



QUANTA
ENERGIZED SERVICES

QUANTA ENERGIZED SERVICES

Quanta's patented LineMaster robotic arm enables:

- Increasing utilization of existing transmission assets
- Safely reconductoring, rebuilding and replacing/adding lines and equipment while not taking system out of service



ROBOTIC ARM ENABLES ...

- **Securely holding energized lines/equipment intact while upgrades are occurring**
- **Increasing personnel safety distance to live-lines**

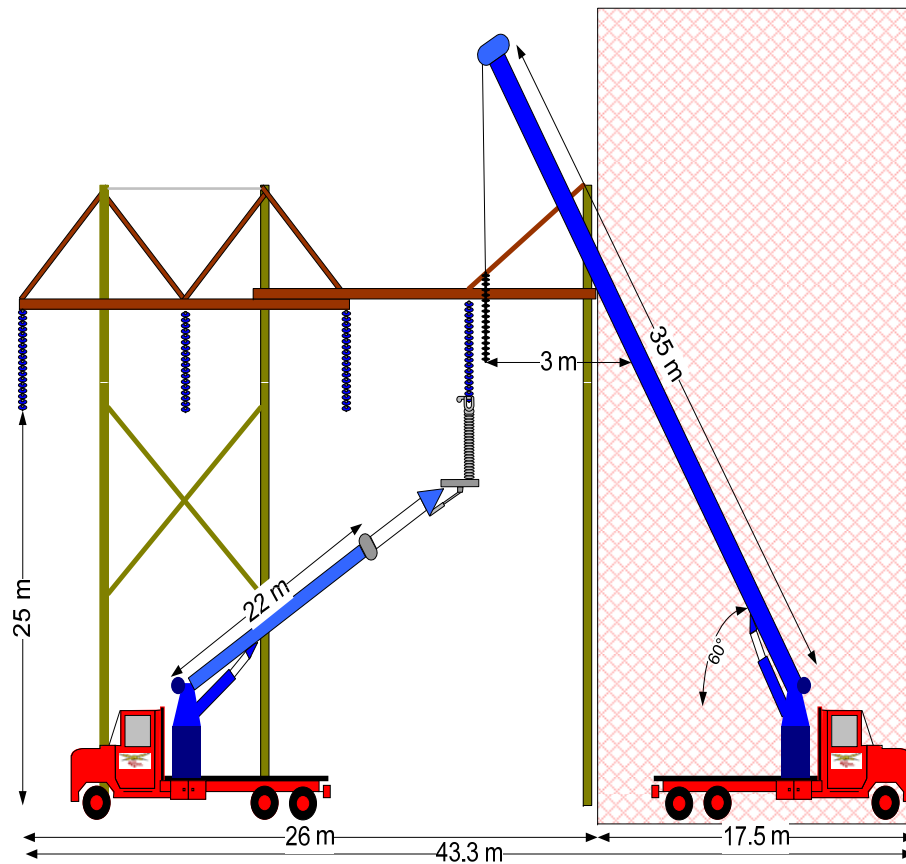


LINEMASTER ROBOTIC ARM

- Operates by hydraulic actuator that attaches to conventional line trucks
- Unit consists of adaptor, robotic arm and fiberglass segment
- Robotic arm can extend up to +/- 10 feet and rotate 270 degrees
- 4 primary unit models:
 - 500 and 1,000 lbs lift
 - 5,000 lbs, single-phase
 - 12,000 lbs, three-phase
- Control is by ground-based safety spotter



OPERATES IN RESTRICTED RIGHT OF WAY



Advantage of robotic technology is restricted rights of way.

ENERGIZED CLIENTS

- **AEP (PS Ok)** – 345kV switch repair
- **Alabama Power** – Nuclear plant substation and daily transmission maintenance
- **Aquila** – Robotic arm and bare-hand work
- **ATC** – Energized reconductor and robotic arm structure change
- **Austin Energy** – Re-sag 345kV, bare-hand
- **Bruce Nuclear** – Substation maintenance
- **Cathiness** – Bare-hand insulator change on dead-ends
- **Entergy** – Nuclear substation
- **Exelon** – Several nuclear plant substations jumpered-out 500kV switches
- **KCPL** – 345kv energized reconductor, robotic and bare-hand
- **LCRA** - Re-sag 345kV and bare-hand
- **National Grid USA** – 115kV bare-hand and hot-stick
- **Northeast Utilities** – 345kV sleeve and dead-end replacements, structures change
- **Oncor** – Robotic arm structure changes
- **PHI** – various T voltages bare-hand
- **Westar** – Switch replacement and installed bare-hand
- **International clients**

UNBLEMISHED ENERGIZED SAFETY RECORD

- No energized work-related incident or injury during more than 2,000,000 energized work man-hours
- Quanta conducts tough training program
 - Screen many journeyman linemen for candidates
 - 120 hours of training per candidate, including math and use of tools
 - Demanding tests -- high washout rate
 - Over 200 Quanta lineman have passed for energized work
- “Proven-safe” energized work procedures
 - If a need to change a procedure is identified, work is stopped, procedure is revised, workforce is retrained, then work is restarted

ENERGIZED LINE CONSTRUCTION & MAINTENANCE TODAY

- Transmission Owner Responsibility
- Chosen after review of all other alternatives
- Cost justified from the Transmission Owner perspective
- Expense or Capital Costs



ENERGIZED WORK BENEFITS

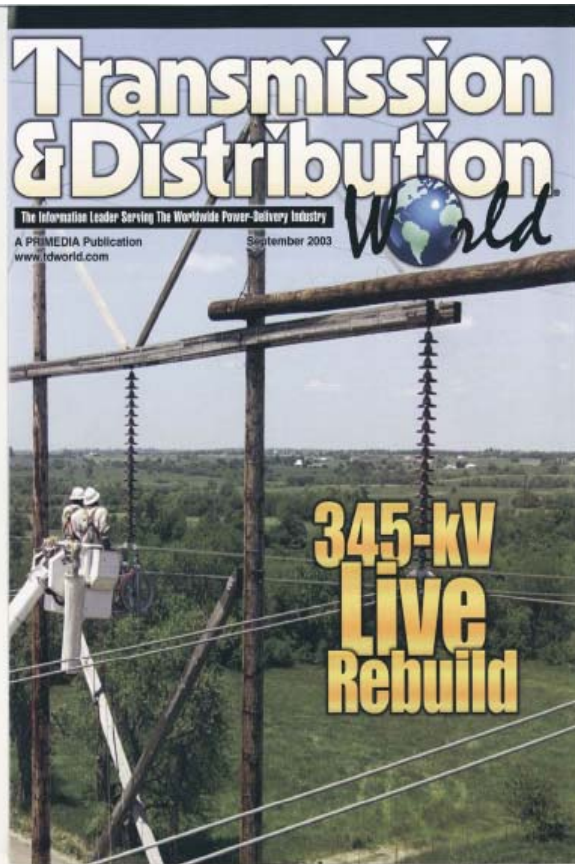
- Enables upgrade relief to congested paths without adding to congestion by scheduling outages to perform work
 - Circuits most in need of relief are usually those difficult to schedule out of service
 - Reconductoring can increase thermal capacity
 - Structures beyond their expected service life can be repaired
- Enables reuse of existing rights of way
- Reduces matting and footprints in wetlands areas
- Reduces operational costs and delays of line switching and grounding
- Enables emergency repairs to generators (including nuclear plant substations) without plant outage
 - Avoid costs of shutdown, restart and replacement purchase power

REGIONAL BENEFITS OF ENERGIZED WORK

- Minimize risk to system reliability
- Congestion savings
- Lost revenue savings to generators
- Savings to transmission owner
- Manage reliability risk until permanent solution
- Not fully captured today



CAPTURING THE MARKET BENEFIT: *COST RECOVERY OF ENERGIZED SERVICES ON A REGIONAL BASIS*



- Utilize Congestion savings to pay for Energized Services
- Share cost with those who benefit
- Regional Tariff adder

QUESTIONS?

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