In subtransmission systems (voltages typically in the range 66-145 kV), series compensation can be used to advantage for voltage improvement on radial lines. Reduced transmission losses as well as power factor correction come as valuable byproducts. Typical applications are found in industrial areas where one or several plants are powered via long radial feeders.

Thus, an ABB series capacitor was commissioned in 1986 in the Hydro-Québec network at Joutel for the purpose of achieving voltage improvement at the receiving end of a 200 km long line feeding power to a mining area at a voltage of 120 kV. The series capacitor, which is rated at 25 Mvar, eliminates the steady-state voltage drop along the line as well as the voltage fluctuations associated with start-up and operation of the large mining loads in the receiving end. As a result, a better quality voltage is secured both for the mines and for other consumers in the area fed from the same network as the mines.

The alternatives to series compensation would have been to upgrade the existing 120 kV system to a higher voltage or to build a completely new line. The series capacitor was chosen at the superior solution due to its considerably shorter installation time and much lower investment cost. The time factor was crucial since the mine could not be operated with the uncompensated 120 kV feeder due to the excessive voltage drop at the receiving end.

The series capacitor was commissioned only 9 months after signing the order.

The operating experience of this installation has fully proved the usefulness of series compensation for voltage control in a subtransmission network.
Layout

Technical data

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>System voltage</td>
<td>120 kV</td>
</tr>
<tr>
<td>Rated reactive power</td>
<td>25 Mvar</td>
</tr>
<tr>
<td>Rated current</td>
<td>410 A</td>
</tr>
<tr>
<td>Degree of compensation</td>
<td>60 %</td>
</tr>
<tr>
<td>Protective scheme</td>
<td>Single-gap</td>
</tr>
</tbody>
</table>

1. Capacitor bank
2. Spark gap
3. By-pass switch
4. Current transformer
5. Damping reactor
6. Damping resistor
7. Trigger
8. Operating mechanism

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