

**New Energy Regulations, Financial Tools,
and Business Models**

**A Digital 360 Summit Series
White Paper**

By

Andres Carvallo, Michael Albrecht, Tom Rose,
Dixon Wright and Greg Tamberlane

Sponsored By

SIEMENS



CMG is a 35-times award winning strategy consulting and advisory company with focus on Smart Grids, Smart Utilities, Smart Cities, and Smart Buildings. We are experts in Energy, Water, Transportation, IoT, Telecommunications, Manufacturing, and Software markets and technologies.

Our customers include [Cities](#), [Enterprises](#), [Utilities](#), [Vendors](#), and [Startups](#). CMG's mission is to help define and accelerate the digitalization and transformation of its customers using its knowledge library of 500 use cases and 18 frameworks.

Our consulting services include the development of Corporate Strategy, Branding & Marketing Strategy, Product and Technology Strategy, White Papers, Reports, Assessments, Gap Analysis, Benchmarking, Designs, Architectures, Roadmaps, Use Cases, Business Models, Business Cases, Marketing Programs, Market Development, Channel Development, Go-to-Market Plans, IT/OT Management, IT Strategy, OT Strategy, Product Innovation, Funding Strategy, and M&A Strategy.

Our consulting and advisory services have focus on the following technologies:

Smart Cities, Smart Energy, Smart Grid and Microgrids, Smart Water and Smart Pipes, Smart Gas and Smart Pipes, Smart Metering and Smart Devices, Smart Buildings, Smart Factories, Smart Homes, Energy Storage, Distributed Generation (Gas CHP, Solar, Wind and Fuel Cells), Smart Transportation, Electric Vehicles and Charging Infrastructure, Energy Management Systems, Network Management Systems, Enterprise Software and Embedded Software, Telecom Networks, and Internet of Things.

Furthermore, we have developed key knowledge about Blockchain, Cloud Computing, Mobile Computing, and Big Data (e.g. Analytics, Machine Learning, Deep Learning, and Artificial Intelligence) applied to Smart Grids, Smart Utilities, Smart Cities and Smart Buildings.

For utilities, cities, and enterprises, we provide world-class strategies, processes, and best practices on how to design, build, run, and optimize all elements of planning and operational execution.

For vendors and startups, we offer proven strategies and tactical methods to accelerate product innovation, go-to-market planning and commercialization, and building of ecosystems.

All trademarks and registered trademarks mentioned in this paper belong to their respective owners.

These materials and the information contained herein are provided by CMG Consulting LLC and are intended to provide general information on a particular subject or subjects and do not represent an exhaustive treatment of such subject(s). Accordingly, the information in these materials is not intended to constitute accounting, tax, legal, investment, or other professional advice or services. The information presented in these pages is not to be used as the sole basis for any decision, which may affect you or your business. Before making any decision or taking any action that might affect your personal finances or business finances, you should consult a qualified professional financial adviser. These materials and the information contained herein are provided as is, and CMG Consulting LLC makes no express or implied representations or warranties regarding these materials and the information herein. Without limiting the foregoing, CMG Consulting LLC does not warrant that the materials or information contained herein will be error-free or will meet any particular criteria of performance or quality. CMG Consulting LLC expressly disclaims all implied warranties, including, without limitation, warranties of merchantability, title, and fitness for a particular purpose, non-infringement, compatibility, security, and accuracy. Prediction of future events is inherently subject to both known and unknown risks, uncertainties and other factors that may cause actual results to vary materially. Your use of these and the information contained herein is at your own risk and you assume full responsibility and risk of loss resulting from the use thereof. CMG Consulting LLC will not be liable for any special,



indirect, incidental, consequential, or punitive damages or any other damages whatsoever, whether in an action of contract, statute, tort (including, without limitation, negligence), or otherwise, relating to the use of these materials and the information contained herein.

For more information on our smart solutions to the challenges outlined in these pages
or to ask any questions to our experts, please contact us via the following:

Telephone: 888-445-5486

Email: info@512cmg.com

Web: <http://www.512cmg.com>

Framing the Evolving Interrelationship between Technologies, Regulations, Financial Tools, and Business Models

We sit at the nexus of four big trends in the energy world: Decarbonization, Decentralization, Digitization, and Digitalization.

Decarbonization of the grid is driven by the proliferation of renewable technologies and regulatory mandates to reduce and eliminate CO₂ from the production of electrons.

Decentralization is propelled by customer choice and competition for cheaper, faster, and cleaner electrons, which have enabled the creation of *prosumers* (i.e., customers that now produce their own energy locally; e.g. solar PV, natural gas turbines, geothermal, diesel generation sets, and fuel cells). Further empowering these residential and commercial prosumers, a recent FERC ruling, Order 841, indicates that customers with energy storage can now play a part in any wholesale market. The commission has directed grid operators to develop rules for storage to participate in the wholesale energy, capacity and ancillary services markets.

Digitization is the process of changing from analog to digital form all our systems. This is a software-driven process that requires digital twin representation and final build out of intelligent integration of all utility-industrial-commercial-residential-transportation infrastructures.

And finally, Digitalization is the creation of new and/or transformation of business models as well as the new creation of value-added productivity, and/or monetary value, enabled by the application of such new technology methods and solutions.

What we are engaged in is essentially a massive next generation construction project akin to any major infrastructure effort in the modern age. We are building new digital things: smart cities, buildings, factories, homes, utilities, banks, hospitals, universities and transportation. These new networks will be integrated into one dense, transparent, intelligent, interconnected living and self-healing infrastructure.

Fifteen years of Smart Grid experimentation and technological innovation, which started at Austin Energy in 2004, has brought us to a new threshold. The emergence of 5G and LPWA networks, AI/ML, Blockchain, a galaxy of IoT sensors and data interoperability standards have presented us with a new digitally-connected ecosystem that ties together and moves electrons and data through intelligent, integrated infrastructures.

Just as the movements and migrations of humans and other animals across the face of the earth appear from space unconcerned with political boundaries, so will electrons and data move seamlessly throughout all infrastructure elements listed above.

Indeed, it is no overstatement to suggest that you, the reader, are a node in that infrastructure supply chain and lifecycle. As we speak, information is streaming into and out of your mind through this article and out into the vast integrated resources now within reach to all of us through the global brain known as the Internet.

Another useful analogy through which to visualize highly integrated infrastructure is the human body itself, as discussed by Andres Carvallo in his seminal book [The Advanced Smart Grid: Edge Power Driving Sustainability](#) (Second Edition, 2015). “The human body is a shining example of the way that networks organize complex systems. Each of the systems inside the human body can be seen as a highly adaptable network, more accurately *nested networks*, working together under the central control of the brain, but also replete with autonomous behavior apart from central, top-down control. When a person’s hand touches a hot stove, for instance, by reflex it draws away immediately based on a preprogrammed intelligence that resides in a different part of the brain away from conscious thought, as a matter of survival. No conscious decision is made to withdraw the hand from the heat; it was a reflex reaction to the heat. In a similar way, the advanced smart grid will see autonomous behavior from preprogrammed control messages that go out to the edge. The future of the electric grid lies down this path: to mimic the architecture of both the Internet and natural networks and systems to enable sustainability and provide the ultimate in adaptability.” (p. 13)

Further enabling the intelligent software and communication technologies described above – and being driven by those technologies - is the emergence of new regulatory structures and mandates, innovative financial tools and platforms, and new and evolving business models that unlock new value-added and accelerate the reduction of risk.

The chicken and egg question of which force is driving which may be irrelevant. The concept of the natural monopoly in the public interest is being turned inside out. What once was centralized is becoming widely distributed. The reality is that a digitally-integrated infrastructure is rapidly unfolding before us, and it is up to us to grab the digital bull by the horns and steer it in the most desirable direction possible for the cumulative benefit of all stakeholders and the public interest, especially for those with disabilities, in low income and under-privileged positions in society.

An interconnected, dynamic relationship exists between regulations, financial tools, and business models. This white paper explores this emerging landscape as captured in a panel discussion at the recent [Digital 360 Summit](#) produced by CMG in San Marcos, Texas, and hosted there by Texas State University.

No Bucks, No Buck Rogers – Data Interoperability to Accelerate Financing of Infrastructure Integration and Renewable Energy Projects

Prior to the Digital Age, in the era of manual business processes, inefficient data gathering and management practices constrained fluid market growth. Some financiers reported spending huge amounts of money for attorneys to review project agreements and conduct laborious due diligence before finalizing projects. Financial processes and transactions for projects were, and largely still are, highly manual, labor intensive, prone to error, time consuming and expensive.

Energy and related sectors involve highly complex financial and performance data sets required for underwriters to assess risk. Data interoperability is key to frictionless financing and contract closure.

Thankfully, automated data interoperability standards have now arrived that promise to accelerate growth potential for everyone.

As we get out of our swim lanes, we're seeing a common set of data elements overlapping with other, previously separate sectors. Data from the construction sector will be exchanged with utility and financial systems without regard of whether it came from an Oracle system, a SAP system, a Salesforce system, or any other system or database.

Evidence of this transition toward interoperability is found in the 2,000 publicly traded utility systems that have implemented XBRL (Extensible Business Reporting Language) data interoperability standards involved with financial reporting to the Securities and Exchange Commission (SEC). Many of the construction and energy reporting elements are the same information types required by capital and financial markets.

Insurance and surety firms have led the charge toward data interoperability, working vigorously to apply to the energy sector the same data exchange, financing, and “work-in-process schedule” efficiencies developed in the construction space.

To accelerate the pace and execution of renewable energy and digital integration projects, underwriting firms realized they needed to step out of traditional silos and merge energy business processes with construction business processes. The challenge for obtaining financing and insurance underwriting for potentially high-risk clean energy projects was to streamline the underwriting process between multiple credit providers. Standardizing grid innovation performance data, construction data, financial data is the key to integrating these processes.

Financial guarantees to reduce risk allows banks to provide more competitive financing. Reducing soft costs streamlines the financing of clean energy and infrastructure integration projects. Envision a world in which the financial settlement piece of an ecosystem could be nearly frictionless, reducing counterparty risk to almost nothing. Emerging data interoperability standards such as XBRL, FIBO and other federally recognized machine-readable data standards further stimulate innovation and competition.

Banks are saying, ‘we just want the data.’ The faster data starts to be exchanged, the greater the appetite for the data will be. Banks and surety companies are saying, ‘if you give me data that allows me to understand my risk better, faster and cheaper, that will enable me to speed up even more the process and to give you far more competitive terms to finance your project. But if you're going to make me manually rate everything, and you're going to give it to me four months later, everything will move slower and my price is going to be much higher.’

Data interoperability is gaining momentum through emerging standards and programs, including DoE’s Orange Button Initiative, the XBRL standard – included in the proposed California SB 598 to transition the state to XBRL - and by the Common Data Exchange (CDX) data interoperability frameworks.

These data exchange mechanisms are accelerating business transactions that define data elements, terms and conditions. They integrate many formerly disparate or siloed components of business transactions,

including energy interconnection information, contract and payment specifications, financial investor data, surety underwriting and bank lending disbursements, as well as utility system performance data. In short, these emerging digital data interoperability standards allow digital communications to process contract negotiations, financial transactions, and, importantly, stakeholder decision-making, to move faster.

Blockchain Reduces Risk and Speeds Project Financing and Energy Transactions

Along with automated data exchange, use of smart contract functionality and blockchain transactions greatly reduces counterparty risk, which further accelerates financing and project groundbreaking.

Counterparty risk is a function of the latency between when each party settles their side of an energy transfer transaction, along with the value of the transaction. In the energy sector, there is traditionally a 40-day latency between delivery of and payment for power, exposing the seller to increased risk of counterparty default.

To understand how these latencies and risks can be ameliorated by interoperability and blockchain, let's examine the current collaboration between American PowerNet (APN) and Signature Bank. APN's Verde Blocks initiative leverages blockchain to confirm with the Independent System Operator (ISO) each day that the agreed-upon generation has been scheduled into the system. Signature Bank's Signet is the first blockchain-powered payments platform offered by an FDIC-insured bank and provides low cost, real-time financial settlement for commercial payments of any size. Incorporating Signet into the Verde Blocks platform, APN is able to provide daily settlement to the generators for the delivery of their power, versus the usual industry standard of monthly, 10 days after the end of the 30-day delivery period.

Signet and Verde Blocks reduces settlement latency, thus minimizing the exposed value. Risk is built into price, so settling daily, thus reducing risk and improving cash flow for the seller, incentivizes them to reduce their prices and encourages participation from buyers. Better cash flow also reduces the need to rely on credit lines to cover against aging receivables.

A major source of friction in the traditional process is lack of transparency and control in payments. ACH and wire are instructions that are sent to a bank to manually settle the transaction, oftentimes with several intermediaries involved and no proactive notification of status or completion to the parties involved. Operational overhead is created by a need to follow up with banks, intermediaries, or counterparty to track each transaction. Signet transfers are direct from sender to recipient with no intermediaries and continuous, real-time status is available to both parties for all transactions from the moment each payment is initiated.

Regulatory approval is required for all solutions offered by an FDIC insured bank. Signet launched on January 1, 2019, and adheres to the safety and security standards established by the New York Department of Financial Services and the FDIC. Real-time data available through this transparent, end-to-end settlement platform benefits all participants and regulatory authorities in the renewable energy

sector, and improves the economics of the ecosystem by significantly reducing friction and counterparty risk in commercial transactions.

“What this comes down to is thinking about your digital strategy as your differentiator: how you're actually marketing that to your customers, how you're marketing it to your employees, how you're marketing it to the market, and then taking that the next step. It's about speed and agility and building that into your organization. That means challenging your organizational structure and how you do things to allow for that speed. And of course, the way that happens is starting at the top. It means starting at the board level.”

Lisa Caswell – Spencer Stuart

Digital Technologies and Regulators Team with Distributed Energy to Reshape Traditional Utility Business Models

Centralized generation and infrastructure have a limited future. Independent System Operators (ISOs) are today struggling with what's happening down at the distribution level, where the introduction of local renewables is impacting the stability of the power grid as well as utility revenue streams and business processes.

Traditionally, there was a large divide between distribution and wholesale transmission controls and architecture. That's changing very fast. We have to figure out how to rationalize that transition into new business models that return value to the customer, who increasingly is going to become a *prosumer* on the grid.

Just as AirBnb and Uber are allowing customers to monetize their cars and homes, so can solar panels allow residents and businesses to sell energy back to the utility or, through transactive energy agreements, between local prosumers and neighbors optimizing the existing infrastructure and negating the need to invest society's capital to further expand an already overbuilt grid.

We believe that the next 10 years will be all about the customer and how they get integrated into the power supply chain as prosumers. We will continue to need utilities to deliver reliable, efficient, cleaner and affordable power. A new challenge is how to deliver both things seamlessly and in a two-way power flow and two-way data flow optimized environment.

Utilities are evolving from volumetric energy sellers to connectivity and energy-as-a-service providers. Some are looking at becoming technology providers. Some are looking at offering other assets and

services beyond power (i.e., IoT networks, billing services, customer engagement platforms, transportation-as-a-service).

One utility is now an energy software company that takes data from distribution energy systems, microgrids, IT systems, power plants, and adds value to maximize the use of those resources to provide higher power quality and additional megawatts to increase the economic value of the system.

Due to the universal nature of the service, energy is a social and political commodity. Electricity specifically is a political commodity within a zone of reasonableness (ZOR). Regulators, policymakers, and legislative members allow things to happen outside of that zone of reasonableness, driven in part by efforts like the Green Button Alliance, an industry-led call to action to help customers understand, download and share their energy consumption data.

Within 10 years, most utilities may operate on a performance value-based price structure, as opposed to the traditional cost of service recovery business model.

The amount of value that's in the traditional utility business model is changing. It's shifting towards a customer-driven, solutions-based business model. An example is how one major multi-national energy company sold all of their thermal assets - about 10,000 megawatts - and reinvested that money and construction efforts around distributed and utility-scale renewables and energy storage, including energy efficiency, retail electricity and retail gas.

Emerging business models increasingly revolve around the customer and how they want to structure their energy options. Customers are pressing much faster for new services than utilities may want to go, or toward which our policy makers will guide us. It is clear that enabling market competition, as proven in many other markets, is the best way to drive innovation, creativity, new services, and new technologies, while reducing costs.

The original reason for regulating the electric industry and assigning it "natural monopoly" status was the idea that, in the public interest, within a large network with economies of scale, one monopoly provider was the most efficient operational structure. In deregulating energy markets, Texas, Western Europe, Australia, and New Zealand have shown that is not the case anymore, if it ever was.

The pace of change in power markets and technology is accelerating. On the flip side, the pace of price-regulations, which is usually driven by current issues, cannot keep up with markets and technologies. Debates over market and business model design that are meant for a long-term planning horizon become moot even in the short term. These days, the more a regulator seeks to try to say 'hey this is what makes sense today,' by the time you get to that horizon you have already passed it.

In Texas, we've seen the oil and gas industry struggle to get the grid built fast enough in the Permian Basin. We had the same problem with wind power. There will come a day as we go through the planning process, even for new transmission, in which we get to the end and say, 'hey, do we still need that thing, because we started it four years ago and a bunch of stuff happened since then.'

That's going to be a major challenge in the regulatory world, modifying itself to a recognition that it's not a natural monopoly anymore, and that that pace of change is going to get so fast that utility business models will have to become more agile and innovative to serve emerging customer demands, as we see with California's Retail Automated Transactive Energy System (RATES) initiative. Removing traditional price-regulation enables innovation that benefits customers.

Emerging Customer Desires Will Steer Business and Regulatory Transformation

Adapting to the need for change, one major energy firm decided that instead of selling Ohio State University x-number of kilowatt hours of retail energy, they were going to sell energy-as-a-service in a new model to achieve reduction in volume and cost of purchased energy commodities, reduction and control over carbon footprint, increase in campus reliability and resiliency, seamless introduction of low/no carbon future energy sources and consumers, ability to island from the grid, implementation of digital platform solutions and energy conservation measures as well as educational collaboration with student project teams.

The firm pitched OSU by stating they were going to manage all of the university's energy infrastructure for the next 50 years, telling them, 'You don't have to worry about the kilowatt hour, we'll take care of it. We'll make sure you consume less. We'll make sure you emit less carbon dioxide.'

As an industry, changing the focus to what matters for the customer means changing the entire business model of the energy sector.

In order to change, industry participants must engage regulators as partners. When regulators see the benefits of price deregulation on customers, that's when you start to see change in the way they're structuring wholesale markets. Once those regulators see the benefits of innovation, it just takes effort to chip away at traditional regulatory ideas and wait for the new class of distributed generation to come online.

How does the utility business model have to change today? Name a distribution utility making 10 to 12 percent regulated return on investment. This rent-seeking model does not have a chance to survive in this new, dynamic business paradigm. They're going to have to transition from providing electrons to *becoming connectivity infrastructure orchestrators*; in this new paradigm they facilitate data exchange between consumers and the availability of renewable and storage resources. They manage the neural (i.e., cloud-based, intelligent, analytic) grid and balance local networks by active control of distributed technologies.

This new distribution utility of the future may deliver data services to the customer so they can make decisions about their energy production, usage and transactions. This new distribution utility may provide pricing signals via data exchange platforms around local and transmission system conditions and requirements, status and availability of distribution-connected generation, and other market information,



while new service providers may own the customer relationship and compete with one another over who can provide the best service to the customer.

The new value of electric distribution may be ensuring connectivity among all market participants, including prosumers and consumers. This new distribution utility, as an energy service provider, may own the customer relationship for these connectivity services and also drive the customer engagement model. Whoever manages the customer and the data will control energy this century. So, there may be additional third-party aggregators that emerge and work in collaboration with the new distribution utility. The new distribution utility that commits its growth and transformation to decarbonization, decentralization, digitization and digitalization will have the best resilient, affordable, clean energy and customer service offering. This new distribution utility providing the most value to their customers and partners will inherit the future.

The key to this new energy future is the unlocking of value that will come from encouraging, empowering and enabling market-driven Decarbonization, Decentralization, Digitization and Digitalization now.



For more information on our smart solutions to the challenges outlined in these pages
or to ask any questions to our experts, please contact us via the following:

Telephone: 888-445-5486

Email: info@512cmg.com

Web: <http://www.512cmg.com>

Sponsored By

SIEMENS