A NEW PARADIGM OF THINKING (SM)

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Innovation is all the buzz. But ideas are cheap: it’s solutions that have value. Can a regulated, monopolistic electric utility compete against the myriad nimble, technology start-ups that plan to change the world? Does it need to? We need a “new paradigm of thinking” in our industry.

Electric service customers want safe, reliable and affordable electric service sourced from more cleaner and more renewable resources, but the business models that might continue to allow sustainable progress are changing. How regulated electric utilities prepare to provide a solid return to investors in as little as the next five years is a big question. It needs an answer.

CEO’s today address the question with think tanks, focus groups, idea incentives, pilots and investment partnerships. But, there’s nothing new and transformational here. Idea programs and talk of the need for innovation have been around for decades. It’s not an easy process. New ideas are hard to incubate and develop and even harder to take to market. Some of the best innovations of recent times like AEP’s Breakthrough Overhead Line Design (BOLD) boldtransmission.com or SDG&E’s renewable meter adapter (sdge.com/residential/savings-center/solar-power-renewable-energy/renewable-meter-adapter) can take years to get to market and gain customer acceptance. In the 1980’s, Houston Light & Power (now CenterPointe Energy) offered the immured foundation as a commercially licensed foundation system whose patent has now expired. patents.google.com/patent/US5050356A. The immured foundation was great idea, but very hard to enforce the commercial licensing once the simple concept was promoted in the trade journals.
Moreover, some regulators may disallow utilities from “experimenting” with customer dollars. **Should each individual utility really attempt to innovate industry changing technology on their own? Is there a better way?**

Yes.....The electric utility industry is rich with opportunities. The impacts of emerging technologies on changing business models are impressive. The wants and demands of customers, regulators and other stakeholders continue to change. Those utilities that anticipate the opportunities, impacts and demands will remain relevant, succeed and grow. Watching and waiting will result in the opposite.

Strategically positioning for success and growth in the electric utility industry will require entrepreneurial creativity, intellectual genius and the very best from other industries. A “new paradigm of thinking” about safety, reliability, affordability, sustainability, compliance, cyber security....and the customer. Who in our industry can do this? In truth, there are hundreds, perhaps thousands, of people that can help, but they don’t work for any single company or industry. The best solutions from the brightest minds are available today for those with a vision for tomorrow.

The “new paradigm of thinking” shifts from an internal focus of a single **traditional** solution to an external embrace of a plethora of competitive
solutions. Your toughest challenges can be offered to a nimble and devoted global community for creative new solutions that our industry planners and strategists may have never considered. Move away from the internal focus and embrace the external solutions.

Southern Company CEO Tom Fanning has said, “We’re going to lean in, play offense, and hopefully invent the future that one day will displace our own big iron business.” We can indeed “lean in and play offense” and must implement a sound, well thought-out strategy to position for the yet undefined opportunities of the future. Southern Company has started. So can you.

**STARTING A NEW PARADIGM OF THINKING**

A “new paradigm of thinking” solves for big picture, high level challenges or opportunities conceived in the broadest terms. The solutions may not come from within. And, that’s okay.

Each utility has a team of thought leaders, system planners, emerging technology advocates and a supply chain. Select a visionary leader (yourself?) and lead the team in the new paradigm of thinking. Identify your largest challenges in the broadest, most high-level terms possible. For example, a new saleable product or service, improvement of safety performance, reduction of call center wait times, or moving megawatts from source to load. Allow your supply chain professionals to engage the global community with a Request for Information (RFI), very similar to crowd sourcing. Get the responses from the RFI, have the team evaluate the responses, and 1) craft a Request for Proposal for a solution with several possible vendors or 2) engage the preferred solution provider directly.

This process is nimble. It requires an open, transparent and communicative approach for the regulated and/or competitive business and can yield literal and figurative dividends for years to come. Perhaps as important, it delivers products and services that have already been invented, incubated, developed and brought to market. Your internal team doesn’t need to spend months (or years) languishing over a long development process. Rather, they implement emerging technologies
almost immediately while the interest, enthusiasm and executive leadership is still piqued. Progress is made, it’s recognized and celebrated. Others ride the momentum and the seeds of competitive transformation start to germinate in your organization positioning your company for opportunity and relevance in the years to come.

LEAP FROG TO 20th CENTURY SOLUTIONS

Several emerging technologies are ready for use in the electric utility industry if utility personnel are ready to accept them. Some are ready for use at scale. These new technologies may allow users to “leap frog” over traditional 20th century answers and position for real 21st century industry impacting opportunities that may be just a few years away. Why invest heavily today in old(er) ideas when a “new paradigm of thinking” will allow a quantum “leap” over your competition and position your company for a bright and successful future? Savvy utility leaders are, in fact, positioning their companies for these emerging technologies today, and savvy investors expect as much.

Several examples of “leap frog” emerging technologies exist today. These technologies solve for the big picture challenge or opportunity. The following paragraphs will describe the challenge in broad, high level terms and contrast the difference between a traditional solution and a “new paradigm of thinking.”

**Big Picture Challenge** Move more power from Point A to Point B

**Traditional Solution** A new power line

**A New Paradigm of Thinking** Install power flow controllers where and when needed to get more capacity from existing rights of way

Smart Wires has a product called SmartValve uses power electronics to effectively increase or decrease the reactance of a line, enabling real-time control of the power flow. SmartValves are modular devices that allow easy deployment and relocation of the units and can be scaled up or down depending on the evolving needs of the grid.
Smart Wires has signed a master supply contract with an affiliate of Hunt Energy Solutions in Texas to provide SmartValves for future transmission projects in the southwestern United States. In addition, Hunt Energy Solutions will be Smart Wire’s exclusive distribution partner in the Latin America areas of Mexico, Central America, the Caribbean and Peru. See smartwires.com/modularpowerflowcontrol.

**Big Picture Challenge** Prepare for Electric Vehicles

**Traditional Solution** Install EV charging stations of various sizes across a diverse service territory in advance of projected EV sales

**A New Paradigm of Thinking** Contract with mobile battery charging companies to charge fleets, commercial and residential EV customers as a service without impacting disparate parts of the distribution system while positioning for major changes in charging technologies.

The Mobi EV L2 charger brings a mobile battery to anyone, anywhere, and provides an opportunity for utilities to engage customers with better solutions to meet all their power needs. Optimize deployments by putting Mobi products in the right places for maximum public engagement and per person energy potential. Software provides data to measure the success of campaigns by tracking increased energy usage in new verticals and quantifying sustainability benefits.

EV Safe Charge offers a similar concept.
**Big Picture Challenge**  Use the 5G network as a source of revenue

**Traditional Solution**  Lease power poles and street lights

**A New Paradigm of Thinking**  Work with local DOT to install underground assets to use as leased spaces for 5G and other utilities

Integrated Roadways has developed and patented the Smart Pavement™ system. The Smart Pavement™ system is a traffic-rated, precast concrete section embedded with digital technology and fiber optic connectivity to transform ordinary roads into smart roads. Each interlocking Smart Pavement™ slab incorporates accessible and upgradable digital technology that connects vehicles to the internet and provides real-time information to drivers about traffic, road conditions and accidents. Much like the touchscreen on a smartphone or tablet, sensors in the pavement can “feel” the positions, weights and velocity of every vehicle on the road, providing superior navigation and telemetry for Level 4 autonomous vehicles and capturing valuable traffic and usage data.
The Smart Pavement™ system provides enhanced connectivity to vehicles on the road while the road will connect cities and communities with seamless, high-speed data transfer becoming the next Information Super Highway. Integrated Roadways claims that the Smart Pavement™ precast concrete technology lasts 4x longer than traditional asphalt construction. It’s 95% less costly to install versus traditional highway construction and up to 80% less in total cost of ownership. In a public-private partnership (PPP) between an electric utility and the local Department of Transportation (DOT), Smart Pavement™ could pay for itself and become a source of revenue through leasing agreements with private sector service providers looking for a more affordable way to build a nationwide 5G network. See http://integratedroadways.com.
**Big Picture Challenge:** Plan five minute ahead energy markets more accurately for renewable integration. Add resiliency.

**Traditional Solution:** Use general weather forecasts and software

**A New Paradigm of Thinking:** Obtain micro-environmental weather data from renewable generation sites or high fire/weather hazard locations

Digital Engineering has profiled how weather affects the balance of supply and demand on a power system, taking into account not only customer behavior as a driver for demand due to weather conditions but also the influence of variable generation from both wind and solar. An extension of this analysis can model line ratings to better optimize power flows and make smarter network reinforcement decisions.

Digital Engineering has worked with leading utility companies like National Grid and SP Energy Networks in the UK and analyzed historic load data from hundreds of primary substations. By overlaying weather information onto this data set, Digital Engineering’s team can identify patterns and trends among electric load and weather variables like temperature and cloud cover. This micro-environmental analysis allows accurate predictions of how consumer demand is affected by the weather. In addition, a micro-environmental analysis contributes significantly to improved resiliency due to fires, floods, ice storms, micro-bursts and more.

**Big Picture Challenge** Control Distributed Energy Resources

**Traditional Solution** Advanced Distribution Management System

**A New Paradigm of Thinking** Look to other industries for command and control systems that form the foundation of a smart city or community

Adopting the mPrest System of Systems (SoS) approach to grid modernization projects lets you enable interaction between systems, applications, sensors and controllable devices over multiple communications media, using multiple protocols. This approach facilitates integration of installed and expected DERs and customer home energy solutions, together with other utility assets such as transformers, SCADA, feeders, GIS and IT systems, in one integrated system view. This enables real-time correlation of data across multiple domains and platforms for optimal situational awareness and generation of operational insights.

The mPrest operational DER Management System (mDERMS) lets you connect, monitor and optimize energy flow across millions of DERs to enhance the operational efficiency and reduce cost. A flexible, vendor-agnostic design facilitates the best of breed deployments and integration with third party systems. See mprest.com.

**Big Picture Challenge** Improve operations & maintenance of substations

**Traditional Solution** Adopt an enterprise wide asset management tool

**A New Paradigm of Thinking** Develop the digital twin of substations allowing virtual reality applications and the foundation for data used for artificial intelligence as it emerges

PG&E has successfully used the Bentley Substation product for years. They have been converting 2D drawings to 3D or a digital twin. Bentley’s process took significantly less time to recreate an existing substation as a 3D model, compared to the previous manual method of creating a 3D model from 2D drawings. The automatically generated reality meshes are accurate within inches and completely eliminate the need to take field measurements. As a result, personnel have to travel to and
from the substation facilities half as often. PG&E also uses ContextCapture for tasks beyond the scope of modeling existing substations. The software can be used to generate a reality mesh of the terrain, producing a quick and low-cost digital terrain model without a full land survey. It can also process images of substation assets, which can be categorized, inventoried, and used to plan condition-based maintenance.

Bentley also offers digital twin document management systems to support regulatory processes and asset maintenance. Simple workflows can be added to the digital twins to record changes in the field to keep information current and provide a sound basis for the next maintenance procedures. Then, Bentley can leverage artificial intelligence and machine learning to improve maintenance and operations processes, enabling digital twins to improve the asset management.

**Big Picture Challenge** Provide Mission Critical Communications

**Traditional Solution** Contract with a major carrier or build a telecom network

**A New Paradigm of Thinking** Buy dedicated 900mHz capacity and build a telecom system to serve you, your neighboring electric, gas, water and wastewater utilities and underserved rural communities as a source of long term revenue.

Southern has supported their regulator’s efforts to expand the viability of broadband spectrum for utility and critical infrastructure industries (CII) communications needs. Dedicated broadband service provides utilities and CII the high data capacity and low latency necessary for the deployment of technologies and applications that support the increasing reliability, security, and efficiency needs of the nation’s energy infrastructure. In many cases, commercial broadband service providers generally cannot meet the levels of coverage, capacity, reliability, and security required by utilities and CII and are unable to provide the dedicated capacity needed for data-intensive, low latency CII applications and uses.

A licensed broadband allocation in the 900 MHz band has the potential to support a number of higher-bandwidth deployments and applications, including many “next generation” electric grid applications. Examples of utility and CII use cases for broadband include: video surveillance of substations and other critical assets; mission-critical push-to-talk; Advanced Metering Infrastructure (AMI) backhaul; dis-
distribution line devices; network underground devices; transmission and distribution substation supervisory control and data acquisition (SCADA); online dissolved gas analysis; condition based maintenance monitoring; transmission line switches; commercial and industrial metering; environmental monitoring; gas measurement data collection; hydro-monitoring for generation; load curtailment notification; transmission tower light monitoring; network lighting controls; voltage monitoring and adjustment; mobile computing; and mobile hotspots (e.g., for storm recovery teams). See anterix.com.

CONCLUSIONS

Can a regulated, monopolistic utility compete against the nimble, technology start-ups that plan to change the world?

The short answer is no.

But, it doesn’t need to.

Your company’s talented and creative team can adopt a “new paradigm of thinking” and embrace a world full of emerging technologies built into products and services that already exist to impact your bottom line, customer satisfaction, carbon footprint, reliability indices and more.

Start the process of this competitive transformation in your organization today and position your company for relevance and opportunity in the years to come.