

# Legacy RTU Upgrade Solutions



Every substation or SCADA engineer will face the choice of upgrading or replacing a legacy remote terminal unit (RTU) at one time or another. Let's address some of the many reasons this decision might be necessary:

- lack of component availability for vendor spare/repair service support
- lack of ability to interface to Intelligent Electronic Devices (IEDs)
- poor reliability of legacy RTUs
- master system replacements or upgrades support modern communications and protocols that are not supported in most legacy RTUs
- legacy protocols have limitations that do not allow you to take advantage of the quantity, resolution, and accuracy of modern data acquisition
- increased availability of modern communications media that are not supported by most legacy RTUs
- limited ability of multiple master communications ports and protocols to share data with other utilities
- inability to segregate data into multiple RTU addresses based on priority

The next step is to determine the technical and financial reasons to upgrade or replace legacy RTUs. An expensive replacement was usually the only option most RTU vendors offered—until now.

Unlike many RTU manufacturers, Advanced Control Systems™ (ACS™) has excelled in providing superior support for its RTU products. In most cases, we have exceeded the traditional ten-year support commitment. ACS has always stressed continual incremental migration of its master and RTU hardware and firmware to minimize the effects of rapid obsolescence prevalent in the microelectronics industry. Although the expected life span of a modern RTU can be more than twenty years, with a support life of at least ten, the practical technological life span is closer to five years.

## **Upgrade versus replacement: a proven business case**

In the early 1980s, we began an upgrade program to address our MPR-3000 series RTUs, built in the 1970s and 1980s. When we introduced the OpEn Connect™

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NTU™-7500 series systems, we expanded the upgrade program to include our MPR-7000 series RTUs, built in the 1980s and 1990s. Next, with the release of our Connex™ series, the first generation OpEn Connect NTU-7500 series built in the late 1990s through 2003 were added to the program. And we are continuing this upgrade policy with our latest line of substation automation controllers—our NTX series. The upgrade program has been very successful, allowing us to upgrade the electronics of literally thousands of ACS legacy RTUs across five model generations that date back to 1976.

Once we had successfully upgraded our own RTU designs, we began looking at legacy RTUs from other manufacturers to see where we could repeat these successes. We began with the Landis & Gyr/Telegyr/Moore Systems RTUs—formally dropped from support by the original product vendor. These products have a card file design similar to our current NTX series products. We successfully implemented an L&G/Moore Systems MPS-9000 and MPS-9000S upgrade at a large mid-western utility, at a tremendous cost saving to the utility versus the projected replacement cost. The utility had previously replaced seven similar L&G legacy RTUs with another vendor's RTUs—a project that took over two years to complete. The ACS upgrade took less than one day per site to implement, and the savings realized versus replacement were in excess of \$34,000 each. Compared to costs for the two previous years (during which full replacements were installed), the upgrade strategy resulted in significant overall project savings:

- project cost reduced by 59%
- engineering time reduced by 97%
- total field crew labor reduced by 92%

According to the customer: “ACS delivered on its promise to significantly reduce the installed cost of (our) RTU upgrades. The field installations went faster and more smoothly than we had expected.”

This project was such a success that the utility took three RTUs they had previously ordered from another vendor as full replacements and put them into stock as spares. Then they purchased and installed our upgrades at these three substations. In each case, they found the savings in labor and cost exceeded their first round of upgrades.

## Technical considerations

When considering a legacy RTU for upgrade, first answer several questions:

1. *Are the existing wiring terminations active or inactive assemblies?*

If they are inactive, the RTU is usually a good upgrade candidate.

2. *If the termination assemblies are active, are they considered reliable and/or repairable?*

If yes to both, the RTU is usually a good upgrade candidate.

3. *Are the existing Control Interposing Relays considered reliable and/or repairable?*

If yes to both, the RTU is usually a good upgrade candidate.

4. *Is the existing cabinet or rack considered usable with an upgrade?*

If yes, the RTU is usually a good upgrade candidate.

5. *Can the original vendor or ACS provide an upgrade kit for this RTU?*

If yes, the RTU is usually a good upgrade candidate.

The choice to maintain the original I/O Termination Boards on a legacy RTU depends on whether the present wiring terminations are reliable. This makes up the bulk of the cost savings with an upgrade and should be considered when answering questions 1, 2, and 5.

If you answered negatively to all 5 questions, your only choice is replacement. However, while a negative answer to 1 or 2 of these questions will affect the total financial gains realized with an upgrade, it does not necessarily negate all the advantages. A complete replacement requires more than just budgeting for a new RTU.

You must also consider the additional budget needed for project management, substation wiring diagram revisions, field installation, point-to-point re-testing labor, and possible changes to the existing master databases and displays. With an upgrade, these costs can be greatly reduced and, in some cases, eliminated.

## Our upgrade solution

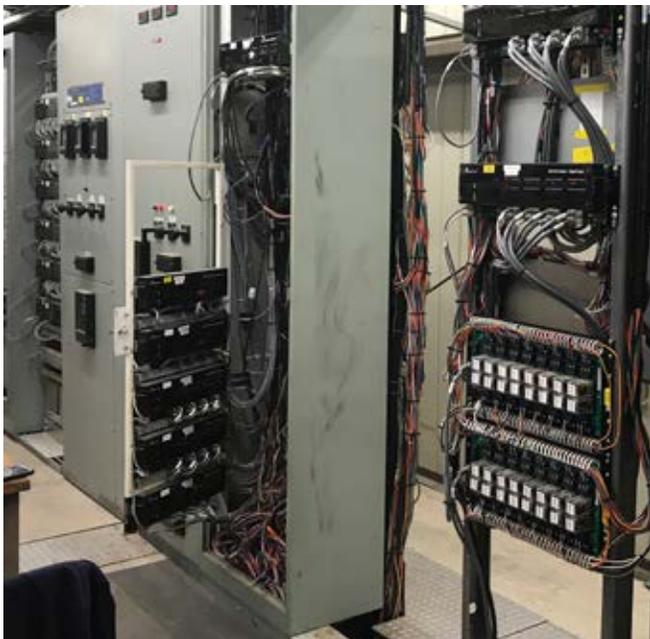
The key to the vast savings in time and money lies in our upgrade solution, which allows you to leave the local I/O terminations and original field I/O wiring in place. If any of the I/O interfaces are active PCB modules that are unreliable or not adaptable to an NTX series interface, we may be able to replace the original vendor's I/O terminations with form and fit blank termination boards that have the same terminal block layout. Or, we can strategically locate our standard Analog or Binary input modules so that relocating the original termination wiring requires minimal effort. This still results in a significant savings in installation and test labor (even if the original wiring has to be moved to the replacement termination boards), as well as long-term maintenance cost savings for these sites. In all cases, the original legacy control relays can be reused, if they are still considered reliable.

With NTX series RTUs, you can configure the RTU master communications database, through Virtual RTU™ addressing, to duplicate the legacy RTU database in its original protocol envelope. This solution lets you:

- greatly reduce wiring and test labor, and engineering costs associated with RTU replacement
- eliminate substation wiring drawing revisions and master station database and display revisions

- eliminate the most failure-prone or unsupported electronics with extremely reliable and fully-supported NTX series hardware and software
- reduce the time required to modernize existing installations from weeks to hours
- obtain many more years of useful life from existing equipment and installations
- take advantage of the latest RTU technology, such as modern open protocols; high-capacity, high-speed master and slave gateways (serial and/or TCP/IP); modern Windows® PC-based configuration and diagnostic tools
- take advantage of modern communications digital interface mediums
- segregate vast amounts of data into separate Virtual RTU addresses; supply this data and control capabilities to multiple master stations at no additional cost
- integrate IEDs inside and outside the existing substations
- Achieve NERC CIP compliance with the use of built-in solutions

Note that we have addressed all the issues raised in the introduction. An ACS NTX series RTU upgrade solves the majority of problems faced by substation engineers responsible for unsupported legacy RTUs that might fail.



Before upgrade



After upgrade - 14 peripherals upgraded in one day

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This success led us to explore other upgrade opportunities. We have developed cost-effective upgrade solutions for a number of RTUs, and have implemented upgrade programs at many utilities, including:

- BBC/CSI 7000 series (DTE, MI)
- CDC/EMPROS/Siemens 8890 (NPPD-Transmission, NE; Public Service Company of New Mexico, NM; City of Detroit, MI)
- CDC 44-500/44-550 (Xcel Energy/Northern States Power, MN)
- Chrysler C7000 (Xcel Energy/Northern States Power, MN)
- Chrysler C8000 (Xcel Energy/Northern States Power, MN)
- Ferranti Outpost (Colorado Springs Utilities, CO)
- Harris 5000/5500 (NSTAR, MA; Provo, UT; Memphis MLGW, TN)
- ILEX 8200 (Orangeburg, SC; Poplar Bluff, MO; Platte-Clay Coop, KS; Village of Rockville Centre, NY)
- Moore Power Systems MPS-9000/MPS-9000S (OG&E, OK; CIPCO, IA; NSTAR, MA; Western Farmers, OK; Nova Scotia Power, Canada; Seattle City Light, WA)
- L&G Telegyr 5300/5500 (New Horizon/Little River Coop, SC; Orlando Utilities, FL; Alameda, CA; City of Palo Alto, CA; TransCanada Ocean State Power, Canada; Xcel Energy/PSC of Colorado, CO)
- L&G Telegyr 5310/5520 (Salem, OR; Sevier County, TN; Fayetteville, NC; NSTAR, MA; Nova Scotia Power, Canada; New Horizon/Broad River Coop, SC; Baldwin EMC, AL; Duke Energy, NC; Arcelor Mittal Burns Harbor, IN; Xcel Energy/PSC of Colorado, CO; Wellesley, MA)
- L&G Telegyr 5700 (NSTAR, MA; City of Palo Alto, CA; Arcelor Mittal Burns Harbor, IN; replacement PDBs: TVA, TN; Loup River Public Power District, NE; Wellesley, MA - new DNP3/IP upgrade)
- L&N Conitel C300 (SDG&E, CA; NV Energy/Sierra Pacific Corp., NV; Pedernales Coop, TX; Cleveland Public Power, OH)
- L&N Conitel C2020 (U.S. Enrichment Corp, KY)
- QEI 4050/4151 (6CPP3)/Quics II (6CP2) (Paducah, KY)
- SNW SR-8000, Type 1 and 2 (DTE, MI; NV Energy/Nevada Power, NV)
- SNW SR-8500 and SR-8550 (DTE, MI; Allegheny Power, PA; El Paso Electric, TX; NPPD-Transmission, NE; NV Energy/Nevada Power, NV; Duquesne Power, PA; Public Service of New Mexico, NM)
- SNW IR-8600 (DTE, MI; El Paso Electric, TX; NV Energy/Nevada Power, NV; Duquesne Power, PA; Pedernales Coop, TX; Great River Energy, MN)
- Tejas CAM/DAC (El Paso Electric, TX; NV Energy/Sierra Pacific Corp., NV; Duke Energy, NC)
- Westronics M3 & M4/Harris 6000 (OG&E, OK)
- Westronics/Harris/GE D20/D200 and peripheral I/O panels (ITC, MI; Montana-Dakota Utilities, ND; MidAmerican Energy, IA; OG&E, OK; Cleco Power, LA; Duke Energy Indiana, IN; NV Energy/Nevada Power Company, NV; Arizona Public Service Company, AZ; Colorado Springs Utilities, CO; Xcel Energy/Northern States Power, MN; Idaho Power, ID; City of Palo Alto, CA; Xcel Energy/PSC of Colorado, CO; Consumers Energy Company, MI; Dairyland Power Cooperative, WI; Entergy, MS; Tennessee Valley Authority, TN; Western Area Power Administration, AZ; Georgia Power Company, GA; Duquesne Light Company, PA)

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