Load Tap Changer Retrofits, Parts, and Services

Increase transformer life and reliability while reducing operation and manufacturing costs
Transformers are critical assets in your electrical system. When a transformer unexpectedly fails due to a load tap changer (LTC) problem, revenues are lost as production comes to a standstill. Equipment age, extreme usage, lack of replacement parts, and declining availability of technical experts all add to the growing risk of failure of transformer LTCs.

A pre-emptive LTC service plan increases the life expectancy of your critical transformers and reduces total operation and maintenance costs. Knowing who to call when a failure occurs minimizes downtime and total outage costs.

ABB Transformer Remanufacturing and Engineering Services (TRES) understands that both utility and industrial companies need to minimize their risk of unplanned outages and improve their transformer reliability. TRES offers a comprehensive portfolio of LTC services supported by design engineers, service technicians, and an original design documentation database for approximately 70% of the installed transformer base in North America.

**LTC Services**

**Field Service**
ABB performs field maintenance, testing, troubleshooting, and failure analysis. We match our employees to the appropriate make and model of LTC, equip them with accurate diagnostic tools, and ensure they follow stringent procedures to minimize outage time and maximize equipment integrity and job site safety.

Typical equipment includes:
- Timing fixtures (for many LTC models)
- Filter presses
- Vacuum pumps
- Boroscope equipment
- Meggers
- Oil test sets
- High current test sets
- Custom tools
- Testers (hi potential testers, turns ratio testers, and insulation power factor testers)

**Engineering Support**
ABB design engineers and technicians specialize in LTCs and the LTC interface with control circuits and power transformers. With access to an original engineering documentation and procedures database containing more than seven million drawings for most current LTC designs, our service professionals are ready to help.

Services provided include:
- Establishing proper test procedures
- Identifying parts
- Setting proper operating parameters
- Performing studies to engineer improvements
- Troubleshooting
- Failure analysis

**Project Management**
A project engineer manages every LTC service project that ABB undertakes. The engineer assures that all engineering, drafting, purchasing, field resource requirements, terms of service contracts, and warranty considerations always meet or exceed ABB’s corporate standards and customer expectations.

Service projects include:
- Schedule coordination
- 24-hour-per-day project support
- Project review and documentation of changes
Demonstrating the value of LTC Retrofits: Case Study

Retrofits add value to your transformer with reduced customer maintenance costs

ABB TRES was performing routine inspections and preventative maintenance on our client’s unit during a scheduled outage. During this time the maintenance crew of the facility informed our service personnel about other LTC issues on different units. The customer was having difficulty with one type of LTC in their fleet that required frequent maintenance resulting in downtime and loss of revenue. ABB accepted the task of overcoming the customer’s special operational requirements which involved reviewing the design capabilities of the unit. After reviewing mechanical strengths and electrical clearances, ABB developed a design for a complete LTC replacement that would increase reliability and reduce the maintenance frequency. Included in the project were a detailed set of drawings and a bill of materials.

This process reduced the cutting and welding work and also kept active parts from being exposed to the atmosphere, thus minimizing the chance of contamination. The increase in size of the new LTC and the limited work environment made the execution of the project challenging. A wall opening was created in order to get the LTC close to the transformer and allow for easy access to the parts. The customer had a very critical production schedule which required ABB to develop design templates. This allowed ABB to pre-fit all components to verify the accuracy of the parts and if any improvements were needed to reduce the total execution time. The retrofit was completed successfully within the given outage period with no production loss to the customer. The customer was very pleased at the improved reliability of the operation and that the transformer was back in service as scheduled.
LTC Parts

Replacement Parts
Whenever feasible, ABB procurement specialists restore an LTC to original specifications when replacement parts are needed. Our procurement specialists have the ability to immediately source and deliver OEM grade parts to customers anywhere in North America.

Parts include:
- Oil seals
- Insulating panel boards
- Control cabinets
- Arc chutes
- Rotary position switches
- Inspection door gaskets
- Assemblies (contact, brake, cam switch, and mechanism)
- Kits (vacuum interrupter kits, Remote indication kits, voltage regulating relay kits)

LTC Service Availability Includes the Following

<table>
<thead>
<tr>
<th>ABB</th>
<th>WESTINGHOUSE</th>
<th>GENERAL ELECTRIC</th>
<th>REINHAUSEN</th>
<th>MOLONEY</th>
<th>FEDERAL PACIFIC</th>
<th>ALLIS CHALMERS</th>
<th>McGRAW EDISON</th>
</tr>
</thead>
<tbody>
<tr>
<td>UZE</td>
<td>UVT</td>
<td>LR9</td>
<td>LR68</td>
<td>MA-1 &amp; 2</td>
<td>TC-15</td>
<td>TLB</td>
<td>220</td>
</tr>
<tr>
<td>UZF</td>
<td>URT</td>
<td>LR10</td>
<td>LR69</td>
<td>MB</td>
<td>TC-25</td>
<td>TLH</td>
<td>397</td>
</tr>
<tr>
<td>UCG</td>
<td>UTH</td>
<td>LR15</td>
<td>LR72</td>
<td>MB-1</td>
<td>TC-515</td>
<td>TLS</td>
<td>996</td>
</tr>
<tr>
<td>UCC</td>
<td>UTN</td>
<td>LR17</td>
<td>LR79</td>
<td>MB-2</td>
<td>TC-525</td>
<td></td>
<td>500</td>
</tr>
<tr>
<td>UCD</td>
<td>UTR</td>
<td>LR19</td>
<td>LR81</td>
<td>MC</td>
<td>TC-546</td>
<td></td>
<td>V2A</td>
</tr>
<tr>
<td>UBB</td>
<td>UB</td>
<td>LR21</td>
<td>LR83</td>
<td>MH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UCL</td>
<td>URF</td>
<td>LR27</td>
<td>LR85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UZD</td>
<td>LR</td>
<td>LR29</td>
<td>LR89</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>VR</td>
<td>LR31</td>
<td>LR91</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SDR</td>
<td>LR38</td>
<td>LR92</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PDR</td>
<td>LR40</td>
<td>LR95</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>URT-DTS</td>
<td>LR41</td>
<td>LR96</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>URT-ATS</td>
<td>LR45R</td>
<td>LR300</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>UTT (-A,-A70, &amp; -B)</td>
<td>LR47</td>
<td>LR400</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>URT-46, -69</td>
<td>LR48</td>
<td>LR500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>UWW (UWW-A)</td>
<td>LR59</td>
<td>LR700</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>URL-4 (-8,-16)</td>
<td>LR67</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
LTC Retrofits

Applications
Load Tap Changers have been historically impractical to retrofit due to varying flange lengths, lead configurations, operating mechanisms, and control differences. Replacement implementation has been hard to justify since excessive downtime has been required to verify design requirements. However, increasing numbers of operational issues warrant this type of work, including:

- LTC mechanisms that have reached the end of their useful mechanical life
- Parts and qualified service personnel that are becoming hard to find
- LTC designs that may be obsolete with hereditary OEMs that may be unreliable
- Unplanned outages costs which have risen dramatically

A LTC replacement or upgrade kit increases the reliability of your transformer at a fraction of the cost of a new transformer. ABB TRES is able to provide the right combination of custom engineering and field expertise to design, procure, and install a replacement LTC or to retrofit an existing LTC.

The features of modernizing with ABB TRES:

- A single source for all parts and services
- Modern tap changer designs
- Proven and reliable vacuum or resistive technology
- Over 80 years of combined of transformer engineering and design experience
- Mechanical parts that are designed and tested for demanding service
- Controlled factory environment for retrofit kit construction

Benefits

- Increased transformer life
- Reduced installation downtime
- Reduced maintenance costs
- Improved reliability of operation
- Increased contact life available
- Reduced costs as compared to mobilizing large power transformers

Completed LTC Retrofit Projects

<table>
<thead>
<tr>
<th>OLD LTC</th>
<th>EXAMPLE REPLACEMENT LTC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-LTC Transformer</td>
<td>Reinhausen RMV-II</td>
</tr>
<tr>
<td>Westinghouse URT</td>
<td>Reinhausen RMV-II</td>
</tr>
<tr>
<td>Federal Pacific TC-25</td>
<td>Reinhausen RMV-II</td>
</tr>
<tr>
<td>Westinghouse URT-HC</td>
<td>Reinhausen RMV-II</td>
</tr>
<tr>
<td>GE LRT</td>
<td>Reinhausen RMV-II</td>
</tr>
<tr>
<td>Ferranti Packard RT</td>
<td>Reinhausen RMV-II</td>
</tr>
<tr>
<td>Moloney MC</td>
<td>Reinhausen RMV-II</td>
</tr>
<tr>
<td>Ferranti Packard TC-25</td>
<td>Reinhausen RMV-A</td>
</tr>
<tr>
<td>Ferranti Packard LR-525</td>
<td>Reinhausen RMV-A</td>
</tr>
<tr>
<td>GE LRT-500</td>
<td>Reinhausen M (in tank)</td>
</tr>
<tr>
<td>Westinghouse URH</td>
<td>Reinhausen M</td>
</tr>
<tr>
<td>Westinghouse UNR</td>
<td>Reinhausen RMV-II</td>
</tr>
<tr>
<td>GE LR-83</td>
<td>Reinhausen RMV-II</td>
</tr>
<tr>
<td>Westinghouse URT</td>
<td>Reinhausen RMV-II</td>
</tr>
</tbody>
</table>

Federal Pacific LTC - Before Retrofit

Reinhausen RMV-II LTC - After Retrofit

EXAMPLE REPLACEMENT LTC

Ferranti Packard RT
Reinhausen RMV-II

Moloney MC
Reinhausen RMV-II

Ferranti Packard TC-25
Reinhausen RMV-A

Ferranti Packard LR-525
Reinhausen RMV-A

GE LRT-500
Reinhausen M (in tank)

Westinghouse URH
Reinhausen M

Westinghouse UNR
Reinhausen RMV-II

GE LR-83
Reinhausen RMV-II

Westinghouse URT
Reinhausen RMV-II