Stochastic Optimization of Coupled Power Distribution-Urban Transportation Network Operations with Autonomous Mobility on Demand Systems

The probability models and parameters for RDGs are given as Tables A1-A4.

TABLE A1
PROBABILITY MODELS OF WIND SPEED AND SOLAR IRRADIANCE

Variable	Model	Probability density function
Wind speed	Weibull	$f(v)=\left(\frac{K}{C}\right)\left(\frac{v}{C}\right)^{K-1}\exp\left[-\left(\frac{v}{C}\right)^{K}\right]$
Solar irradiance	Beta	$f(r)=\frac{\Gamma(A+B)}{\Gamma(A)\Gamma(B)}\left(\frac{r}{r_{\max}}\right)^{A-1}\left(1-\frac{r}{r_{\max}}\right)^{B-1}$

where v is the wind speed; K and C are the parameters of a Weibull distribution; r is the solar irradiance; $r_{\max}$ is the maximum solar irradiance; A and B are the parameters of a Beta distribution.

TABLE A2
POWER OUTPUT MODELS OF PV AND WT

RDG	Power output
PV	$P_{\mathrm{PV}}=rR\eta$
WT	$P_{\mathrm{WT}}=\begin{cases}0, & v<v_{\mathrm{in}} \text{ or } v>v_{\mathrm{out}}\\ \frac{P_w(v-v_{\mathrm{in}})}{v_{\mathrm{r}}-v_{\mathrm{in}}}, & v_{\mathrm{in}}\le v\le v_{\mathrm{r}}\\ P_w, & v_{\mathrm{r}}<v<v_{\mathrm{out}}\end{cases}$

where P_w is the rated power of WT units; v_{in}, v_{r}, and v_{out} are the cut-in, rated, and cut-out wind speeds, respectively; R is the area of PV cells; η is the photoelectric conversion rate.

TABLE A3
PARAMETERS FOR PROBABILITY MODELS OF RDGS

Bus in PDN	Variable	Model	Parameters
2	WT_1	Weibull	C=7.5, K=3.0
7	WT_2	Weibull	C=7.0, K=2.0
9	WT_3	Weibull	C=6.0, K=2.5
10	PV_1	Beta	A=0.40, B=8.56
11	PV_2	Beta	A=0.45, B=9.81
12	PV_3	Beta	A=0.50, B=8.94

TABLE A4

PARAMETERS FOR POWER OUTPUT MODELS OF RDGS

RDG	P_w/(p.u.)	v_{in}(m/s)	v_r(m/s)	v_{out}(m/s)	RDG	R(m^2)	η/%
WT_1	0.24	3.5	14.5	20.0	PV_1	2400	0.15
WT_2	0.16	3.0	13.0	19.0	PV_2	2400	0.14
WT_3	0.20	3.5	15.5	20.0	PV_3	2400	0.16