Conundrum: Global Warming – Electric Demand

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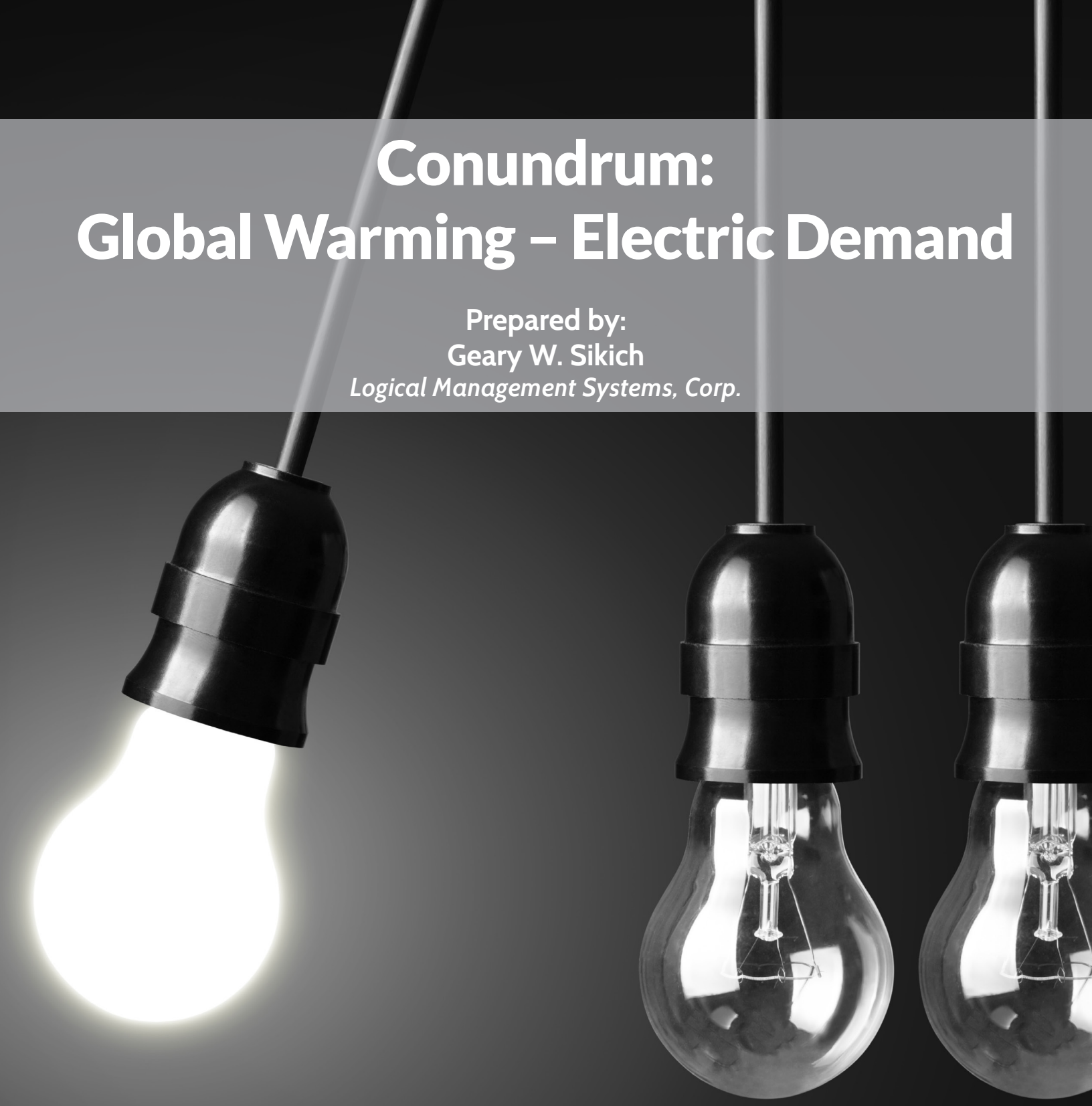

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Introduction

We hear so much about global warming, climate change and disruptive weather these days. It is often difficult to understand what is fact, truth and valid from hype, hysteria and hyperbole. Should we all be driving electric cars, not eating as much meat, using wind and solar; redefining our lives? Or, should we forget about it and continue doing what we have been doing since the early days of the industrial revolution? Do we actually have any ability to change the course of nature? After all, the world population is just over 7 billion today and is projected to reach 11 – 12 billion before 2030. How do you get 7+ billion people to suddenly change to a new non-polluting lifestyle? And, you will have to deal with the resentment of those who have been excluded from all the benefits of industrial society.

Is There a Solution Looking for a Problem; or a Problem Looking for a Solution?

I am not going to attempt to address all the aspects of global warming, climate change, etc. in this article. Rather, I will focus on one significant aspect: Electricity Demand. The demand for electricity is driving a substantial amount of global warming and climate change according to the University of California. (figure 1 below).

So, should we curtail the use of coal as a generation source for electricity? There are around 10,000 retired, operating and planned coal units, totaling close to 3,000 gigawatts (GW) across 95 countries according to carbonbrief.org, with more on the drawing boards or under construction (see References for link).

Wikipedia lists coal fired plants as follows:
The following page lists all coal-fired power stations (including lignite-fired) that are larger than 2,000 MW in current net capacity, which are currently operational or under construction. If station has also non-coal-fired blocks, only coal-fired capacity is listed. Those power stations that are smaller than 2,000 MW, and those that are only at a planning/proposal stage may be found in regional lists, listed at the end of the page. (See References for link).

Wow, where to start? Well, let's eliminate all the planned, under construction and operating coal fired plants. Yes, that makes perfect sense. I am being facetious, of course. There are no readily available replacements for the current existing power grid infrastructure.

What about more nuclear plants? Takes a long time to build nuclear plants and there is another factor to consider. Over 57% of the nuclear engineers are at retirement age right now. The replacement pool is pretty limited (no one wants to be a nuclear engineer or petrochemical engineer these days it seems). So, go ahead and build the plants; who will be there to run them?

What about natural gas? In order to convert coal plants to natural gas, you have to have gas supplies available. "We do!" you say. Yes, but getting the gas from the field to the plant requires a pipeline connection or multiple connections. The state of pipeline infrastructure in the US for example is very dated and needs a lot of attention (upgrades) and we still have to lay pipe to the plants. It is a massive undertaking awaiting us.

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Okay, so more solar and wind should solve the problem. Guess again. The amount of replacement generation required to offset taking coal plants offline is, again, massive. Production capacity for solar and wind could not ramp up fast enough to meet demand, even with a gradual shutting down of coal plants. And, this does not take into account the availability of space for solar and wind farms, weather factors (wind does not blow necessarily because you need it to, and neither does the sun shine at your command).

And don't forget the ever present – NOT IN MY BACK YARD (NIMBY) groups that will challenge the proposed siting of the above-mentioned projects.

Oh, and how about financing all of this? Where is the money going to come from to finance the massive construction projects that are required?

And, let's not forget that demand for electricity is growing, not declining. You start to get a feel for the complexity that environmentalists, politicians and the general public have yet to comprehend.

And, I haven't even mentioned grid susceptibility to cyber threats (hacking, viruses, etc.), little or no inventory of spare transformers, electromagnetic pulse (EMP) events and workforce transition loss of skills.

Consequence Planning or Continuity Planning as Usual?

According to ABB Automation & Power World, the utility infrastructure presents a potential vulnerability to continuity planning. ABB cited the following:

- ❒ Assets are aging: 70% of transmission lines and power transformers are 25 or more years old, and 60% of circuit breakers are 30 or more years old.
- ❒ The changing generation landscape is creating grid stability issues: Nearly one-sixth of the US's existing coal-fired capacity for electricity generation is due for retirement by 2020.
- ❒ Threats to our infrastructure make security more critical than ever: A FERC power flow analysis in 2013 identified 30 critical HV transformer substations across the continental US; a failure of as few as nine of these during a time of peak electricity demand could cause a coast-to-coast blackout.
- ❒ Super storms are increasing: Power outages in the US are up a massive 285% since 1984, costing businesses up to $150 billion a year.
- ❒ Workforce retirements and reduced O&M spend make grid modernization a must: With hundreds of thousands of miles of power lines that can't be centrally monitored, utility workers spend 60% of their time searching for breaks.
- ❒ Renewable mandates are increasing: 29 states and the District of Columbia have renewables portfolio standards, but no two standards are designed the same.

Source: ABB Automation & Power World

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ABB further cites the following:

- ❒ Power outages are up 285% since 1984.
- ❒ 80% of utility enterprise information is on individual hard drives - and 80% of THAT data is not secure or backed up.
- ❒ 29% U.S states now mandate green power portfolio goals.
- ❒ Disabling 9 substations during peak electricity demand can cause a coast-to-coast blackout?
- ❒ Retiring coal generation plants destabilizes grid voltage and 49 gigawatts of coal-fired capacity will be retired through 2020.

Source: ABB Automation & Power World

Many questions come to mind when reading these bullet points. Have you in your planning efforts coordinated with your local utility to find out where you are on the list of interruptible businesses? How prepared is your organization for a lengthy power outage? What would the cost be to your organization in lost sales, customer disruption, idle workers, etc. if your organization had no back-up power plan?

What would be the consequences of not being able to determine where or on what servers your data is stored? How secure is the Cloud if we lose electrical power? How will alternative energy source integration affect the continuity of your power supplies? If it takes only 9 Substations to be interrupted to create a nationwide blackout how can you afford to be without some form of internal power supply?

Power Plants are being retired; the major effect is that we are creating grid instability. We depend more and more on electricity to power our lives. We are seeing the advance of the electric and hybrid automobiles into the traditional fossil fuel auto market. Coal is a dirty word; but nuclear power takes a long time from the design and construction process to the licensing and operational activities. And, nuclear engineers are not to be found in great numbers in the marketplace. A study written a few years ago indicated that 57% of the nuclear engineers would be at retirement age within two years; and that was over three years ago. It is even worse for petrochemical engineers where in less than six years almost 80% will be eligible for retirement. And, as with the nuclear engineers, petrochemical engineers are not being graduated in large numbers.

It's All About the Consequences

If we really put on our thinking caps we would realize that, while important, all the analysis (Business Impact Assessment, Threat Assessment, Risk Assessment, Hazards Assessment, etc.) and all the planning that we do is really just a best guess; not even an educated guess, at potential events that have consequences and ramifications to our organization. We, all too often, make assumptions that the infrastructures that we are used to having available will still be available when we have a crisis. The reality is that they may not be. We rarely take into account the power of the Federal, State and Local governments to use the power of eminent domain to redirect these infrastructure resources to other areas. What would be the consequences if such an event were to occur? Have you ever designed and implemented a simulation (tabletop, etc.) that focused on the consequences of the decision making that was taking place instead of the demonstration of proficiency in a controlled environment?

We fail to plan for the consequences of events. This may sound as if I am saying that our planning is misguided and fails to address the correct needs. That is not the case at all. Planning is an exercise in "best guessing" and anticipated responses to events that we cannot predict, cannot prepare for the magnitude of or the velocity at which events will unfold. We do not know if the primary position holders in our plan will all be available when a

crisis unfolds; we assume that they will be, and we exercise our plans accordingly. When was the last time that you used alternates instead of primary position holders?

How does one plan for the complexities of an event? We tend to plan for our internal operations without much thought to what the external environment (public sector and/or private sector) are planning to do. The following comments I find to quite enlightening:

- ❒ "90% of the information used in organizations is internally focused and only 10% is about the outside environment. This is exactly backwards" — *Peter Drucker*.

- ❒ "We're living in a world where we need to completely understand our environment and then look for anomalies, look for change and focus on the change "— *Admiral Mike Mullen, 17th Chair, Joint Chiefs of Staff*

The above statements give us clear indication that we need to refocus our continuity planning efforts and readdress our understanding of how complex this process is.

Four Points Regarding Risk

What is risk? Think about it before you leap to answer. Do we really know and understand risk? Some facts to consider:

- ❒ Risk is not static, it is fluid.

- ❒ Risk probes for weaknesses to exploit.

- ❒ Risk, therefore, can only be temporarily mitigated and never really eliminated.

- ❒ Over time risk mitigation degrades and loses effectiveness as risk mutates, creating new risk realities.

Risk management requires that you constantly monitor recognized risks and continue to scan for new risks. This process cannot be accomplished with a 'one and done' mindset. Risk needs to be looked at in three dimensions and perhaps even four dimensions to begin to understand the "touchpoints" and aggregation of risk, potential to cascade, conflate and/or come to a confluence.

We start by identifying risk as having three main components:

- ❒ Defined Risk (Identified threats, hazards, vulnerabilities that are assessible based on impact, volatility, effects, etc.),

- ❒ Probability (likelihood of occurrence),

- ❒ Time (positive/negative decay of risk mitigation efforts)

In an article that I wrote in 2014, entitled "Risk and the Organizational Mindset: Learn to Think like a Commodities Trader" (Continuity Central) I expanded upon the concept of risk buffering and introduced the term "risk parity". Risk parity being defined as: an approach that focuses on the allocation of risk, usually defined by exposure, velocity and volatility rather than allocation of assets to the risk. The risk parity approach asserts that when asset allocations are adjusted (leveraged or deleveraged) to the same risk level, risk parity is created resulting in more

resistance to discontinuity events. The principles of risk parity are applied differently according to the risk appetite, goals and objectives of the organization and can yield different results for each organization over time.

When we use the three components: Defined risk, Probability and Time in tandem with the concept of risk parity we can begin to categorize risk based on an organizations' ability to buffer against risk realization; that is, to protect against the negative impact of risk realization while leveraging the positive impact that risk may have. I have provided the following definitions:

Risk Absorption Capacity can be defined as:

"**An organization's ability to survive the uncertainty of risk realization**".

Risk Saturation Point can be defined as:

"**That point at which an organization's capacity to absorb risk (either positive or negative) exceeds its capabilities; thereby creating an inability to sustain risk exposure**".

Risk Deflection can be defined as:

"**An organization's ability to create risk parity through risk buffering to deflect the impact of risk realization**".

Risk Explosion can be defined as:

"**The impact (either positive or negative) on organization's ability to balance risk realization resulting in greater risk awareness**".

For more detailed discussion see my 2014, entitled "Risk and the Organizational Mindset: Learn to Think like a Commodities Trader" (Continuity Central).

Concluding Thoughts

As I write this article, the media is focusing on BREXIT, Tweets from politicians, opioids, drug resistant bacteria, etc. We may see a story or two about utilities if there is a severe weather event; but generally, there is little being covered when it comes to utility vulnerabilities. If you are looking at continuity/resilience planning, I suggest that you look at the consequences to the infrastructure, especially the utility sector, and to your organization's product/service offerings if there is a significant disruption of the electrical power grid.

We often fail to see the consequences and potential collateral damage that can occur when an event unfolds. Recognize that we are all swayed by the media, fear and by factors that have nothing to do with logic or reason. There is a natural tendency not to see the potential consequences of events as they are too speculative for us to estimate and/or understand. But until we come to grips, so to speak, with the complexity of the consequences we will always have plans that tend to be internally focused, are subject to transparent vulnerabilities and fail to comprehend the need to see the potential consequences in light of the external environments that we operate in.

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About the Author

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Geary Sikich is a seasoned risk management professional who advises private and public sector executives to develop risk buffering strategies to protect their asset base. With a M.Ed. in Counseling and Guidance, Geary's focus is human capital: what people think, who they are, what they need and how they communicate. With over 30 years in management consulting as a trusted advisor, crisis manager, senior executive and educator, Geary brings unprecedented value to clients worldwide.

Geary is well versed in contingency planning, risk management, human resource development, "war gaming," as well as competitive intelligence, issues analysis, global strategy and identification of transparent vulnerabilities. Geary began his career as an officer in the U.S. Army after completing his BS in Criminology. As a thought leader, Geary leverages his skills in client attraction and the tools of LinkedIn, social media and publishing to help executives in decision analysis, strategy development and risk buffering. A well-known author, his books and articles are readily available on Amazon, Barnes & Noble and the Internet.

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