



CAPABILITIES

Experts in Protection and Control

Where does your team look for Protection expertise?

Quanta Technology is helping many Utilities across the country with their Protection resource needs. We specialize in providing protection specialists to supplement your needs in times of heavy work volumes, training, implementation of new process, or when advanced testing techniques are required. Quanta Technology is a premier choice for Investor Owned, Cooperative, and Municipal Utilities. Our laboratories, located across the country and internationally, support major industry advancements including Real Time Digital Simulation testing of Protection Systems. Our longstanding history of innovation has helped position our customers to succeed in some of the most complicated situations. Let our Protection and Control team show you how Quanta Technology can prepare and support your organization for new challenges facing the evolving protection industry.

Top 6 Reasons Utilities Hire Quanta Technology for Protection:

- ◆ Lack of Resources with Protection Expertise
- ◆ Lack of Resources to support NERC Compliance
- ◆ 3rd Party Evaluation of System through Wide-Area Protection Studies
- ◆ Validation of Short Circuit Model
- ◆ Advanced Applications utilizing Real Time Data Simulation
- ◆ Quanta Technology's analysis is independent of manufacturers

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Utility Protection Challenge	Quanta Expertise
Lack of resources with Protection expertise Lack of adequate staff for capital projects	Staff augmentation Protection for settings support, EHV and HV fault analysis, Fault calculations, and third-party peer review
Lack of resources to compete compliance requirements: - PRC-019, PRC-023, PRC-024, PRC-025, PRC-026, PRC-027	Supplemental staff for Compliance studies for preparation into new studies: - PRC Standards - CIP Standards
Identifying latent protection issues in the transmission grid and creating a verified base case for use in PRC-027	Wide-Area Protection coordination studies
Review and validation of short-circuit model	CAPE and ASPEN data and model reviews
Advanced Applications	IEC 61850 support & evaluation DER integration protection studies RTDS testing of protection systems PMU Applications

Staff Augmentation, Analysis, and Peer Review

Quanta Technology team provides drawings, review, support, and protection settings / coordination review services to utility customers based on their templates and protection philosophy. In cases of the customer lacking the templates and /or philosophy settings criteria, Quanta Technology can support the development of the customer's own relays setting templates and protection settings criteria. Quanta Technology also performs third party peer review on the settings work performed by other entities.

Supplemental Staff for Compliance Studies

Our protection engineers are experienced at reviewing protection settings for standards compliance. For example, we have helped several utilities to verify and document their system compliance with the PRC-023 reliability standard. Compliance with the PRC-023 Transmission Relay Loadability Standard requires a thorough review of all protection functions and associated settings that could trip on-load current in an effort to identify and correct any potential load compliance issues. Doing this in a timely manner has become a major challenge for many transmission utilities. Quanta Technology's project management has been the solution for our utility customers.

Wide Area Protection Coordination Studies

Over time, relay settings may be impacted by system changes. Quanta performs studies to review relay coordination across the transmission grid with testing for sensitivity and selectivity, evaluation of protection performance under numerous fault cases and contingencies, and generation of actionable reports for utility engineers to rank issues found based on pre-defined risk levels. This study not only provides a detailed coordination review with numerous fault and contingency issues, but ensures that the system and relay data is configured in the short circuit and settings management databases. Our experience provides a solid base case for future PRC-027 studies.

CAPE and ASPEN Support

Today's complex and integrated protection and control systems require more sophisticated modeling and study tools to simulate and analyze the dynamic behavior of the power network. Our protection experts provide support to utilities in updating and validating their CAPE, ASPEN or other system databases, as well as work with utilities on generating automated reports or summaries from Powerbase, CAPE, ASPEN or other tools for setting summaries or compliance records. We also provide independent assessment of the various tools on the market, based on the utility needs and provide assistance in tool evaluations.

IEC 61850, DER, RTDS, and PMU Applications

In addition to the items outlined above, Quanta Technology offers comprehensive studies and testing of advanced protection applications such as DER, RTDS studies, IEC 61850, PMU's, and others. These capabilities include: (i) Review of the existing protection scheme, (ii) Protection system design including any changes to existing equipment, (iii) Modeling in simulation software and evaluation of protection system through coordination studies and/or event analysis, and (iv) real-time hardware-in-loop testing of the protection scheme utilizing Real Time Digital Simulation (RTDS) Also, Quanta Technology's industry experts have participated in the development of the IEC 61850 protocol since its inception in 1995. Quanta can assist utilities developing a system architecture, automating and configuring networked devices from multiple vendors and understanding new communication applications. A Quanta Technology IEC 61850 strategy project maps these factors to the needs and circumstances of the utility, weighing alternatives and risks in the process. Further, we have worked with utilities on the development, evaluation and testing of Special Protection Schemes and Wide Area Monitoring Protection and Control using PMUs.

What are the most common tests we have performed in Quanta Technology advanced laboratory?

Hardware in the Loop testing to validate:

- Training on Real Time Digital Simulation
- Protection for series compensated lines
- IEC 61850 architecture performance
- DER protections schemes
- Hardware functional testing
- PMU hardware and system performance

We are the #1 choice for hardware in the loop testing.

Our expertise with Real Time Digital Simulation, coupled with our competencies in all areas of utility work, including renewable integration, protection, distribution and transmission; makes Quanta the 1st choice, for our existing customers to test advanced applications.

About Quanta Technology:
Quanta Technology is a consulting and technology firm providing expertise, software and testing tools to solve strategic and operational problems for global energy utilities and industry. We focus on solutions for transmission and distribution in key areas of protection & control, planning, operations, asset management, as well as emerging technologies such as : distributed energy resource integration, storage and energy system automation.

Quanta Technology is a wholly owned subsidiary and technology arm of Quanta Services Inc. (NYSE: PWR).

Our Locations: Raleigh, NC headquarters and regional offices in Boston, Chicago, Oakland and Toronto, Canada.



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