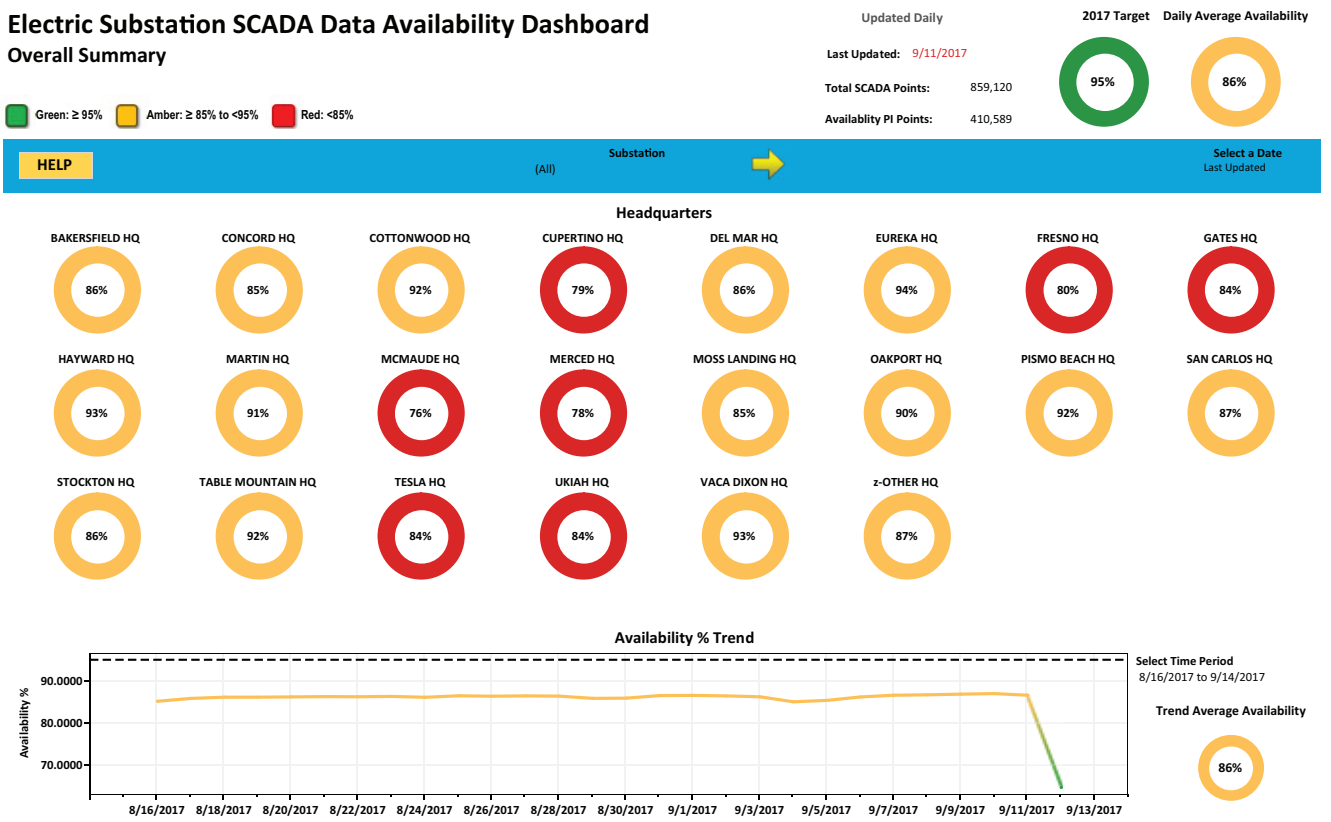
AFFORDABILITY, RELIABILITY AND SAFETY CAN COEXIST IN THE MODERN UTILITY

By Scott Woodbury, BRIDGE Energy Group

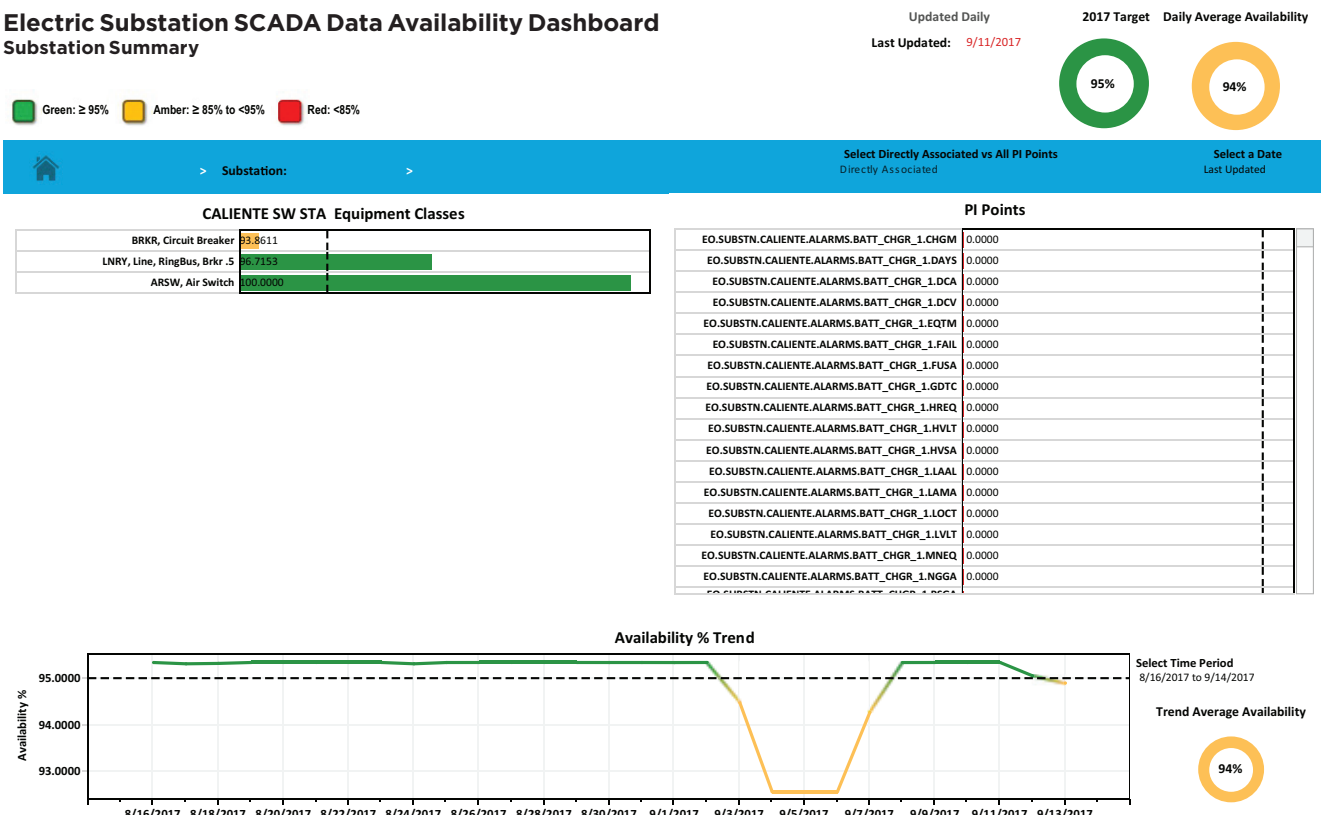
Affordability, reliability and safety don't easily come together for utility companies. The scale of infrastructure makes maintaining reliability challenging, while prioritizing reliability and safety does affordability no favors. However, some technological breakthroughs trigger a new approach with the right formula to succeed on all three fronts. Riding the wave of grid modernization, these advances include the confluence of next-generation supervisory control and data acquisition (SCADA); fault location, isolation and system restoration (FLISR); and related technologies — including predictive analytics, cloud storage and the advent of the Internet of Things (IoT).

SCADA is a control system architecture that uses computers, networked data communications and graphical user interfaces to deliver operational data. This includes the instantaneous measurements of volts, currents and breaker status, which are continuously transmitted from field devices to the SCADA system in the control center. By incorporating IoT technologies such as cloud storage and predictive analytics, modern SCADA software, when integrated properly, can manage more-complicated datasets than traditional systems. This development is enabling unprecedented visibility for grid operators at a time when it is needed most.

BRIDGE Energy Group's expertise in this area allows for close collaboration with Pacific Gas & Electric Company (PG&E) as they operationalize their grid modernization goals. Based in San



The Overall Summary dashboard shows high-level analytics for quick and easy insights, including the data availability percent trend for a user-defined time frame, as well as the target percentage for the year. (BRIDGE Energy Group)



The Substation Summary dashboard provides a detailed look into the circuits that are fed by the selected substation and their current availability. (BRIDGE Energy Group)

Francisco, PG&E is one of the largest combination natural gas and electric utilities in the nation. It provides natural gas and electric service to approximately 15 million people throughout a 70,000-square-mile service area in northern and central California. The key facilities of PG&E's electric transmission and distribution infrastructure include 18,600 miles of transmission lines, 850 substations, 123,000 miles of distribution lines and more than a million transformers. These facilities form an electric network that connects in-area generation sources and bulk energy transmission from southern California, the western United States and Canada.

The PG&E Grid Modernization Plan

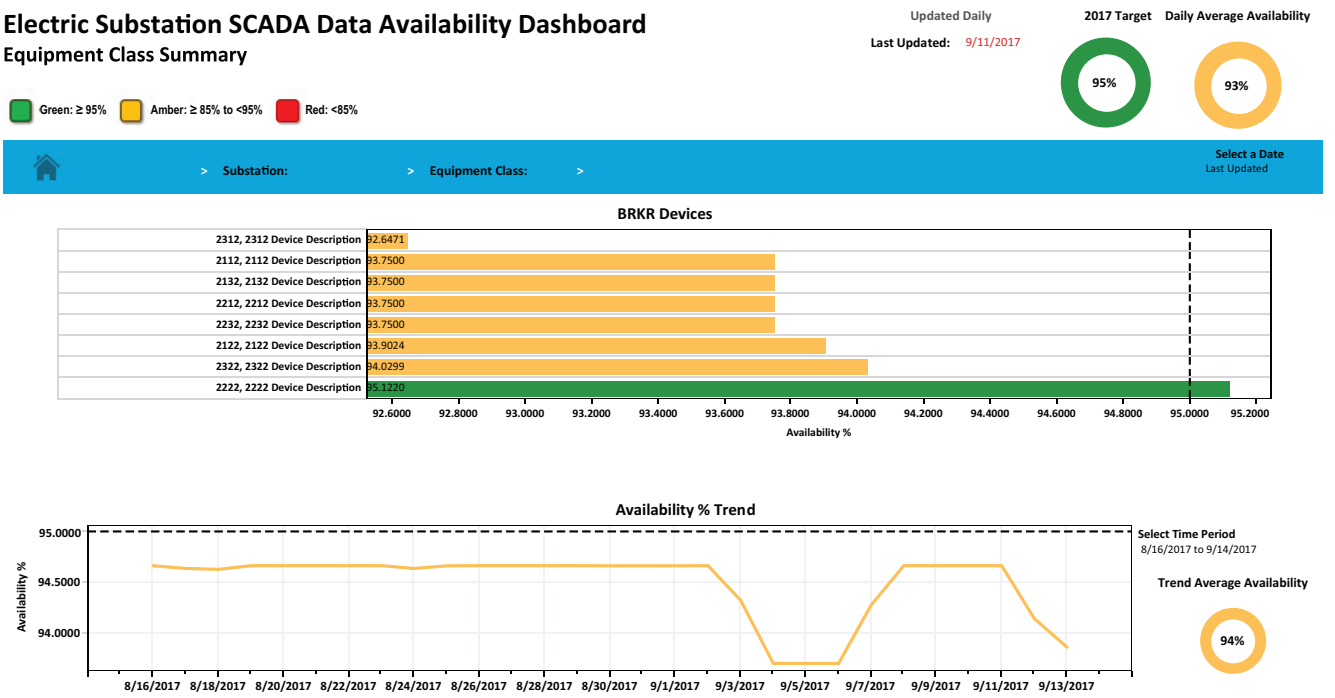
Driven by its consumers, regulators and policy makers, PG&E has embarked on an ambitious electric operations improvement plan featuring six key areas: public/system safety, employee safety, compliance, customer satisfaction, reliability and work efficiency. The PG&E Grid Modernization Plan identifies all capital work planned over a rolling five-year period to modernize and improve its electric transmission and distribution systems.

PG&E is supported by California policies such as the California Electric Program Investment Charge (EPIC), which enables PG&E and the other California investor-owned utilities, as well as the California Energy Commission (CEC), to develop smart grid technology demonstration and deployment projects. In a recent update, Kevin Dasso, PG&E's vice president of electric asset management, said, "What we're learning from these EPIC projects will directly benefit our customers in terms of saving money, improving reliability and advancing grid efficiency. The results will be used operationally by a number of our teams here at PG&E, as well as by other energy companies, technology companies, and stakeholders who will benefit from these results."

With a projected annual Grid Modernization Plan capital spend of more than $2 billion, the company plans to increase capacity, while simultaneously integrating clean, renewable sources of energy. As part of the strategy, they also will be upgrading aging assets and substations across their network. PG&E's ambitious approach is expected to deliver a smarter, more-resilient grid, through new information and operational technologies, as well as tools and processes.

Introducing SDAD

To help them with this challenging and important redevelopment, PG&E called on BRIDGE Energy Group, experts in systems integration and real-time operations. BRIDGE combines business, operational technology (OT), and informational technology (IT) domain expertise to deliver and optimize innovative grid operations solutions at any stage in



The Equipment Class Summary dashboard shows all devices associated with the selected circuit and the availability percent trend for a user-defined time frame. (BRIDGE Energy Group)

the project life cycle: from strategy and regulatory, to implementation and optimization.

PG&E selected BRIDGE to create a tailored SCADA Data Availability Dashboard (SDAD) that enables users to easily analyze data trends. The new dashboard BRIDGE provided enables users to drill down into SCADA availability metrics in various ways — such as headquarters, substation, or asset metrics. It also lets users export the data into a variety of formats for presentations and sharing. The automated reporting provides PG&E with a consistent approach to evaluating and validating estimates.

The infrastructure and architecture behind BRIDGE SDAD leverages PG&E's existing OSIsoft PI Asset Framework. It supports PG&E's continuous improvement initiative by delivering tools that provide transparency and awareness of SCADA data availability and accuracy. Using the new SDAD system, PG&E can accurately optimize maintenance schedules and prioritize improvement investments to continuously enhance the efficiency and reliability of their system. These efficiency benefits are calculated by the number of full-time equivalent hours saved by reducing or eliminating manual processes. Significant time is saved by data-naming and metadata standardization, which reduces errors from manual searches to verify relationships across the transmission and distribution system. It also reduces the manually intensive process of pulling data from multiple sources to analyze and create key reliability metrics.

In addition, the system reduces troubleshooting and testing for related support groups through a more-targeted root cause analysis across substation devices and telecommunications, as well as energy management infrastructure and applications. When troubleshooting is needed, the system responds faster through new visualization and intelligence tools, which not only reduces service restoration times, but also positively impacts the overall user experience.

Above all, SDAD supports proactivity through visibility, such as improving identification of substation and distribution device performance degradation, and condition-based maintenance processes. Substation operations will become more proactive in managing the health and performance of the end-to-end SCADA infrastructure and software systems. It even expedites the triage process in determining SCADA root cause issues during normal operating hours and under emergency conditions.

Information insights through automation

The power of SCADA and SDAD is enabling better decision-making by providing greater, more-accurate, and clearer information to decision makers in real time. In addition, with enhanced data accuracy and controls, many more decisions can be reliably automated, creating speed and cost advantages.

Empowered by their new-found information insights, these decision makers can drive their organizations forward based on facts. It is these qualities that help firms such as

PG&E realize their ambitions of simultaneously providing their customers affordability, reliability and safety.

This was not the end of the story, however. PG&E also called on BRIDGE to help deliver their fault location, isolation and service restoration (FLISR) system. It was BRIDGE's experience on both projects that helped to identify a series of related and competing projects that could be better managed from a resource, budgetary and scheduling perspective.

Assessing all projects, BRIDGE delivered greater value by using an aggregate set of focus capabilities integrated within its methodology. BRIDGE's repeatable, cross-functional model provided greater consistency across the organization, but more so, it mitigated overlaps, resource and budgetary constraints, and fostered collaboration.

The BRIDGE approach enabled PG&E's substation automation group to prioritize, integrate and sequence use cases, resource needs and funding with other dependent and related initiatives. The group will now establish and govern a four-year roadmap to deliver health and performance monitoring of operational assets, technology, systems and data. Meanwhile, the IT department is set to build a scalable technology architecture to deliver operational performance dashboards, geospatial visualization and enhanced situational awareness.

Producing bottom-line benefits

This portfolio of operational and nonoperational data integration, visualization and intelligence projects brings about unprecedented visibility and is expected to deliver millions in estimated savings over the next five years.

While operational data tells a control center operator what is happening in real-time, nonoperational data is useful for explaining why things are happening. Nonoperational data gives operations personnel the information they need to take action to keep system devices healthy, and to catch and prevent a problem from getting worse. This relates directly to improvements in system reliability, affordability and customer satisfaction. Therefore, by integrating data sets while correlating and analyzing nonoperational data in near-real time, utilities gain insights that can be used to holistically support grid modernization.

With BRIDGE's support, PG&E has embarked on a program of initiatives to develop and deploy operational and nonoperational performance monitoring visualizations, dashboards, analytics, and new response processes to monitor and control transmission and distribution system performance. These new tools, processes and capabilities will support the real-time monitoring and proactive management of system assets as PG&E's grid continues to evolve with distributed energy resources and new market providers.

"The utility industry is undergoing transformational change, with increasingly challenging customer, regulatory and shareholder expectations," said Hugo van Nispen, BRIDGE CEO. "BRIDGE is proud to be partnered with clients like PG&E, as they seek to rapidly realize breakthrough results needed to navigate business, technical and regulatory challenges."

Information, and the actionable intelligence it provides, is the new source of value creation for companies across the business world. It is no different in the power sector where information is ushering in game-changing technologies such as distributed energy resources and dynamic demand optimization.

The transition to distributed energy resources

The future of power generation is distributed, and those who are slow to adapt are likely to fall behind and could face consequences that impact their sustainability and independence. The transition to distributed energy resources will not be easy. It will require a complete reengineering of the system to support two-way power flow and the integrated, real-time, cross-transmission and distribution necessary to manage changes at the grid edge. There also is the need to deliver predictive analytics, through accurate and readily available data.

The quality of information available to infrastructure-focused organizations can suffer from the unrelenting pace and diversity of change in technology, as well as a lack of interoperability. However, much of this evolution will be about upgrading system monitoring and control software, rather than just replacing hard infrastructure. Clear and accurate system interfaces, such as SDAD, will be fundamental in the supply of information to decision makers, and therefore will be critical to the realization of aggressive policy goals — namely the integration of distributed energy resources.

PG&E's Grid Modernization Plan, enabled by technologies like modern SCADA, SDAD, FLISR, predictive analytics, IoT, among others, will drive them into the information age and to the forefront of the power sector. In partnering with BRIDGE, PG&E is taking steps to ensure the alignment of IT investment and strategic initiatives with measurable outcomes, and is laying the foundation for successful modernization.

SCOTT WOODBURY is a principal consultant with BRIDGE Energy Group. He has over 20 years of program/project management and technology consulting experience in the delivery of enterprise-wide, multi million-dollar, critical impact projects.