Presidential Victory Must Deliver Smart Grid and New Power Utility Business Models

This paper was written for POTUS45, for the white house, for congress, for power and energy executives, for regulators, and for federal energy administrators faced with rationalizing the rapid and numerous changes currently pressuring the traditional structure of the power utility industry.

New business models and cutting edge technologies such as distributed solar and CHP, demand response, microgrids, energy storage, electric vehicles, cyber-security, advanced wholesale markets, and new competitive retail energy markets are all impacting the traditional regulated utility industry. Generation, grid operations, and wholesale and retail energy sales are being transformed by innovation and competition, forcing utilities faster than ever to make critical choices about business models and technologies.

Yet, it is the regulatory gridlock, current business model, and lack of creativity that is preventing innovation to deliver on the needs on customers and the environment.

In this white paper, CMG experts try to analyze what both presidential candidates can offer, what challenges they face, and make a few recommendations.

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Industry Background

As we wrote in our white paper titled "Disruption becomes Evolution: Creating the Value-Based Utility", innovations in the 20th century drove the fastest and most disruptive transformations in economic history. The automobile devastated the horse-and-buggy industry, railroads consumed large market share from shipping, and airplanes later took passenger and freight business away from railroads. Assembly lines and engines that ran on fossil fuels enabled great leaps forward in manufacturing productivity.

The computer and telecommunications industries also advanced rapidly, likewise propelled by disruptive innovation. Computers advanced from room-sized mainframes to smaller and more easily deployed minicomputers. Then to personal computers which automated previously manual tasks and finally to portable laptops which enabled computing to move out from the office and into every location of the world. Similarly, telecommunications equipment went from circuit switches, to PBX systems for offices, to fax machines for business or personal use enabling the transformation of how we used data, and finally to the smart phone that we can not live without a single moment today. The important common trend among then, and coming soon to the energy industry, was the movement from centralized capacity controlled by a few to distributed capacity independently controlled by anyone and costing a fraction of the traditional cost.

The power sector has moved forward at a much slower pace, when compared to the Computer and Telecommunications industries. After the late 19th century transition from DC power to AC power generation, the advent of steam-powered generation, and the industry consolidation led by Commonwealth Edison, the electric utility business continued expanding over the next century based on slow incremental change.

Today, after more than a century of slow evolution and little power system changes, a confluence of factors within the industry now result in electric utilities now facing multiple technological and business disruptions that in many ways mirror the evolutions of the past in other industries.

Technological Disruptions:

1. Renewable and Distributed Generation – Continued inaction by the utilities will lead to an increased potential for an unstable grid. The distributed energy resources (DER) ship has sailed, buoyed by social and environmental pressures. Accordingly, utilities have to accommodate more and more centralized renewable generation as well as rapidly increasing DER on the grid in a safe, reliable, and affordable way.

   Utilities should plan new and innovative architectures that integrate DER into their dispatch equation as part of their portfolio rather than treating DER as a standalone initiative. The NY State REV plan provides a forward-thinking approach on this regard. And the ERCOT grid and market is already designed to manage DER efficiently.

2. Demand Response – Utilities tend to implement demand response if and only if a regulator asks them to do it, as it places them in the awkward situation of asking customers to use less product. This causes them to miss opportunities to add attractive options for their customers.

Utilities should work with regulators to make demand response a part of the normal portfolio of products offered to their customers and establish a rate structure that supports it.

3. Microgrids – Microgrids today are generally designed and implemented outside the utility planning realm, thereby causing potential serious headaches for utilities long-term. Some microgrid owners expect the local utility to take care of them during emergencies and may have not designed an efficient two-way interconnection.

   Utilities should adopt and advance microgrids as a next generation tool to create a much needed two-way power and data flow smart grid to support the anticipated growing penetration of electric vehicles, solar PVs, energy storage, and dynamic demand response in smart homes and smart buildings.

4. Electric Vehicles – Globally, growth of EVs is expected to accelerate as their prices drop. Today they show up in clusters within the distribution grid. If not managed properly, they can cause reliability issues by creating extended peak periods that further stress the utility's assets and potentially create risk and safety problems.

   EVs could nicely counterbalance central renewable generation (e.g., wind) given their potential to charge when wind is most often generating at its maximum rate in the middle of the night. Managed and coordinated properly by utilities, EV's enhance the operation of the grid by smoothing the rate at which power is consumed, while reducing peak loads, providing power to the grid, and helping balance load levels.

5. Energy Storage – Utilities and regional transmission organizations (RTOs) and/or Independent Systems Operators (ISOs) deliver power to their customers based on a consumption cycle that usually has one or more peaks during the day. During these peaks the use of peaking power plants at locations of congestion is very expensive since they are used only for a few hours a day.

   Installing energy storage devices at various points in the distribution and transmission system enables delivery of hitherto "not possible" services. Energy storage can fill the gaps during peak usage for a system originally designed for instant consumption upon generation, and reduce the need for expensive "peaker" generators. Regulators must allow energy storage to be used freely by the transmission and distribution operators.

Business Disruptions:

1. Retail Choice – As states move to implement advanced metering infrastructure (AMI), the move toward retail choice is advancing in parallel, allowing new players to enter the market and contract to deliver power to traditional utility customers. Competition accelerates innovation and better customer service.

   A "do nothing" strategy is not viable for utilities. Delivering power to an increasingly smaller set of customers enables the profitability per customer to reach a point when the business will no longer be sustainable. Regulators play a vital role in avoiding disruption by loosening restrictions and allowing regulated utilities to embrace new business models.

2. Product Bundling – Players from the telecom, Internet, cable, and home security industries are melding into a single group of companies (e.g. Comcast, AT&T, and Verizon) that deliver services bundled to

customers. Other than not owning the electric wires, these new entrants appear increasingly to customers as legitimate sources from which to purchase power and all kinds of energy services.

Utilities must proactively address competitive threats from bundlers by first defining their long-term strategy – wires-only, or both wires and retail customers – and taking appropriate steps based on that strategy.

3. Municipalization – Many municipalities are considering the set of steps needed to "secede" from the incumbent investor owned utility (IOU) and become their own utility by owning distribution assets and purchasing transmission, energy, and other ancillary services from the wholesale market.

   The threat to the entrenched utility is the potential loss of a large group of customers who exit the utility and decrease its rate base. Incumbent utilities must respond by becoming more customer-centric and placing a stronger focus on leveraging new technologies and offering new services. Cities and communities wanting to own their own power company must get the right strategic business plan, technology roadmap, and advise to succeed.

4. Nationwide Wholesale Markets – The US and Canada have taken a Swiss cheese approach to implementing wholesale markets across the country with markets in some areas and none in others – even though all are required to follow the tenets of FERC orders 888 and 889 related to unbundling. While the size and scale of most of these markets is quite large, disparate rules make it impossible for the participants to drive economies of scale across these markets.

   We believe there is a need for a nationwide wholesale market as an alternative to existing regional marketplaces. This would enable, for example, Midwest wind power to be transferred to marketplaces in the east, and initiatives like the Tres-Amigas project that can provide the perfect balancing between the eastern, western and Texas interconnection and others.

5. New Business Models – Choosing the right business model is the first step toward becoming a smarter utility, and the answer depends in large part on the current structure of the particular utility, including the level of regulation under which it operates and its management's appetite for change and risk. It requires insight into divestments and investments, and often requires external help to rethink strategies and manage innovation as a competitive advantage.

   Utilities may be capable of handling one of these changes on their own, but dealing with all at the same time can quickly overwhelm a slow-moving industry. While some forecast a dramatic decline for regulated utilities, we are optimistic about the future of those willing to embrace, rather than resist, the coming transformation. Preparing for the evolution requires each utility to chart its own course, develop sound a strategic business plan and technology roadmap to serve customers in the most effective and efficient manner, and carefully enable the right business cases and strategies based on their own unique challenges, generation sourcing, and electric network design characteristics.

Introduction

What do the Presidential campaigns tell us about the future direction of legislation and regulation for the utility sector in general and Smart Grid in particular? In this paper, we examine the platforms of the presidential candidates, searching for common themes and common proposed initiatives on Power Utility issues and the Smart Grid. These could point to the prospect of bipartisan support and agreement across the

houses of Congress and the new Administration for Power Utilities and Smart Grid measures. Regardless of the outcome in the presidential election, there are some aspects of Smart Grid in which there might exist some level of agreement and a reasonable prospect of legislative or regulatory adoption.

While we do not find a lot of common ground in the respective campaign platforms, there are some elements that could find bipartisan support after January 20. The new administration could:

- Build on energy legislation now pending in Congress, the North American Energy Security and Infrastructure Act of 2016, that enjoys bipartisan support

- Promote job creating infrastructure projects through infrastructure funding mechanisms

- Find significant bipartisan support on measures addressing cybersecurity, including aspects of reliability and resilience with increased emphasis on distributed energy resources

As we approach the US presidential elections, is it already possible to anticipate the steps of the next Administration, and the new Congress, relating to Power Utilities and Smart Grid? Can we already discern at least the outlines of legislative initiatives, regulatory agency measures and budget actions that will impact America's power utilities, state public utility commissions, technology and equipment vendors, and new participants in energy markets? How much Smart Grid signal can we find in the noise of the campaigns?

An argument can be made that the needs for a nationwide Smart Grid – renovation of America's electricity grid to accommodate new communications technologies, new sources of energy, the pressure to reduce carbon emissions, and enhanced reliability – are so compelling that the campaigns will find common ground. If we can identify this common ground, then the presidential outcome itself may not be determinative; it will be easier to predict Smart Grid initiatives in 2017 and beyond no matter who wins.

CMG has undertaken a trawl of platforms, position papers, pronouncements and some punditry to tease out the common elements. At the outset we note that there exists an imbalance in the source material. Overall, as noted, Power Utilities and Smart Grid are not a central focus of either campaign and it is often wrapped in the broader discussion of critical infrastructure improvements. Nevertheless, the Clinton campaign has a more developed energy policy with information on its ambitions for the Smart Grid and has publicized its policies early during the primary season. From all evidence it has continued its policy work in anticipation of a transition to a Clinton presidency. And it is also able to build from the eight years of the Obama Administration as a continuation platform.

From the Clinton campaign website, we have examined its Hillary Clinton's Vision for Modernizing North American Energy Infrastructure (September 2015). Another, overarching document (but on energy policy largely duplicative of the Vision) is the 2016 Democratic Party Platform (July 21, 2016).

By contrast the Trump campaign has not published yet a comprehensive energy policy. The Trump campaign has to clearly articulate its plans around a continuation of coal mining, which we assume that it means more coal use only via clean coal technologies. Here, among other materials, we have examined the Republican Platform 2016. We have also drawn on the speeches that Trump has delivered during his campaign and his responses during the Presidential debates.

The Trump Campaign

On energy policy the main themes of the Trump campaign have generally been the problems of EPA and other regulatory overreach and the need to bolster fossil-based fuels. The campaign materials offer few specifics, especially on Power Utilities and the Smart Grid and any new technologies needed to continue the use of coal as power fuel. "Energy infrastructure" is generally understood to mean, "the pipelines needed to bring shale oil and other products to markets". Until late in the campaign, assistance for this infrastructure has not gone beyond a promise for speedier regulatory approvals.

In his Gettysburg speech in late October, Trump offered a Contract with the American Voter that included a number of legislative measures, to be adopted during his first 100 days in office. One such measure is an American Energy & Infrastructure Act that would leverage "public-private partnerships, and private investments through tax incentives, to spur $1 trillion in infrastructure investment over 10 years." In the same speech, Trump indicates that he would use executive orders to remove regulatory hurdles to vital infrastructure projects including the Keystone Pipeline and to development of energy resources.

Adopted at the time of the Republican Convention in July, the Republican Platform does explicitly recognise the importance of America's electric grid, "a catalyst for developing and delivering low cost energy while spurring economic growth throughout the United States". It finds that the grid is aging, vulnerable to cyber and terrorist threats, and unprepared to serve the US energy needs of tomorrow. Its recommendations call for an expedited siting processes (speedier approval and construction of transmission lines, streamlining other regulatory processes) and "thoughtful expansion of the grid". The platform elsewhere praises recent "far-sighted legislation . . . that will modernize pipelines and the electric grid, protect the grid from disruption . . ." These disruptions stem from breaches of cybersecurity (discussed below) and – detailed at some length – the dangers of electromagnetic pulse.

In a Trump website fact sheet on job creation (September 2016), the campaign calls for "reliable streamlined regulatory and permitting process for energy infrastructure projects" and support for "continued research into advanced energy technologies", but it cautions against "government picking winners and losers. We need to allow the free market and the innovative spirit of the American people to produce the new energy technologies of tomorrow, without undue government interference". Trump repeated this theme during the second Presidential debate, where he condemned regulatory overreach while supporting new sources of energy generation, "Now, I'm all for alternative forms of energy, including wind, including solar, etc."

While the policy statements on energy lack specific proposals, the platform notably calls for the new Republican administration "to find new ways to store energy, a breakthrough of extraordinary import". This specific reference is consistent with the view expressed by Republican congressmen giving priority to energy storage (for example comments of Congressman Lamar Smith (R-TX), chairman of House Committee on Science , Space and Technology).

The Trump campaign also makes frequent reference to the need for enhanced cybersecurity (a generally broader theme that includes consumer fraud caused by hacking retailers and government security lapses). In a speech delivered on October 3, 2016, Trump stated, "One of the very first things I will do is to order a thorough review of our cyber defences and weaknesses, including all vital infrastructure". He would provide the ability to "launch crippling cyber counter-attacks . . . as a deterrent against attacks on our critical resources".

The Clinton Campaign

A candidate now through two Presidential cycles, Clinton has been able to devote considerable resources to her energy policies. The central elements were already elaborated in September 2015 in her Vision for Modernizing North American Energy Infrastructure. To some extent, Clinton's current energy positions draw from the energy plan she developed during the 2008 campaign (http://grist.org/article/hillary-clintons-climate-and-energy-plan/). As a senator, she also co-sponsored legislation in support of the Clean Power Act of 2007.

Overall, Clinton's Vision features three principal elements

- ***Infrastructure reliability and safety***. Here "infrastructure" includes many forms of energy and she looks for solutions covering pipeline modernization and rail tank cars. Consistent with this emphasis on safety and reliability, for the electricity grid, the campaign's central focus is on cybersecurity. Other aspects of the grid, like distributed energy resources, are mentioned only as targets of enhanced cybersecurity. (She mentions elsewhere her ambition to have half a billion solar panel installed by the end of her first term.)

- ***Unlocking investment***. For the electricity grid, her vision contemplates resources drawn from a National Infrastructure Bank and challenge grants to States and communities for reduction in carbon pollution by investment in renewable energy, nuclear power, carbon capture and sequestration (CCS) and energy efficiency in buildings. A Clinton administration seem to be willing to "accelerate investment" by making the permitting process more efficient and effective. Public investment in clean energy R&D, through "successful innovation initiatives like ARPA-E", is to be directed to storage technology, designed materials, and (once again) advanced nuclear and carbon capture and sequestration. For Smart Grid technologies, what is noticeable is her failure to mention explicitly solar and wind solutions. This could reflect a perception that the technologies are relatively mature and that market introduction is well advanced; or maybe that the Clinton campaign is reluctant to be seen to pick winners in a field where the Obama administration had made bad choices before. It is not clear to us, which it is. Also the repetition of advanced nuclear and CCS could be a signal that the campaign has not abandoned, in energy policy, an "all of the above" approach.

- ***Open trade, open borders***. The scope of Clinton's ambition for her energy infrastructure policy encompasses all North America. She contemplates a North American Climate Compact that includes "ambitious national targets, coordinated policy approaches, and strong accountability measures to catalyse clean energy deployment, reduce energy costs, cut greenhouse gas emissions, guide infrastructure investment, and make our integrated energy and vehicle markets cleaner and more efficient".

Post January 20

In the transition to a Trump presidency, Trump would assess which of his proposed regulatory and legislative measures would have the greatest priority. He is likely to move forward with deregulation and accelerating permitting because he is counting on a robust energy sector to generate taxes that will allow him to reduce the deficit and pay for new programs.

As Clinton approaches the White House, she would have different challenges. The spending constraints imposed by the Budget Control Act may continue absent a transfer of control of both the House and Senate. She will also inherit a Clean Power Plan that is delayed because of litigation and market rejection.

Both candidates would find success in the following measures:

- Building on energy legislation now pending in Congress, the North American Energy Security and Infrastructure Act of 2016, that apparently enjoys bipartisan support;
- Promoting infrastructure projects, including through infrastructure funding mechanisms to include the electricity grid and pipelines, in each case where the underlying justification is not climate change, but jobs;
- Finding significant bipartisan support on measures addressing cybersecurity, that, for the Smart Grid, could include aspects of reliability and resilience, together with increased emphasis on distributed energy resources;

Recommendations

The winner of the presidential election has a unique opportunity to create a new vision that leverages the technology and business disruptions present and upgrade an old industry that requires major regulatory re-engineering and significant technology investment. The Smart Grid is the single most important and foundational infrastructure investment to get right. Our global future depends on it.

- Utilities are historically conservative and risk-averse. They need to be led to learn to accept more business risks, leverage new technologies earlier and take aggressive steps to alter their business model and improve their customer relationships.

- Utilities are at risk with all the new disruptions shared above, yet if they adapt intelligently, they can become more viable than ever before with the right strategic plan, roadmap, and technology investments. For example:

    - Rather than dealing with demand response as something that is forced upon them, utilities should lead the way to virtual power plants (i.e. managing negawatts at customer sites via pricing and/or load control programs) as part of their portfolio, where and when appropriate.

    - Rather than resist the move to distributed resources, utilities need to incorporate all forms of Distributed Energy Resources into a new portfolio-based business model, one in which the new prosumer (producer and consumer as one) is treated as an ally rather than as a competitor or rate-payer.

Federal, State and Local Regulators also must get on board to change the regulatory paradigm that today rewards "only iron in the ground and capital return" with the ability to get compensated for some R&D, energy efficiency, and increased use of distributed energy resources. For example:

    - Regulators should explore retail choice for their state, if they don't already have it, and should allow other players to deliver services to customers.

- Regulators should also figure out how to incorporate Distributed Energy Resources into their incumbent utility systems and identify mechanisms with which all can be compensated fairly and equitably.

- Regulators should mandate Power Factor of 1.0 for all home appliances and devices sold in the US. This adoption would save billions of dollars is energy losses and extend the live of the power wires across the nation.

- Regulators should commit to building a two-way power grid with two-way data communications to enable a real-time control reality that embraces both central and distributed generation.

- Regulators should study the benefits and impacts of energy storage as a tool for utilities to help deal with generation deferral, wholesale marketing resource calls, frequency regulation, synchronized reserves, supplemental reserves, energy arbitrage, black-start, transmission deferral, voltage support, distribution deferral, outage mitigation, and distribution loss reductions.

- Regulators should study the benefits and impacts of electric vehicles on the electric grid and create new regulatory frameworks that accelerate their use and deployment.

The advent of new technology requires new thinking as an electric utility considers its future. Developments in communication technologies, monitoring and sensing equipment, distributed generation, energy storage, and dynamic customer engagement programs require utilities to reconsider the nature of grid operations and resource planning.

We also recommend the reader to learn more on the technology and market disruptions mentioned here, by reading our white paper titled “Disruption Becomes Evolution : The Creation of the Value-Based Utility”

See http://www.512cmg.com/services/white-papers/disruption-becomes-evolution/

And to learn more about all things Smart Grid by reading the book titled “The Advanced Smart Grid : Edge Power Driving Sustainability”.

See http://www.512cmg.com/services/book/

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