) - \sum_{g\notin S_i^{\mathrm{G}},k,t} (a_{gkt} P_{gkt}^{\mathrm{G}} + P_{gk}^{\mathrm{Gmax}} \tau_{gkt}^{\mathrm{Gmax}}) - \sum_{f,t} F_f(\mu_{ft}^{\min} + \mu_{ft}^{\max}) \tag{10t}$$
$$\sum_{d\in S_j^{\mathrm{D}},l,t} \rho_{dt} P_{dlt}^{\mathrm{D}} = \sum_{g,k,t} (a_{gkt} P_{gkt}^{\mathrm{G}} + P_{gk}^{\mathrm{Gmax}} \tau_{gkt}^{\mathrm{Gmax}}) - \sum_{d\notin S_j^{\mathrm{D}},l,t} (b_{dlt} P_{dlt}^{\mathrm{D}} - P_{dlt}^{\mathrm{Dmax}} \tau_{dlt}^{\mathrm{Dmax}}) + \sum_{f,t} F_f(\mu_{ft}^{\min} + \mu_{ft}^{\max}) \tag{10u}$$
$$\sum_{g\in S_i^{\mathrm{G}},k} \rho^{\mathrm{RO}} P_{gk}^{\mathrm{ROG}} = \sum_{\Lambda} (m_\Lambda P_\Lambda^{\mathrm{ROD}} - P_\Lambda^{\mathrm{RO,Dmax}} \tau_\Lambda^{\mathrm{RO,Dmax}}) - \sum_{g\notin S_i^{\mathrm{G}},k} (x_{gk} P_{gk}^{\mathrm{ROG}} + P_{gk}^{\mathrm{Gmax}} \tau_{gk}^{\mathrm{RO,Gmax}}) \tag{10v}$$

E. The nonlinear functions: $\mathrm{h}(\cdot)$, $\max(\cdot)$, $\mathrm{h}(\cdot)\mathrm{h}(\cdot)$, $\mathrm{h}(\cdot)\max(\cdot)$, $\mathrm{h}(\cdot)\min(\cdot)$, $\max(\cdot)\min(\cdot)$

The linearization of the nonlinear functions is as follows:

$$\mathrm{h}(\rho_{gt} - K) = \theta_{gt}^{\rho,\mathrm{K}}, \forall g, \forall t \tag{10w}$$
$$\max(\rho_{gt} - K, 0) = y_{gt}^{\rho,\mathrm{K,max}}, \forall g, \forall t \tag{10x}$$
$$\mathrm{h}\Big(\sum_k P_{gk}^{\mathrm{ROG}} - \sum_k P_{gkt}^{\mathrm{G}}\Big) = \theta_{gt}^{\mathrm{P}}, \forall g, \forall t \tag{10y}$$
$$\min\Big(\sum_k P_{gkt}^{\mathrm{G}}, \sum_k P_{gk}^{\mathrm{ROG}}\Big) = y_{gt}^{\mathrm{P,min}}, \forall g, \forall t \tag{10z}$$
$$\mathrm{h}(\rho_{gt} - K)\mathrm{h}\Big(\sum_k P_{gk}^{\mathrm{ROG}} - \sum_k P_{gkt}^{\mathrm{G}}\Big) = \theta_{gt}^{\rho,\mathrm{K,P}}, \forall g, \forall t \tag{10aa}$$
$$\mathrm{h}(\rho_{gt} - K)\min\Big(\sum_k P_{gkt}^{\mathrm{G}}, \sum_k P_{gk}^{\mathrm{ROG}}\Big) = z_{gt}^{\rho,\mathrm{K,P,min}},$$

$$\forall g, \forall t \tag{10bb}$$

$$\mathrm{h}(\sum_k P_{gk}^{\mathrm{ROG}} - \sum_k P_{gkt}^{\mathrm{G}})\max(\rho_{gt} - K, 0) = z_{gt}^{\mathrm{P},\rho,\mathrm{K},\max}, \forall g, \forall t \tag{10cc}$$

$$\mathrm{h}(\rho_{gt} - K)\sum_k P_{gk}^{\mathrm{ROG}} = z_{gt}^{\rho,\mathrm{K},\mathrm{P},\mathrm{RO}}, \forall g, \forall t \tag{10dd}$$

$$\mathrm{h}(\rho_{gt} - K)\max(\sum_k P_{gk}^{\mathrm{ROG}} - \sum_k P_{gkt}^{\mathrm{G}}, 0) = z_{gt}^{\rho,\mathrm{K},\mathrm{P},\mathrm{RO}} - z_{gt}^{\rho,\mathrm{K},\mathrm{P},\min}, \forall g, \forall t \tag{10ee}$$

$$0 \leqslant y_{gt}^{\rho,\mathrm{K},\max} \leqslant M\theta_{gt}^{\rho,\mathrm{K}}, \forall g, \forall t \tag{10ff}$$

$$\rho_{gt} - K \leqslant y_{gt}^{\rho,\mathrm{K},\max} \leqslant \rho_{gt} - K + M(1 - \theta_{gt}^{\rho,\mathrm{K}}), \forall g, \forall t \tag{10gg}$$

$$\sum_k P_{gkt}^{\mathrm{G}} - M(1 - \theta_{gt}^{\mathrm{P}}) \leqslant y_{gt}^{\mathrm{P},\min} \leqslant \sum_k P_{gkt}^{\mathrm{G}}, \forall g, \forall t \tag{10hh}$$

$$\sum_k P_{gk}^{\mathrm{ROG}} - M\theta_{gt}^{\mathrm{P}} \leqslant y_{gt}^{\mathrm{P},\min} \leqslant P_{gk}^{\mathrm{ROG}}, \forall g, \forall t \tag{10ii}$$

$$\theta_{gt}^{\rho,\mathrm{K},\mathrm{P}} \leqslant \theta_{gt}^{\rho,\mathrm{K}}, \forall g, \forall t \tag{10jj}$$

$$\theta_{gt}^{\rho,\mathrm{K},\mathrm{P}} \leqslant \theta_{gt}^{\mathrm{P}}, \forall g, \forall t \tag{10kk}$$

$$\theta_{gt}^{\rho,\mathrm{K},\mathrm{P}} \geqslant \theta_{gt}^{\rho,\mathrm{K}} + \theta_{gt}^{\mathrm{P}} - 1, \forall g, \forall t \tag{10ll}$$

$$-M\theta_{gt}^{\rho,\mathrm{K}} \leqslant z_{gt}^{\rho,\mathrm{K},\mathrm{P},\min} \leqslant M\theta_{gt}^{\rho,\mathrm{K}}, \forall g, \forall t \tag{10mm}$$

$$y_{gt}^{\mathrm{P},\min} - M(1 - \theta_{gt}^{\rho,\mathrm{K}}) \leqslant z_{gt}^{\rho,\mathrm{K},\mathrm{P},\min} \leqslant y_{gt}^{\mathrm{P},\min} + M(1 - \theta_{gt}^{\rho,\mathrm{K}}), \forall g, \forall t \tag{10nn}$$

$$-M\theta_{gt}^{\mathrm{P}} \leqslant z_{gt}^{\mathrm{P},\rho,\mathrm{K},\max} \leqslant M\theta_{gt}^{\mathrm{P}}, \forall g, \forall t \tag{10oo}$$

$$y_{gt}^{\rho,\mathrm{K},\max} - M(1 - \theta_{gt}^{\mathrm{P}}) \leqslant z_{gt}^{\mathrm{P},\rho,\mathrm{K},\max} \leqslant y_{gt}^{\rho,\mathrm{K},\max} + M(1 - \theta_{gt}^{\mathrm{P}}), \forall g, \forall t \tag{10pp}$$

$$-M\theta_{gt}^{\rho,\mathrm{K}} \leqslant z_{gt}^{\rho,\mathrm{K},\mathrm{P},\mathrm{RO}} \leqslant M\theta_{gt}^{\rho,\mathrm{K}}, \forall g, \forall t \tag{10qq}$$

$$\sum_k P_{gk}^{\mathrm{ROG}} - M(1 - \theta_{gt}^{\rho,\mathrm{K}}) \leqslant z_{gt}^{\rho,\mathrm{K},\mathrm{P},\mathrm{RO}} \leqslant \sum_k P_{gk}^{\mathrm{ROG}} + M(1 - \theta_{gt}^{\rho,\mathrm{K}}), \forall g, \forall t \tag{10rr}$$

$$\{\theta_{gt}^{\rho,\mathrm{K}}, \theta_{gt}^{\mathrm{P}}, \theta_{gt}^{\rho,\mathrm{K},\mathrm{P}}\} \in \{0, 1\} \tag{10ss}$$

Except for $\max(\rho_{gt} - K, 0)\min(\sum_k P_{gkt}^{\mathrm{G}}, \sum_k P_{gk}^{\mathrm{ROG}})$, all nonlinear terms are linearized through Eqs. (10w)-(10ss). $\max(\rho_{gt} - K, 0)\min(\sum_k P_{gkt}^{\mathrm{G}}, \sum_k P_{gk}^{\mathrm{ROG}}) = y_{gt}^{\rho,\mathrm{K},\max} y_{gt}^{\mathrm{P},\min}$ is linearized by the binary expansion method through Eqs. (10n)-(10s).