American Electric Power Lower Rio Grande Valley Energized Reconductor

Location: *Rio Grande Valley, Texas*

Voltage: *345kV*

Scope: *Reconductoring to increase transfer capacity of existing lines*

Start: *2012*

Completion: *2015*

Quanta Team: *North Houston Pole Line, Quanta Energized Services, Quanta Technology, Dashiell, Canfer*

Services:
Line Condition Assessment
Structure Rehabilition
Structure Replacement
Energized Reconductor

Since 1996 American Electric Power's peak load in the Rio Grande Valley has grown by 80%. In the winter of 2010 during an unusual cold snap a record 2,378 MW was consumed. This load was 300MW greater than the existing transmission system capacity causing some load to be shed during this peak demand. Compounding this problem, forecasts of predicted load were estimated to be 3,000 MW by the end of 2020. This growth required sufficient transmission to connect generation to load.

In 2012 the Lower Rio Grande Valley was served by 2 single circuit 345kV transmission lines which had been installed in the 1970's and as a result of their proximity to the gulf of Mexico subjected to 4 decades of hurricanes and corrosion by salt water. In spite of the predicted load projections and the peak demand seen in 2010 a new line was unable to be built until sometime after 2020.

With no other options to meet this demand AEP turned to Quanta Energized Services for assistance. QES dispatched a team to Texas to look at the existing line and develop a work method that would safely and cost effectively meet the utilities goal. By installing high temperature low sag conductor (ACCC) in place of the existing 795 ACSR conductor QES was able to effectively double the rated amapcity of the existing 240 mile system. Given the demands on this critical system a long term outage was impossible; utilizing proprietary tools and methods QES was able to complete this entire project while the line remained energized.

Every step of AEP's South Texas Project was reviewed, assessed and planned by senior QES technical advisors. AEP considered the capabilities and competency of the QES team to be the determining factor when deciding whether to undertake such a complex and unique project. The project was subdivided into 5 segments and AEP and QES developed an aggressive project schedule to meet the predicted load demands and maximize productivity on the project.

Several of Quanta Services Operating Units were brought on board to provide the necessary man power and resources to complete this project. At the start of the project the line was inspected by specially trained crews to verify its capacity to handle the upcoming work and to identify any corroded or damaged structures.

This project had many unique challenges but each one was overcome using proven and tested procedures and tools including the use of a "D-phase" mounted to temporary structures, trailer mounted breakers to make and break parallel circuits and equipotential zone work methods during the stringing process. The LineMaster Robotic Arm provided the brawn to move conductors and open up limits of approach when required.

The final phase featured another industry first when a double circuit section of 345kV and 138kV was successfully reconductor and upgraded all without a required outage. The Lower Rio Grande valley project is the longest energized reconductor project ever completed and the longest installation of advanced conductor in the United States.

System Uprating Johannesburg City Power

In South Africa, recent economic growth in the region had created critical demand that was outstripping the capacity of the country's 1950s electricity transmission and distribution infrastructure. The need for infrastructure upgrades in Johannesburg was put on a fast-track for the 2010 World Cup in South Africa.

City Power in Johannesburg, contracted Quanta to re-conductor the existing 88 kilovolt (kV) network around Johannesburg to increase capacity and reliability (approximately 200 MW per circuit) and upgrade to ACCC High Temperature Lisbon conductor using Quanta proprietary LineMaster™ energized robotic arm technology. Although live line work is becoming more common in the U.S. and Canada, this was the first use of the technology in South Africa.

The project started with a complete condition assessment of the lines, towers insulators, tower footing and access roads and facilities. This was followed by line design, conductor selection and general engineering studies. Most of the tower and footing re-conditioning were done first before the energized work started. Although the sophisticated and patented LineMaster™ equipment requires the unique live-line skills of Quanta crews, the project was executed by a combination crew from Quanta and a local construction company in a highly populated urban setting in far less time and at a reduced budget than otherwise would be possible using conventional upgrading techniques and taking system outages. The other hidden benefit using this energized recnductoring technique, is the cost benefit of no outages, hence no revenue loss for the client.

The 12-person Quanta crew arrived in South Africa in August 2009 and received one month of training related to local rules and regulations. The remaining part of the crew (10 linemen) was made up of local authorized barehand linemen. The crew utilized barehand techniques to complete the projects. Phase 1 of the contract – from the Kelvin Generation Plant to Cydna Substation – began early in the summer of 2009 and involves the energized re-conductor of four 88 kV circuits on double-circuit, lattice towers. Each circuit is approximately 10 miles in length. Additional circuits to be worked were identified as the project progressed. By the end of December 2011, Quanta has installed approximately 400km of Lisbon conductor under energized conditions.

Critical system improvements were made in time for the arrival of more than 1.3 million people for the World Cup's first round. During the 2010 World Cup, Quanta also provided emergency restoration, and was kept on standby to ensure that the event was free of disruptions or outages. During the world cup, a tower was damaged and Quanta was contracted in to replace the tower under energized conditions. In 4 hours, Quanta replced the old lattice type tower with a monopole.

Economic and Other Benefits of Energized Work

- Increase system capacity –50% target. Achieve 100%
- Mechanically harden transmission system, extended life
- Improve reliability and enhance economic performance
- Emergency Support During World Cup

Location: *Johannesburg, South Africa*

Voltage: *88kV*

Scope: *Reconductoring to increase transfer capacity of existing lines*

Start: *2009*

Completion: *2012*

Quanta Team: *Quanta Technology, Allteck Line Contactors, Quanta Services Africa*

Services:
Line Condition Assessment
Energized Services
Live Reconductoring
Emergency Restoration

Kansas City Power & Light
ENERGIZING LIFE

Location: *LaCygne, Kansas, USA*
Voltage: *345 kV*
Completion: *2003*
Quanta Team: *PAR Electrical Contactors*
Services: *Energized Services*

LaCygne-Stillwell Energized 345 kV Reconductor

In order to optimize economic generation dispatch and meet power flow contractual commitments, the LaCygne – Stillwell 345 kV transmission line was up-rated using ACSS high temperature conductor.

As outages were unavailable to support timely project completion, PAR Electrical Contractors, a Quanta Services Company, performed the work using energized services technology and work practices.

The 32 miles (51 km) of 345 kV line on H-Frame wood structures was replaced with ACSS conductor within 20 weeks; the power transfer capability of the line was increased 50% to 1972 MVA at a cost of $10 million. The project payback was 14 months; the South West Power Pool receives a residual monthly benefit of $0.8 million.

PAR is the only North American company to safely and successfully re-conductor an energized 345 kV transmission line.

This project was profiled in a September 2003 Transmission & Distribution World magazine, article..

Progress Energy

Location: *Intercession City to Dundee, Florida, USA*
Voltage: *230 kV*
Completion: *2010*
Quanta Team: *Dillard Smith Construction, Quanta Energized Services*
Services: *Energized Services*

Intercession City--Dundee 230 kV Rebuild

Quanta completed the rebuild 20 miles (34 km) of energized 230 kV transmission line. Single circuit 230 kV wood H-frame structures replaced with double circuit steel poles

- No outage required, while 120 days outage required for de-energized
- Outage results in cost of US$7.5 million.
- Structure replacement done in 150 days due to energized nature
- Avoided potential reliability penalty

Additional Energized Projects		Voltage	Completion
AEP	Provided hotstick crew for maintenance T&E work *Location: Oklahoma, USA* *Contract Type: Testing and Evaluation* *Quanta Team: North Houston Pole Line*	*138 kV*	*2013*
Xcel Energy	Full time hotstick crew for maintenance T&E work *Location: Amarillo, Texas, USA* *Contract Type: Testing and Evaluation* *Quanta Team: North Houston Pole Line*	*138 kV / 161 kV / 230 kV*	*2013*
Quillq Energy	**Iqaluit, Nunuavut Town Voltage Conversion** Supply all labor and equipment to convert the Town of Iquluit from their existing 4 kV system to new 25 kV / 14.4 kV system. Project to be completed in the energized state and converted in phases while energized. Scope included new poles, insulators, hardware, transformer upgrades, new secondaries feeders, change out of all existing underground cables to new 25 kV cables, all terminations and connections, upgrading of town substation from 4 kV – 25 kV. All work done using 25 kV rubber glove / stick methods. *Location; Iqaluit, Nunuavut, Canada* *Quanta Team: Valard Construction*	*4 kV / 25 kV*	*2013*
SaskPower	**Emergency Repair – Transmission** Replacement or reparation of structures damaged by cold and heavy ice. Performed under emergency situation as structures were actively collapsing. • Initial work performed under extreme winter conditions • Crews worked 24/7 on rotating shifts in order to ensure the stability of the structures • Required use of specialized equipment: Robotic Arms and Track Machines among others. *Location: Saskatchewan, Canada* *Quanta Team: Allteck Line Contractors*		*2013*
Alabama Power	**Maintenance Contract** Energized repairs for 46 kV, 115 kV and 230 kV. Majority of the work has been energized insulator and structure/pole change-outs, along with re-stringing of shield wire. Repair sleeves and cut in switches. *Location: Alabama, USA – Various Locations* *Quanta Team: Dillard Smith*	*46 kV / 115 kV / 230 kV*	*2012*
ATCO Electric	**Suncor 260 kV / 144 kV Transmission Line Crossing - Fort McMurray** Installation of 2 x 220 foot H-frame tangents, helicopter fly in tension stringing ropes, tension sting in 780m of bundled 795 -240 kV circuits, constructed with oh shield, and fibre shield overtop of existing 144 kV and 260 kV Suncor Energy transmission line for new 240 kV ATCO Electric Line. *Location; Fort McMurray, Alberta, Canada* *Quanta Team: Valard Construction*	*144 kV / 260 kV*	*2012*
BC Hydro	**Arc Horn** 500 kV installation of arc horns and insulator strings *Location: British Columbia, Canada* *Quanta Team: Allteck Line Contractors*	*500 kV*	*2012*

Additional Energized Projects		Voltage	Completion
Enmax	**Overhead Distribution Construction Contract** Construction for City of Calgary (Enmax Power) area for a three year term. Contract includes construction of standard system improvement, through customer driven work orders. These include 1 phase and 3 phase 14.4 kV / 25 kV work packages, overhead and underground distribution construction type projects, varying in size from small to large (up to 800 man-hour type projects). Area employs two to four six-man crews on a continual basis. Work includes both greenfield de-energized construction as well as brownfield energized construction work, reconductoring, tension stringing, 3 phase OH transformer banks, setting poles and anchors within the urban area of Calgary. *Location: Calgary, Alberta, Canada* *Quanta Team: Valard Construction*	*25 kV*	*2012*
Enmax	**Lynwood/Sarcee Trail - Liveline 240 kV Structure Change outs and Installations** Liveline pole installations for Enmax Power in the City of Calgary. Scopes included hauling, framing and setting of 180 foot single monopole type structures inline, utilizing liveline robotic arm and liveline stick methods for installation. Work includes removal of one existing lattice type "L+20" double circuit structure for additional ground clearance for new building and over pass being constructed in Calgary. *Location; Calgary, Alberta, Canada* *Quanta Team: Valard Construction*	*138 kV / 240 kV*	*2012*
Fortis Alberta	**Unit Price Area Contracts** Preparation and installation of various types of structure installs using liveline techniques and equipment. Poles range from 1 phase 25 kV to 3 phase 25 kV typical type structures and framing. All work completed throughout the unit price, area contract boundaries on an as required or as requested basis. Includes arranging material, material pickup and delivery to site, framing prepping and installation of all required poles, equipment, and materials. Coordinating and arranging for proper voltage non reclosure hold off permits/ requests through co-ordinators within each service area point. *Location; Alberta, Canada* *Quanta Team: Valard Construction*	*25 kV*	*2012*
Georgia Power	**Duval-Hatch 500kV V-String Replacement** Replacement of V-String Insulators on (26) 500 kV A-Towers on the Duval-Hatch Line. Testing for Corona Damage. Barehand method used. *Location: Georgia, USA* *Quanta Team: Sumter Utilities, Inc.*	*500 kV*	*2012*
Georgia Power	**GPC Energized Maintenance** Energized maintenance on 115 kV lines. Barehand method used. *Location: Georgia, USA* *Quanta Team: Sumter Utilities, Inc.*	*115 kV*	*2012*
Progress Energy Carolinas	**LIDAR Work** Change out structures (wood to steel) in order to raise lines to achieve required clearances (miscellaneous lines). Hotstick method used. *Location: North Carolina and South Carolina, USA* *Quanta Team: Sumter Utilities, Inc.*		*2012*

Additional Energized Projects		Voltage	Completion
Progress Energy Florida	**Apalachicola-Eastpoint 69 kV Rebuild** Reconstruction of approximately nine miles of 69 kV transmission line. Energized work at GOAB switch and mobile sub only. *Location: Apalachicola-Eastpoint Florida, USA* *Quanta Team: Dillard Smith*	*69 kV*	*2012*
Progress Energy Florida	**St. George Island 69 kV Rebuild** Reconstruction of approximately six miles of 69 kV transmission line. Energized work at switch and mobile sub only. *Location: St. George Island, Florida, USA* *Quanta Team: Dillard Smith*	*69 kV*	*2012*
Altalink	**904 Line Rehab** Performed energized *Location: Canada* *Quanta Team: Allteck Line Contractors*		*2011*
Baltimore Gas & Electric	400 Str Conductor inspection. Barehand work. *Location: Baltimore, Maryland, USA* *Quanta Team: Irby Construction*		*2011*
City of Lethbridge	**Rebuild 138 kV double Circuit Transmission Line 725 LD 725 LW** Performed energized *Location: Lethbridge, Alberta, Canada* *Quanta Team: Allteck Line Contractors*	*138 kV*	*2011*
Edison Jehamo Power	Refurbishment and upgrade of selected City Power 88 kV Line Routes. Performed energized. *Location: South Africa* *Quanta Team: Allteck Line Contractors*	*88 kV*	*2011*
Fortis Alberta	**Medicine Hat area WPF Liveline Maintenance** Replace 490 – 25 kV 3 phase cross arms with new fiberglass cross arms on four of Fortis Alberta worst performing feeder circuits, repair damaged conductors at various locations, re-insulate, re-tie at various locations, all work done in the energized state utilizing 25 kV liveline Linemaster Robotic arm techniques and equipment. *Location: Medicine Hat, Alberta, Canada* *Quanta Team: Valard Construction*	*25 kV*	*2011*
Georgia Power	**Deptford-Whitemarsh 115 kV** Working a 115 kV line, energizing the new line with a bypass switch and de-energizing the old line with a switch. Barehand methods used. *Location: Savannah, Georgia, USA* *Quanta Team: Sumter Utilities, Inc.*	*115 kV*	*2011*
Georgia Power	**GPC Cost Plus Maintenance & Construction** Miscellaneous energized maintenance on 115 kV and 230 kV lines. *Location: Georgia, USA* *Quanta Team: Sumter Utilities, Inc.*	*115 kV / 230 kV*	*2011*

Additional Energized Projects		Voltage	Completion
Kentucky Utilities	**Beaver Creek - Bonneville H-Frame Install & 138 kV Transfer** Installation of H-Frame structures mid-span of existing to alleviate low-clearance issues. *Location: Bonneville, Kentucky, USA* *Quanta Team: Dillard Smith*	*138 kV*	*2011*
NSTAR Electric & Gas	**Waltham to Lexington** Replace approximately 60 towers (40 of them energized) then reconductor two parallel 115 kV transmission lines. This turnkey project consists of each line being approximately 5.2 miles long. The easterly line is designated as Line 320-508, and the westerly line is designated as Line 320-507. These lines are connected at three substations: Station 282, Main Street, Waltham is at the southern end; Station 450, Trapelo Road, Waltham, is near the midpoint; and Station 320, Marrett Road, Lexington, is at the northern end. *Location: Waltham, Massachusetts, USA* *Quanta Team: PAR Electrical Contractors*	*115 kV*	*2011*
Oncor	Various hotstick maintenance work *Location: Fort Worth, Texas, USA* *Quanta Team: North Houston Pole Line*	*69 kV / 138 kV*	*2011*
Pacific Gas & Electric	**TTA Morgan & North Midway Substations** The project includes above and below ground construction of a modification to an existing 115 kV substation. 115 kV transmission lines will be moved under energized conditions in order to minimize outages to the substation. *Quanta Team: PAR Electrical Contractors*	*115 kV*	*2011*
PPL Services Corporation	**Cellon Pole Replacements** Replacement of 104 transmission wood structures with steel light duty poles. Work was completed while energized and voltage capacity was increased from 69 kV to 138 kV. *Location Carlisle, Pennsylvania, USA* *Quanta Team: M. J. Electric*	*69 kV / 138 kV*	*2011*
Progress Energy	**Florence-Kingstree 230 kV Switch Replacements** Working energized 230 kV lines, replacing existing switches with 2000A switches. Barehand methods used. *Location: Kingstree, South Carolina, USA* *Man-hours: 712* *Quanta Team: Sumter Utilities, Inc.*	*230 kV*	*2011*
Progress Energy Carolinas	**LIDAR Work** Change out structures (wood to steel) in order to raise lines to achieve required clearances (miscellaneous lines). Hotstick technique used. *Location: North Carolina and South Carolina, USA* *Quanta Team: Sumter Utilities, Inc.*		*2011*
Rio Tinto Alcan	**Kitimat** Insulator replacement, performed energized. *Location: British Columbia, Canada* *Quanta Team: Allteck Line Contractors*		*2011*

Additional Energized Projects		Voltage	Completion
SaskPower	**25 kV 3 Phase Feeder Crossarm Change Outs** Replace 225 – 25 kV 3 phase cross arms with new cross arms on mainline feeder, repair damaged conductors at various locations, re-insulate, re-tie at various locations. All work done in the energized state utilizing 25 kV 3 phase aerial lift and liveline stick techniques and equipment. *Location; Saskatchewan, Canada* *Quanta Team: Valard Construction*	*25 kV*	*2011*
Seminole Electric Cooperative	**Vandolah-Charlotte 230 kV** Approximately 50 miles of 230 kV reconductor that includes 208 new monopole steel structures for 2156 ACSS conductor. Structure installation performed energized. *Location: Vandolah-Charlotte, Florida, USA* *Quanta Team: Dillard Smith*	*230 kV*	*2011*
Walter Energy / Western Coal	**Brule Mine Project** 230 kV Interconnect, performed energized. *Location: British Columbia, Canada* *Quanta Team: Allteck Line Contractors*	*230 kV*	*2011*
Alabama Power	**Dauphin Island** Energized maintenance work of 46 kV transmission line consisting of replacing wood poles, insulators, automatic splices, conductor, clamps and conduct pole drilling. Work completed using barges in the marshy areas of Dauphin Island, Alabama. *Location: Dauphin Island, Alabama, USA* *Quanta Team: Dillard Smith*	*46 kV*	*2010*
Alabama Power	**McIntosh Substation** Barehand hot substation work; switch installation using hot scaffolding (fiberglass) that had not been used in the U.S. before. *Location Washington County, Alabama, USA* *Quanta Team: Dillard Smith*		*2010*
Altalink	Energized tower move on 931 line/ 933 line *Location: British Columbia, Canada* *Quanta Team: Allteck Line Contractors*		*2010*
American Transmission Company	**Cranberry-Conover-Plains Project** The transmission line portion of the CCP Project was divided into four segments. Segment 1 had 12.6 miles of new 115 kV transmission line with 4.5 miles of 24.9 kV distribution underbuild from Cranberry Substation to Conover Substation. Segment 2 had approximately 30 miles of 69 kV with 24.9 kV distribution underbuild rebuilt to 138 kV transmission line from Lakota Road Substation to Iron Grove Substation. Segment 3 included a rebuild of 28 miles of 69 kV transmission line to 138 kV from the Iron Grove Substation to the Aspen Substation. Segment 4 has a rebuild of 23 miles of 69 kV transmission line to 138kV from Aspen Substation to Plains Substation. Portions of the project were completed energized. *Location Eagle River, Wisconsin, USA* *Quanta Team: M. J. Electric*	*69 kV / 115 kV / 138 kV*	*2010*

Additional Energized Projects		Voltage	Completion
BC Hydro	**Three Year Strategic Alliance** The overhead portion of the contract included maintenance and pole replacement on energized 4 kV, 12 kV, and 25 kV circuits. Reconductoring of energized lines was carried out in both rural and commercial environments. Other work included new line construction and relocation of existing lines, installation of protection (i.e. GOAB switches, disconnect switches and re-closure structures), 1 Phase and 3 Phase service installations including transformers and conductor to service entrance, as well as trouble-shooting and emergency power restoration. Underground distribution and feeder cable were also covered by the contract. *Location: British Columbia, Canada* *Quanta Team: Allteck Line Contractors*	*4 kV / 12 kV / 25 kV*	*2010*
CenterPoint Energy	Insulator Washing *Location: Houston, Texas, USA* *Quanta Team: North Houston Pole Line*	*69 kV / 138 kV / 345kV*	*2010*
City Power	**Engineering Support** Technical studies for USA related engineering costs required to perform the line profile calculations, line scheduling, electrical clearance studies, final conductor calculations, and related live line work calculations for three lines: • Delta - Rosebank; 86 kV - 1.26km • Kelvin - Cydna (1 and 2); 88 kV - 16.8km • Kelvin - Cydna (3 and 4); 66 kV - 16.6km *Location: Johannesburg, South Africa* *Contract Type: Planning, Engineering & Consulting* *Quanta Team: Allteck Line Contractors, Quanta Technology*		*2010*
Enmax	**52nd Street Three Phase Re-conductor / Re-build** Reconductor, rebuild and replace all existing pole structures and conductors to accommodate a new 25 kV and 8 kV double circuit system along 52nd Street between 76th - 61st Ave (approx 3.5km). Relocate existing conductors and string in new 477 waxwing to accommodate one new 25 kV feeder and one new 8 kV feeder system. All work to be completed in the energized state utilizing applicable liveline technique and equipment. *Location; Calgary, Alberta, Canada* *Quanta Team: Valard Construction*	*8 kV / 25 kV*	*2010*
Georgia Power	**McManus-West Brunswick 230kV** Change-out of guys and anchors on energized 230 kV transmission line. *Location: Brunswick, Georgia, USA* *Quanta Team: Sumter Utilities, Inc.*	*230 kV*	*2010*
Georgia Power	**West Brunswick - Kingsland 115kV** Replacing suspension shoes and static wire on 115 kV H-frame structures. Barehand methods used. *Location: Brunswick, Georgia, USA* *Quanta Team: Sumter Utilities, Inc.*	*115 kV*	*2010*

Additional Energized Projects

		Voltage	Completion
Georgia Power	**GPC Cost Plus Maintenance & Construction** Miscellaneous energized maintenance on 115 kV and 230 kV lines. Barehand methods used. *Location: Georgia, USA* *Quanta Team: Sumter Utilities, Inc.*	*115 kV / 230 kV*	*2010*
ITC Midwest	**Marshalltown West Main - Story County 161 kV Rebuild** The project involved approximately 15 miles of 161 kV line rebuild and three miles of new 161 kV construction. The existing structures were wood H-Frames and were replaced with steel monopoles. The rebuild portion of the project was constructed while the existing line was energized using robotic arm technology. *Location: Marshalltown, Iowa, USA* *Quanta Team: M. J. Electric*	*161 kV*	*2010*
KAMO Electric	**AR-32 Lake to Tablerock and Lake to Kimberling City Pole Change Out** Replace wood poles with steel wood equivalent poles on 69 kV h-frame line and 69 kV single pole line with energized 15 kV underbuild, the 69 kV lines will be de-energized. *Location: Kimberling City, Missouri, USA* *Quanta Team: PAR Electrical Contractors*	*69 kV / 15 kV*	*2010*
Michigan Electric Transmission Company	**Black River - Tyler Transmission Line** Installation of approximately four miles of new single circuit 138 kV transmission line on steel poles and replacement of approximately 7.5 miles of single circuit 138 kV line on existing wood poles, with new double circuit 138 kV line on steel poles. Installation also included OPGW. The lines were energized for the majority of the project. *Location: Holland, Michigan, USA* *Quanta Team: M. J. Electric*	*138 kV*	*2010*
Northeast Utilities	**Greater Springfield Reliability Project -Energized Support** As needed energized support for work associated with GSRP in Massachusetts and Connecticut. *Location: Springfield, Massachusetts, USA* *Quanta Team: PAR Electrical Contractors*		*2010*
Oncor	**Duck Cover Iron Bridge** Six mile project, performed energized *Location: Brownwood, Texas, USA* *Quanta Team: North Houston Pole Line*	*69 kV*	*2010*
Progress Energy Florida	**Williston - Cara Tap** Approximately nine miles of 69 kV reconstruction on new monopole concrete structures with 954 ACSS conductor. Energized at tap switch only. *Location: Williston – Cara, Florida, USA* *Quanta Team: Dillard Smith*	*69 kV*	*2010*
Progress Energy Florida	**Bell Tap – Bell** Reconstruction of approximately nine miles of 69 kV transmission line. Energized work at tap switch only. *Location: Bell, Florida, USA* *Quanta Team: Dillard Smith*	*69 kV*	*2010*

Additional Energized Projects		Voltage	Completion
Public Service of New Hampshire	**380 Line Raising** Replaced four structures of Line #380 using energized techniques. *Location: New Hampshire, USA* *Quanta Team: PAR Electrical Contractors*		*2010*
BC Hydro	**Spacer Damper Replacement Transmission Project** • 500 kV energized • Barehand procedures used • Limited or no access to structures in isolated locations and mountainous terrain for part of the project, requiring access by helicopter • Adverse weather conditions (winter conditions in some locations) • Work performed in busy urban areas with many possible public safety hazards • Special training had to be devised. Class D procedures had to be developed and approved by Transport Canada as this type of line access had never been attempted in the past *Location: British Columbia, Canada* *Quanta Team: Allteck Line Contractors*	*500 kV*	
Endaco Mines	• 2551FSR single phase 25 kV circuit with neutral on existing 69 kV structures, arranged as underbuild. Length of 25 kV circuit is approximately 2.8km • Replacement, and installation of new structures • Stringing and sagging approximately 23km of line using live line methods • Dismantling of existing conductors *Location: British Columbia, Canada* *Quanta Team: Allteck Line Contractors*	*25 kV*	
Enmax	138 kV Liveline *Location: Canada* *Quanta Team: Allteck Line Contractors*	*138 kV*	*2009*
Enmax	**Ogden Area Three phase Re-conductor / Re-build** Reconductor, rebuild and replace all existing pole structures and conductors to accommodate a new 8 kV 3 phase feeder circuit system in Ogden area. Relocate existing conductors and string in new 477 waxwing to accommodate one new 25 kV feeder and one new 8 kV feeder system. All work to be completed in the energized state utilizing applicable liveline technique and equipment. *Location: Ogden, Alberta, Canada* *Quanta Team: Valard Construction*	*8 kV*	*2009*
Enmax	Energized circuits on four separate towers *Location: Canada* *Quanta Team: Allteck Line Contractors*		*2009*

Additional Energized Projects

		Voltage	Completion
Progress Energy Florida	**Dundee – West Lake Wales** Rebuild 10 miles of energized 230 kV transmission line (double circuit) *Location: Dundee – West Lake Wales, Florida, USA* *Quanta Team: Dillard Smith*	*230 kV*	*2009*
Rio Tinto Alcan	Barehand insulator replacements *Location: Canada* *Quanta Team: Allteck Line Contractors*		*2009*
American Transmission Company	**Laurium #1 Rebuild** Rebuild of a 13.8 mile 69 kV transmission line from the Atlantic Substation in Houghton, Michigan to the Osceola Substation in Laurium, Michigan. MJE also developed a contingency plan during the rebuild because there is only one circuit to feed under the Portage Canal in Houghton. Work performed energized. *Location Laurium, Michigan, USA* *Quanta Team: M. J. Electric*	*69 kV*	*2008*
BC Transmission	**Dokie Wind Farm** Energized transmission line construction *Location: British Columbia, Canada* *Quanta Team: Allteck Line Contractors*		*2008*
Jamaica Public Service	**Energized Services Repair** Quanta Energized Services and Quanta Technology responded to critical infrastructure repair needs of Jamaica Public Service Company. This project involved the determination of the necessary maintenance work on critical transmission lines. The evaluation indicated that the required corrective maintenance would be most expeditiously performed under energized conditions in order to have the least power delivery service impact. *Location: Jamaica* *Quanta Team: Quanta Energized Services and Quanta Technology*		*2008*
National Grid	**Gardenville – Homer Hill 115 kV Line** Replacement of 14 steel towers with 11 wood pole structures and three steel pole structures under energized conditions. A new steel pole, Structure 614.5, was added to reduce span length. *Location: Olean, New York, USA* *Quanta Team: M. J. Electric*	*115 kV*	*2008*
Northeast Utilities	115 kV De-energized structure replacement: Energized Pole Replacements in Western Massachusetts. *Location: Massachusetts, USA* *Quanta Team: PAR Electrical Contractors*	*115 kV*	*2008*
Sun Electric	**Cut in energized jumpers on 69 kV line** *Quanta Team: Irby Construction*	*69 kV*	*2008*
Connecticut Light & Power	**345 kV Line Live Sleeve Replacement** Provide services for 2156 splice and dead end, replacement for several lines. Work performed energized. *Location: Meriden, Connecticut, USA* *Quanta Team: PAR Electrical Contractors*	*345 kV*	*2007*

Additional Energized Projects		Voltage	Completion
Connecticut Light & Power	**345 kV Polymer Insulator Replacement** Replaced several insulators while line was energized *Quanta Team: PAR Electrical Contractors*	*345 kV*	*2007*
ITC Transmission	**Tittabawassee-HSC#2 138 kV Line** Construction of a new 8.5-mile, double circuit, single-shaft steel pole 138 kV transmission line from the HSC Substation to the Lawndale tap. This line replaced an existing single circuit 138 kV line on wood poles. The existing circuit remained energized requiring M. J. Electric to lean the wood pole circuit to the side to provide line clearance while the new steel poles were installed. *Location: Hemlock, Michigan, USA* *Quanta Team: M. J. Electric*	*138 kV*	*2007*
Northeast Utilities	345 kV line live sleeve replacement for various lines. Provided services for line splice and dead-end, replacement for several lines in Meriden, Connecticut; work performed energized. *Location: Meriden, Connecticut, USA* *Quanta Team: PAR Electrical Contractors*	*345 kV*	*2007*
Northeast Utilities	**Spar Arm Replacement** Provide services for replacing more than 60 spar arms on circuit 1050 115 kV transmission line while energized. *Location: New England, USA* *Quanta Team: PAR Electrical Contractors*	*115 kV*	*2007*
Northeast Utilities	345 kV polymer insulator replacement while energized. *Location: New England, USA* *Quanta Team: PAR Electrical Contractors*	*345 kV*	*2007*
Alabama Power	**Various Barehand Work** *Location: Alabama, USA* *Engineer: Owner* *Quanta Team: Irby Construction*		*2006*
American Transmission Company	**Plains-Stiles 138 kV Line Rebuild** Upgraded and rebuilt the 69 kV and 138 kV lines from Plains Substation in Quinnesec, MI to Stiles, WI. The 45-mile segment from West Marinette to Amberg, WI was upgraded from 69 kV to 138 kV. A 22-mile 138 kV segment from Amberg to the Plains Substation was rebuilt using a temporary bypass line. After rebuilding the existing line, the temporary line was removed. The 44-mile double circuit 138 kV line from Amberg to Stiles was also rebuilt. Portions of the line constructed using energized methods. *Location Amberg, Wisconsin, USA* *Quanta Team: M. J. Electric*	*138 kV*	*2006*
BC Transmission	**Moyie Tap 69 kV** Energized work *Location: British Columbia, Canada* *Quanta Team: Allteck Line Contractors*	*69 kV*	*2006*
BC Transmission	Structure replacement 60L129 circuit upgrade *Location: British Columbia, Canada* *Quanta Team: Allteck Line Contractors*		*2006*

Additional Energized Projects

		Voltage	Completion
Independence Power & Light	**Lees Summit Road Reconductor / Rebuild** From 39th Street south to Adair Parkway, reconductored and rebuilt 15 kV overhead distribution line to 600 amp energized *Location: Lees Summit, Missouri, USA* *Quanta Team: PAR Electrical Contractors*	*15 kV*	*2006*
MidAmerican Energy Company	**Council Bluffs Energy Center** ***Unit #4 Substation Expansion Project*** Consisted of expanding existing 345 kV and 161 kV substations, including installation of new auto transformer, unit #4 generator ties, grading and drainage, structures and welded bus, 345 kV and 161 kV SF6 breakers, center-side break motor operated switches, control wiring, relay panels, battery system, testing and commissioning. All work performed while portions of the substations remained energized including final cutover and back feed. *Location: Council Bluffs, Iowa, USA* *Quanta Team: PAR Electrical Contractors*	*345 kV / 161 kV*	*2006*
Xcel Energy	**345 kV Structure Replacement** Replace existing 345 kV wood h-frame structures with 345 kV steel h-frame structures; line energized. *Quanta Team: PAR Electrical Contractors*	*345 kV*	*2006*
BC Hydro	230 kV Insulators *Location: British Columbia, Canada* *Quanta Team: Allteck Line Contractors*	*230 kV*	*2005*
BC Transmission	60 kV structure replacements *Location: Port Alberini, British Columbia* *Quanta Team: Allteck Line Contractors*	*60 kV*	*2005*
Commonwealth Edison	**138 kV Line Rebuilds - 77.5 Miles** Replaced wood H-frame poles on 77.5 miles of 138 kV transmission line with steel monopole structures in Illinois locations, including: Waterman to Steward 12 miles - Waterman to Glidden 20 miles - Wempletown to Lancaster 22 miles - Davis Creek to Bradley 3.5 miles - Joliet to Matteson 20 miles. Portions completed energized. *Location: Various Locations, Illinois, USA* *Quanta Team: M. J. Electric*	*138 kV*	*2005*
Constellation Energy Group	Repair one 345 kV switch connection energized at Nine Mile Point Nuclear Power Plant *Location: Oswego, New York, USA* *Quanta Team: PAR Electrical Contractors*	*345 kV*	*2005*
ITC Transmission	**Thumb Loop Rebuild** Conversion of a 34-mile, single-circuit, wood H-frame, 120 kV transmission line into a double-circuit, 230 kV line on steel poles. The project began in summer 2004 and was completed in late fall 2005. The work was performed while the existing line was still energized by using live line work methods, which spread the conductors to either side of the right-of-way. The new line was then built between the phases of the energized circuit. *Location: Lapeer, Michigan, USA* *Quanta Team: M. J. Electric*	*230 kV*	*2005*

Additional Energized Projects		Voltage	Completion
Northeast Utilities	**"Contractor of Choice" Alliance Project** Distribution, transmission, and substation work in eastern Connecticut under a three year contract. Energized services included. *Location: Madison, Connecticut, USA* *Quanta Team: M. J. Electric*		*2005*
Alabama Power	Barehand Maintenance - Thru 230 kV *Location: Alabama, USA* *Engineer: Owner* *Quanta Team: Irby Construction*	*230 kV*	*2004*
ComEd	**New Lenox - Aldridge Distribution Work** Installation and reconductoring of approximately 60 new poles and reworking approximately 40 existing poles. Energized services included. *Location: New Lenox, Illinois, USA* *Quanta Team: M. J. Electric*		*2004*
Conectiv Power Delivery	**Six Distribution Projects - Glassboro District** Reconductor approximately 34,200 feet with 3 phase 477AA. Work performed energized. *Location: Gloucester and Salem Counties, New Jersey, USA* *Quanta Team: M. J. Electric*		*2004*
Detroit Edison	**3-Year T&M Distribution Maintenance Contract** A three-year contract (2001-2004) with Detroit Edison to provide distribution line maintenance, including storm damage work. The previous three-year contract began Spring 1998 and ended Spring 2001. *Location: Detroit, Michigan, USA* *Quanta Team: M. J. Electric*		*2004*
Nevada Power Co.	**Mountains Edge – North and South Relocation Project** 138 kV on concrete and steel poles. 954 ACSR with 7/16" static and/or OPGW; two separate sections of 1.75 miles each, this project also involved energized 69 kV work. *Location: Las Vegas, Nevada, USA* *Quanta Team: PAR Electrical Contractors*	*138 kV / 69 kV*	*2004*
Wisconsin Public Service	**Multiple 138 kV Maintenance Projects** Multiple 138 kV line projects in the Upper Peninsula of Michigan. Much of the work is performed on energized lines. *Location: Upper Peninsula, Michigan, USA* *Quanta Team: M. J. Electric*	*138 kV*	*2004*
American Transmission Company	**Kewaunee – North Appleton 345 kV Live Line Arm Replacement** Live line replacement of 114 structures on 19 miles of H-frame line *Location: Brown County, Wisconsin, USA*	*345 kV*	*2003*
American Transmission Company	**Christiana-Kegonsa 138 kV circuit** Energized Reconductor - 12 miles on lattice steel structures *Location: Wisconsin, USA* *Quanta Team: Quanta Energized Services*	*138 kV*	*2003*

Additional Energized Projects

		Voltage	Completion
American Transmission Company	**DeTour Reliability Improvement Project** Rebuild of a nineteen mile 69 kV transmission line including construction of new wood pole line five feet from the existing energized line and removal of the existing line when the new line construction was complete. *Location: DeTour, Michigan, USA* *Quanta Team: M. J. Electric*	*69 kV*	*2003*
American Transmission Company	**345 kV Live Line Arm Replacement** Replacement of arms on 110 wooden H frame structures containing 345 kV transmission line. The work was completed while the lines were energized. *Location: Brown County, Wisconsin, USA* *Quanta Team: M. J. Electric*	*345 kV*	*2003*
Conectiv Power Delivery	**Route 47 Relocation Project** Relocation of two miles of 12 kV distribution line on Route 47, a heavily travelled state highway. Work performed energized. *Location: Rio Grande, New Jersey, USA* *Quanta Team: M. J. Electric*	*12 kV*	*2003*
Conectiv Power Delivery	**Conectiv Reconductoring Projects** Distribution work for four projects which involved the reconductoring of 19,800 feet of wire. Performed energized. *Location: Barnegat, New Jersey, USA* *Quanta Team: M. J. Electric*		*2003*
Cutler-Hammer Engineering	**Fort Dix Distribution Rebuild** Installation of 98 poles for a new two mile 5 kV line, new overhead transformers, pad mount transformers, conduits and panels in the buildings, directional boring conduits under the prison fence, and removal of an existing line between two security fences. *Location: Fort Dix, New Jersey, USA* *Quanta Team: M. J. Electric*	*5 kV*	*2003*
Enmax	**84th Street Rebuild/Reconductor** Rebuild/Reconductor - replace all existing pole structures, hardware and apparatuses to accommodate a new 25 kV circuit system along 84th Street between 50th Ave and Glenmore Trail in the City of Calgary, Alberta (approx 3.5km). Relocate existing conductors and string in new 477 waxwing to accommodate the existing 25 kV feeder system upgrade. All work to be completed in the energized state utilizing applicable liveline techniques and equipment. *Location; Calgary, Alberta, Canada* *Quanta Team: Valard Construction*	*25 kV*	*2003*
First Energy	**4 kV to 13 kV Conversion Prep Work** Performed prep work for converting a 4 kV line (ungrounded system) to 13 kV line (grounded system). Involved replacing poles, changing out transformers, and grounding. *Location: Pine Beach, New Jersey, USA* *Quanta Team: M. J. Electric*	*13 kV*	*2003*

Additional Energized Projects

		Voltage	Completion
Alabama Power	Various barehand projects *Location: Alabama, USA* *Engineer: Owner* *Quanta Team: Irby Construction*		*2002*
CenterPoint Energy	Barehand maintenance T&E work *Location: Houston, Texas, USA* *Contract Type: Testing and Evaluation* *Quanta Team: North Houston Pole Line*	*138 kV / 345 kV*	*2002*
Entergy Services	Various barehand projects in Louisiana *Location: Louisiana, USA* *Engineer: Owner* *Quanta Team: Irby Construction*		*2002*
Entergy Services System	**Barehand Projects** Various barehand projects in Louisiana *Location: Baton Rouge, Louisiana, USA* *Engineer: Owner* *Contract Value: Cost Plus* *Quanta Team: Irby Construction*		*2002*
Alabama Power	Barehand Work *Location: Alabama, USA* *Engineer: Owner* *Quanta Team: Irby Construction*		*2001*
Rochester Gas & Electric	**34 kV Tie Upgrade** Ten miles of new 34 kV double circuit line with a 12 kV underbuild. *Location: Rochester, New York, USA* *Quanta Team: M. J. Electric*	*34 kV*	*2001*
Rochester Gas & Electric	**RG&E Line Maintenance** Distribution line work for Rochester Gas & Electric to provide distribution line maintenance. Energized services included. *Location: Rochester, New York, USA* *Quanta Team: M. J. Electric*		*2001*
Rochester Gas & Electric	**Sodus Line Conversion** Conversion of ten miles of 4 kV line to 12 kV, replacement of some poles, and reconductoring of existing circuit. *Location: Sodus, New York, USA* *Quanta Team: M. J. Electric*	*12 kV*	*2001*
City of Geneva, IL	**City of Geneva FY2000 Pole Changeout** This project is part of a multi-year pole replacement project. Replaced 220 wood distribution poles and installed wildlife protection devices on an additional 250 poles. Much of the work was performed in the backyards of the local residents and required close coordination and communication. *Location: Geneva, Illinois, USA* *Quanta Team: M. J. Electric*		*2000*

Additional Energized Projects		Voltage	Completion
Rochester Gas & Electric	**Substation 419 Line Conversion** Converted a 4 kV line to 12 kV. Installed new transformers, new wire, set poles and removed old equipment. *Location: Henrietta, New York, USA* *Quanta Team: M. J. Electric*	*12 kV*	*2000*
City of Fountain, CO Electric	**City of Fountain 115 kV Transmission Crossing Rebuild** Barehand work *Location: Fountain, Colorado, USA* *Engineer: Owner* *Quanta Team: Irby Construction*	*115 kV*	*1999*
Bangor Hydro-Electric	**Rebuild 66 Line** 115 kV energized (approx. 100 structures) *Quanta Team: PAR Electrical Contractors*	*115 kV*	*1998*
APS/West Penn	**Armstrong – Elko & Burma-Ridgway** 138 kV Wood H-Fr. line rebuild (energized), 100.7 Miles *Quanta Team: PAR Electrical Contractors*	*138 kV*	*1994*
Bowater / Great Northern	**Energized Structure Changeout** 30 Miles *Quanta Team: PAR Electrical Contractors*	*115 kV*	*1992*
Public Service Company of Colorado	**Lookout to St. Vrain 230 kV** Installed 36 miles of 1033.5 ACSR conductor on existing double circuit structures with existing circuit energized; lattice steel towers. *Location: Longmont, Colorado, USA* *Quanta Team: PAR Electrical Contractors*	*230 kV*	*1992*
Public Service Company of Colorado	**Barr Lake to Ft. Lupton 230 kV** Installed 20 miles of 1033.5 ACSR conductor on existing double circuit structures with existing 230 kV circuit energized. *Location: Ft. Lupton, Colorado, USA* *Quanta Team: PAR Electrical Contractors*	*230 kV*	*1988*