Graph theory-based radial load flow analysis to solve the dynamic network reconfiguration \(^1\)  
\[
\begin{align*}
\text{\textit{Problem}} & \quad \text{\textit{Solution}} \\
\begin{cases}
\Delta \varphi & \pm 2 \quad \text{\textit{Radial}} \\
\Delta P & \pm 3/4 \quad \text{\textit{Graph}}
\end{cases}
\end{align*}
\]

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KEY WORDS: \(^1\) \(\partial \), \(\varphi\), \(\Delta P\), \(\Delta \varphi\), load analysis, network reconfiguration, distribution system

Network reconfiguration is one of the key tools in planning and operation of medium voltage distribution system. Network reconfiguration is defined as altering the topological structures of the distribution feeders, by changing the position of tie and sectionalizing switches; however, under normal operation, medium voltage distribution networks operate in radial manner \([15]\). Authors have utilized this tool for minimization of power losses \([5,12]\). Some of the authors have also used network reconfiguration \(^1\) as a tool for load balancing \([13,17]\), power supply restoration \([18]\), \(\Delta \varphi\), \(\Delta P\), \(\text{load stability improvement}\) \([22,24]\), and operation cost reduction \([25]\).

Network reconfiguration problem differs from other power system problems including distributed generator placement and shunt capacitor bank placement and can be referred as \(\pm 3/4 \pm 2 \quad \text{\textit{Graph}}\) and \(\pm 2 \quad \text{\textit{Radial}}\) and robust load flow method is required to solve the network reconfiguration \(^1\)  
\[
\begin{align*}
\begin{cases}
\Delta \varphi & \pm 2 \quad \text{\textit{Radial}} \\
\Delta P & \pm 3/4 \quad \text{\textit{Graph}}
\end{cases}
\end{align*}
\]

In network reconfiguration, the topology of the network changes with the tie switch position. Further, it is also needed that the radiality of the system must be maintained and all the buses must remain in contact with the source node (main substation) during reconfiguration process. Therefore, an efficient and robust load flow method is required to solve the network reconfiguration problem. Some of the load flow methods have been utilized in solving the distribution system \([26,27]\). Some of the load flow methods are an approximate form of

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