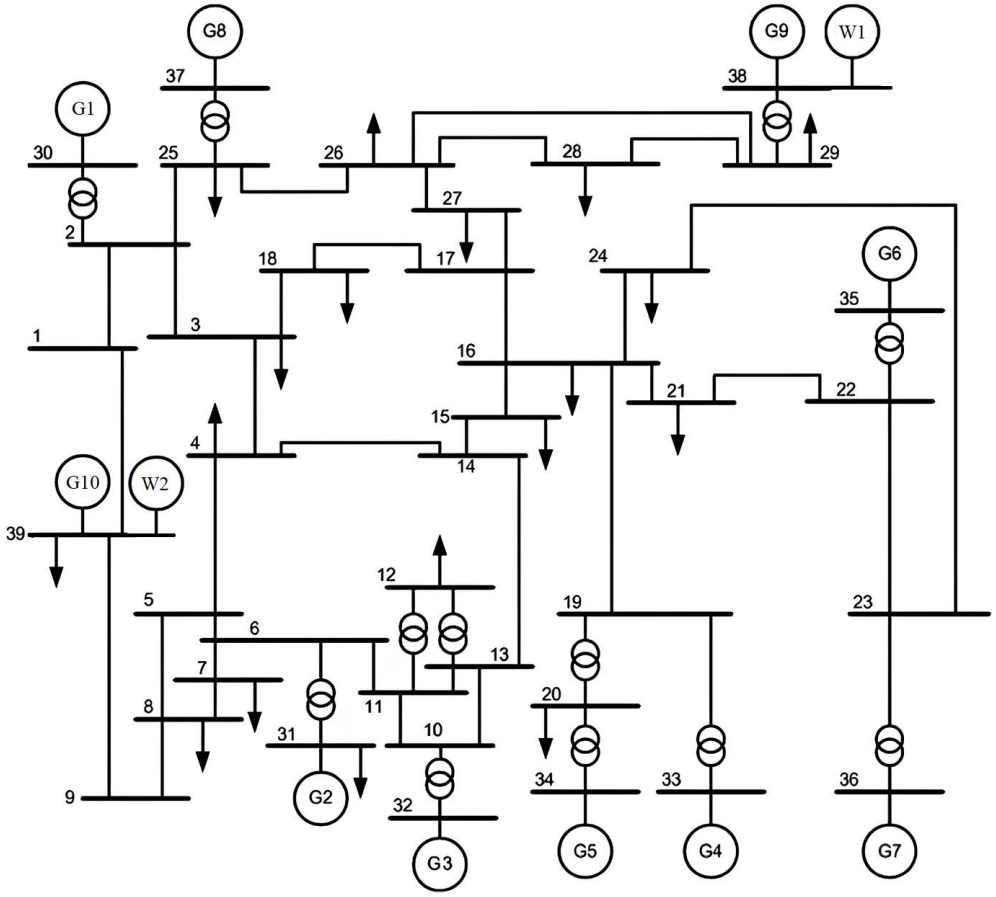

Fig. 1: The illustration of IEEE 39-bus system with 2 wind farms.

TABLE I: Cost and technical data in DA and RT market of IEEE 39-Bus system, where only G_9 and G_{10} are flexible generators to adjust in real-time.

		G_1	G_2	G_3	G_4	G_5	G_6	G_7	G_8	G_9	G_{10}
DA market	Marginal generation cost $\boldsymbol{\rho}$ (\$/MW)	40	30	25	26	27	35	32	38	22	24
	Minimum generation power $\underline{\boldsymbol{p}}$ (MW)	0	0	0	0	0	0	0	0	0	0
	Maximum generation power $\overline{\boldsymbol{p}}$ (MW)	1040	646	725	652	508	687	580	564	865	1100
	Lower ramping limits $\underline{\boldsymbol{r}}$ (MW)	-500	-300	-250	-300	-350	-300	-250	-300	-150	-200
	Upper ramping limits $\overline{\boldsymbol{r}}$ (MW)	500	300	250	300	350	300	250	300	150	200
RT Market	Marginal cost $\boldsymbol{\rho}_+$ (\$/MW)	-	-	-	-	-	-	-	-	52	54
	Marginal utility $\boldsymbol{\rho}_-$ (\$/MW)	-	-	-	-	-	-	-	-	16	14
	Marginal opportunity loss for up-regulation $\boldsymbol{\rho}_+ - \boldsymbol{\rho}$ (\$/MW)	-	-	-	-	-	-	-	-	30	30
	Marginal opportunity loss for down-regulation $\boldsymbol{\rho} - \boldsymbol{\rho}_-$ (\$/MW)	-	-	-	-	-	-	-	-	6	10
	Up-regulation limit $\overline{\boldsymbol{p}^+}$ (MW)	-	-	-	-	-	-	-	-	800	800
	Down-regulation limit $\overline{\boldsymbol{p}^-}$ (MW)	-	-	-	-	-	-	-	-	800	800