## APPENDIX

### PROOF OF PROPOSITION 1

The general form of constraint (6j) can be expressed as:

$$\inf_{\mathbb{P}\in\mathcal{P}_{|\mathcal{I}|}} \mathbb{P}\left(c\left(x_t\right)^T \xi_t + d\left(x_t\right) \le 0\right) \ge 1-\alpha_{\mathrm{PV}} \tag{A1}$$

where $\xi_t$ and $x_t$ are random variable and decision variable, respectively. The chance constraints (A1) can be approximated by the CvaR approach as follows:

$$\begin{aligned}&\inf_{\mathbb{P}\in\mathcal{P}_{|\mathcal{I}|}} \mathbb{P}\left(c\left(x_t\right)^T \xi_t + d\left(x_t\right) \le 0\right) \ge 1-\alpha_{\mathrm{PV}}\\ &\Leftrightarrow \sup_{\mathbb{P}\in\mathcal{P}_{|\mathcal{I}|}} \mathbb{P}-\mathrm{CVaR}_{\alpha_{\mathrm{PV}}}\left(c\left(x_t\right)^T \xi_t + d\left(x_t\right)\right) \le 0\end{aligned} \tag{A2}$$

where the CvaR is defined at the level of $\alpha_{\mathrm{PV}}$ for the $\mathbb{P}$ :

$$\begin{aligned}&\mathbb{P}-\mathrm{CVaR}_{\alpha_{\mathrm{PV}}}\left(c\left(x_t\right)^T \xi_t + d\left(x_t\right)\right) \le 0\\ &\triangleq \inf_{\beta\in R}\left\{\alpha_{\mathrm{PV}}\beta + \mathrm{E}_{\mathbb{P}_i}\left[\left(c\left(x_t\right)^T \xi_t + d\left(x_t\right)-\beta\right)_+\right]\right\}\end{aligned} \tag{A3}$$

The explicit expression for the chance constraint maximization can be written using the above definition of CVaR:

$$\begin{aligned}&\sup_{\mathbb{P}\in\mathcal{P}_{|\mathcal{I}|}} \mathbb{P}-\mathrm{CVaR}_{\alpha_{\mathrm{PV}}}\left(c\left(x_t\right)^T \xi_t - d\left(x_t\right)\right) \le 0\\ &= \sup_{\mathbb{P}\in\mathcal{P}_{|\mathcal{I}|}} \inf_{\beta\in R}\left\{\alpha_{\mathrm{PV}}\beta + \frac{1}{\alpha_{\mathrm{PV}}}\mathrm{E}_{\mathbb{P}_i}\left[\left(c\left(x_t\right)^T \xi_t - d\left(x_t\right)-\beta\right)_+\right]\right\}\\ &= \inf_{\beta\in R}\left\{\alpha_{\mathrm{PV}}\beta + \sup_{\mathbb{P}\in\mathcal{P}_{|\mathcal{I}|}}\mathrm{E}_{\mathbb{P}_i}\left[\left(c\left(x_t\right)^T \xi_t - d\left(x_t\right)-\beta\right)_+\right]\right\}\\ &= \inf_{\beta\in R}\sup_{\mathbb{P}\in\mathcal{P}_{|\mathcal{I}|}}\mathrm{E}_{\mathbb{P}_i}\left[\max_{j=1,2}\left(c_j\left(x_t\right)^T \xi_t - d_j\left(x_t,\beta\right)\right)\right]\end{aligned} \tag{A4}$$

where $c_1(x_t)=c(x_t), c_2(x_t)=0, d_1\left(x_t,\beta\right)=d(x_t)-(1-\alpha_{\mathrm{PV}})\beta_k$, $d_2\left(x_t,\beta\right)=\alpha_{\mathrm{PV}}\beta$ . Assuming the uncertainty set takes the form of a polytope, it can be represented as $\Xi=\left\{\xi\in\mathbb{R}^m : E\xi\le e\right\}$, where $E$ denotes a matrix and $e$ is a vector, both of the suitable dimensions. According to Ref. [22], we have:

$$\begin{cases}\inf\limits_{\pi,s_i,\gamma_{ik}} \pi\varepsilon_{\mathrm{PV}} + \dfrac{1}{|\mathcal{I}|}\sum\limits_{i\in\mathcal{I}} s_i & \\ \text{s.t. } c_j\left(x_t\right)^{\mathrm{T}}\hat{\xi}_i + d_j\left(x_t,\beta\right) + \gamma_{ij}^T\left(e-E\hat{\xi}_i\right) \le s_i & \forall i\le|\mathcal{I}|, \forall j\le 2\\ \left\|E^T\gamma_{ij} - c_j\left(x_t\right)\right\|_* \le \pi & \forall i\le|\mathcal{I}|, \forall j\le 2\\ \gamma_{ij}\ge 0, \beta\in R, \pi\in R & \forall i\le|\mathcal{I}|, \forall j\le 2\end{cases} \tag{A5}$$

where $\xi=\left[P_{\mathrm{CS,PV}}^{i,1},\cdots,P_{\mathrm{CS,PV}}^{i,24}\right]$, take $\boldsymbol{E}=-\boldsymbol{I}, \boldsymbol{e}=0$. To this end, the ambiguous chance constraint can be rewritten as constraint (11b).