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COMMENTS AND CORRECTIONS

Corrections to "Efficient Day-Ahead Scheduling Voltage Control Scheme of ULTC and Var of Distributed Generation in Distribution System"

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In the above article [1], the simulation for CASE 2 contained technical mistakes. First, the scenario data for the simulation included errors caused by technical mistakes in the process of generating the scenarios according to the forecast error levels of the distributed generators (DGs) and loads. Furthermore, the performance index (PI) values in Table 12 of Section IV, which compared the performance of the proposed and conventional control schemes, were incorrectly calculated due to an error in the program calculation process. To correct these technical mistakes, the simulations for CASE 2 were re-performed and the results for each control scheme are shown in Table 12, and a summary of the corrected contents is as follows:

1) In [1, Table 12,], the PI values for the comparison between the conventional control schemes and the proposed control scheme were miscalculated in the program calculation process. This was expressed as a value $10\times$ larger than the normal calculated value. Therefore, this was corrected using Equation (15) given in [1] and is shown in Table 12.
2) In CASES 2-2, 3, 4, and 5 presented in [1], technical mistakes were made in the process of generating the scenario data, meaning incorrect input data was applied. Therefore, the simulations for CASES 2-2, 3, 4, and 5 were re-performed, and the results are shown in Table 12. In addition, the scenario of CASE 2 for the simulation was replaced with 100 random cases for the average error level (as shown in Table 12) to correct technical mistakes and evaluate each control scheme. These 100 random cases according to average error level were scenarios that contained more uncertainty problems due to the forecast errors of DGs and loads compared to the single case presented in [1], which was considered suitable for evaluating each control scheme. The simulation results for each control method are shown in Table 12 and the DG and load forecast profiles used in the simulation were generated based on the scenario presented in [1]. The forecast profiles of the DGs and loads and the simulation environment is the same as that presented in [1].

A description of the scenario for CASE 2 and Table 12 in [1] are presented on pages 157232-4. The corrected contents are Table 12 and the contents explaining it, and the corrected contents are as follows:

In CASE 2, the proposed control scheme was applied to the IEEE 69-bus radial distribution system with photovoltaic generators (PVs), and the performance of each control scheme was evaluated for scenarios including forecast errors, as shown in Table 12. In CASES 2-2, 3, 4, and 5, simulations for 100 random cases were performed according to each average error level presented in Table 12, and the results of each control scheme listed in Table 12 represent the average numerical results for 100 cases.

According to the results in Table 12, the conventional LDC method had deteriorated performance compared to the other control schemes. This clearly demonstrates the need for reactive power control of the DGs in a distribution system with DGs, where it is necessary to improve performance through coordinated control of OLTC and the DGs. In contrast, the real-time control scheme achieved improved performance compared to the other control schemes by determining the tap position of OLTC and the reactive power reference of the DGs using the measurement data. The measurement data in CASE 2 was assumed to be very accurate. However, the real-time control scheme had a large number of tap-changing operations for OLTC, because the real-time control scheme did not consider the number of tap-changing operations for OLTC. The tap-changing operations of OLTC are related to the mechanical life, which is deteriorated by frequent tap changing. Therefore, the real-time control scheme requires a strategy that considers the number of tap-changing operations for OLTC.

TABLE 12. Result of each control scheme in CASE 2.

Cases	Categories	Conventional LDC method [6]	Real-time control scheme [29]	Proposed control scheme			
				1	2	3	4
CASE 2-1 (Load average error : ±0[%], DG average error : ±0[%])	PI	28.30	10.41	12.92	23.18	21.97	12.14
	Reference voltage of ULTC [p.u.]	-	-	1.0068	1.0054	1.0057	1.0063
	Number of tap changing	2.00	7.00	1.00	0.00	0.00	1.00
	Total reactive power [MVarh]	0	42.56	42.49	42.28	45.09	44.46
CASE 2-2 (Load average error : ±5[%], DG average error : ±10[%])	PI	29.87	11.86	16.10	26.16	24.24	15.88
	Reference voltage of ULTC [p.u.]	-	-	1.0068	1.0054	1.0057	1.0063
	Number of tap changing	2.13	9.04	1.00	0.00	0.11	0.91
	Total reactive power [MVarh]	0.00	42.39	42.49	42.28	45.10	44.65
CASE 2-3 (Load average error : ±5[%], DG average error : ±20[%])	PI	30.23	12.01	16.32	26.44	24.25	16.38
	Reference voltage of ULTC [p.u.]	-	-	1.0068	1.0054	1.0057	1.0063
	Number of tap changing	2.15	7.96	1.00	0.00	0.14	0.89
	Total reactive power [MVarh]	0.00	42.46	42.49	42.28	45.10	44.67
CASE 2-4 (Load average error : ±10[%], DG error : ±10[%])	PI	31.09	12.41	17.40	27.55	23.95	16.85
	Reference voltage of ULTC [p.u.]	-	-	1.0068	1.0054	1.0057	1.0063
	Number of tap changing	2.32	8.68	1.00	0.00	0.19	0.89
	Total reactive power [MVarh]	0.00	42.41	42.49	42.28	45.10	44.57
CASE 2-5 (Load average error : ±10[%], DG average error : ±20[%])	PI	31.64	12.62	18.00	27.99	25.05	16.54
	Reference voltage of ULTC [p.u.]	-	-	1.0068	1.0054	1.0057	1.0063
	Number of tap changing	2.26	8.80	1.00	0.00	0.12	0.93
	Total reactive power [MVarh]	0.00	42.48	42.49	42.28	45.11	44.58

※ The numerical results in CASE 2 represent the average of 100 simulation cases for each average error level.

According to the results for the proposed control schemes presented in Table 12, the proposed control scheme 4 achieved better performance than the proposed control scheme 1. Although the proposed control scheme 4 represented improved performance than the proposed control scheme 1 despite the absence of forecast error, it shows a slight performance difference due to the error of the simplified voltage equation applied to the proposed method. CASE 2-1 was a single simulation case and exhibited a slight performance difference due to the inclusion of errors in the simplified voltage equation. However, it is evident that the performance of the proposed control schemes 1 and 4 was very similar in CASE 2-1. Proposed control schemes 3 and 4 had deteriorated performance compared to the other proposed control schemes due to the constant reactive power for one or two sections according to the active power of the DGs. Nevertheless, these control schemes had the lowest number of tap-changing operations for OLTC. The performance of the proposed control scheme 1 deteriorated as the forecast error increased. In comparison, proposed control scheme 4 achieved improved performance compared to proposed control scheme 3 in CASES 2-2, 4, and 5. In CASE 2-3, the proposed control scheme 1 attained improved performance compared to the proposed control scheme 4, despite the large forecast error of the DGs. However, this performance difference was very small, and as mentioned previously, the simplified voltage equation model contained some errors. In CASES 2-2, 4, and 5, the proposed control scheme 1 clearly exhibited deteriorated performance due to the forecast errors of the loads and DGs. In comparison, the proposed control scheme 4 achieved similar levels of performance regardless of the forecast errors of the loads and DGs. This indicated that the proposed control scheme could effectively mitigate deteriorated performance caused by forecast errors.

The proposed control scheme improved the voltage profile of the distribution system with DGs, and its effectiveness was verified through comparisons with the conventional control scheme in the corrected simulation. Furthermore, the proposed control scheme mitigated some forecast errors of the DGs and loads through reactive power control for each section of the DGs and reduced the number of tap-changing operations for OLTC through constant reference voltage control in the substation. These results clearly demonstrate the basis for the conclusion presented in [1] and confirm that the corrected simulation does not contain any technical mistakes. Accordingly, the corrected simulation did not provide any new conclusions and was performed to correct the technical mistakes and evaluate the proposed control scheme.

Permission was obtained from all authors for the correction, and they all reviewed the corrected paper

REFERENCES

[1] K.-Y. Jo, S.-J. Ahn, S.-Y. Yun, and J.-H. Choi, "Efficient day-ahead scheduling voltage control scheme of ULTC and Var of distributed generation in distribution system," *IEEE Access*, vol. 9, pp. 157222–157235, 2021.