Long-term operational experiences with fluid-filled and polymerised polyethylene 110 kV cables in Vienna

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Guide values

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply area</td>
<td>2000 km²</td>
</tr>
<tr>
<td>Turnover</td>
<td>750 Mio. €</td>
</tr>
<tr>
<td>Employees</td>
<td>3,000</td>
</tr>
<tr>
<td>Customers</td>
<td>1,500,000</td>
</tr>
<tr>
<td>Demand</td>
<td>10 TWh</td>
</tr>
<tr>
<td>Peak</td>
<td>2000 MW</td>
</tr>
<tr>
<td>Substation</td>
<td>40</td>
</tr>
<tr>
<td>Transformer station</td>
<td>10,000</td>
</tr>
<tr>
<td>380kV</td>
<td>85 km</td>
</tr>
<tr>
<td>110kV</td>
<td>760 km</td>
</tr>
<tr>
<td>20 und 10kV</td>
<td>7500 km</td>
</tr>
<tr>
<td>1kV</td>
<td>13000 km</td>
</tr>
</tbody>
</table>
Our 110 kV grid

- 7 groups with extinction of earth-faults, with at least 2 feeding-ins from 380 kV or 220 kV (n-1), 3 of them cable only, 2 cable-dominated
- 80 km of 380 km non fluid-filled
- Since 1990 exclusively polymerised polyethylene laying (except maintenance)
- 50+ years life expectancy for fluid-filled
- Increasing share of ppe in network expected
Why ppe?

- Fluid-filled cables have to be handled with care
- Liquid pressure -> complexity
- Fluid-filled difficult to buy
- Cheaper
- No fluid, no environmental issue
- Maintenance = sheath measurements
- Also with lead shed
Some recent failures

- Wrong reading of the plan
- Lightning arrester striking in
- Waste canal
- Opening a wall by using a hilti hammer
- Well
Wrong reading of the plan
Lightning arrester striking in
Waste channel
Opening a wall by using a hilti hammer
Well
New challenges

- Cooling old cables
- Replacement invest
- Workforce management
- Sophisticated integrated maintenance tools
- optical, urbanistic and electromagnetic
OBJECTIVES
• 110 kV polymerised polyethylene as well as fluid-filled cables are reliable and long-living grid components.
• Some experiences are being exchanged.

RESULTS
The age pattern of 110 kV cable systems will soon enforce high expenses for reinvestition.
At this point it is crucial to take all available knowledge about component behaviour into account to recreate a reliable and economically reasonable network for the next generation.