power and facing the same meteorological conditions. Line 1 is approximately short compared to lines 2 and 3. There is no significant temperature changes along the line 1 as it is mainly located on the same longitude limiting to some extent the ambient temperature effect. A new challenge arises for lines 2 and 3 as there DLR is not constant throughout the entire line due to the temperature changes as they connect northern and southern parts of Egypt. This problem mandates that we keep the DLR constant at the local value of the DLR at the critical span.

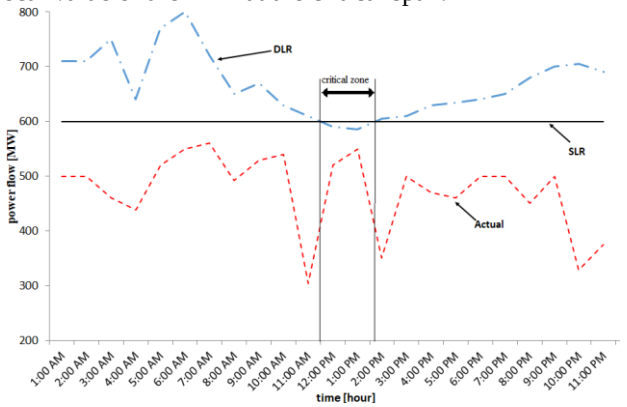

Fig. 7: line 1 power flow

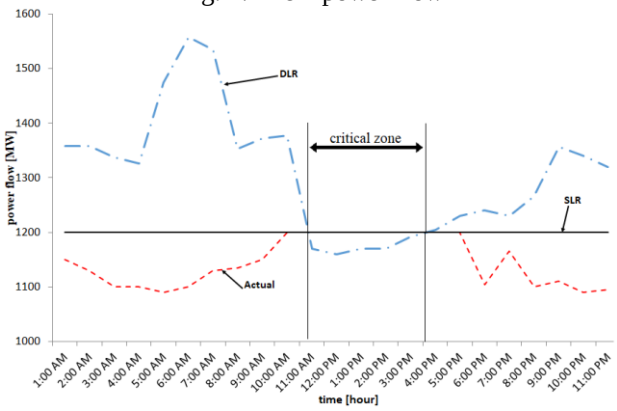

Fig. 8: line 2 and line 3 power flow

From Fig. 7 and Fig. 8, it is noticed that the power flow in the OHTL using the DLR concept is more than the actual power flow. This leads to increase the power supply from the Zafarana wind farm to the electrical grid by 10% and increase the supplied energy from H-dam and Benban solar park by 9.6 %. Also, it is noticed that in the period between 11:30 AM to 2:10 PM at Fig. 7 and from 11:15 AM to 4:00 PM in Fig. 8, the DLR amount is lower than the SLR according to increasing the atmospheric temperature. Therefore, the control model must reduce the power flow in these intervals to improving the system reliability. This does not happen when the operator is using SLR technique.

Finally, the proposed improved power flow with DLR effect using MPC enables the operating system to increased line ratings on existing and new transmission lines, reduced need for special protection schemes, and reduced carbon footprint.

6. Conclusion

This paper discussed Dynamic Line Rating (DLR) and its use for enhancing the power flow in the system. An automotive control technique to manage the power flow in the overhead transmission line (OHTL) by using a combination of a control technique using model predictive control (MPC) and prediction concept using the artificial neural network (ANN). ANN is used to predict DLR as a function of environmental impact. Mathematical models and applications to one-year data are presented in the paper. The system under study in this paper is a portion of the Egyptian grid supplied from a hybrid renewable energy.

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