

The Clean Tech SuperGrid™ Has Arrived

The quest for a smart grid, advanced grid or intelligent grid continues throughout the world. And, for good reason. But thus far, we have admittedly fallen short of the promises of a truly 'smart grid'.

The distribution grids of today's world are being expected to reliably perform, while also supporting a myriad of new concepts for which they were never conceived. The depth and breadth of these present and emerging changes is impressive, sweeping, and in most cases it's necessary. Some of the recent emerging advances impacting our distribution grids include:

- a) Reverse Energy and voltage impacts due to excessive solar and wind renewables,
- b) Electric Vehicle charging station impacts, and
- c) Increased legalization of marijuana

Each of these aforementioned items, and others are actually causing tremendous negative impact upon the grid due to significant, potentially grid de-stabilizing unplanned energy flow, and unplanned loading.

Most funding has continued to focus upon exciting grid-edge developments. However, utility leadership, regulators, and political leaders are now realizing the importance of strengthening the most fundamental element upon which all such advancements must rely -- the distribution grid. Specifically, the weakening condition, limitations, and age of the distribution grid are quickly coming into focus.

Many have mistakenly assumed the grid is resilient enough as is, and that it is somehow capable of endlessly supporting our present and future demands. However, the fact is that nearly every grid on the planet is admittedly considered to be 'aged', stressed, and inefficient. And, every grid on the planet was only conceived to be a one-way delivery infrastructure, intended to simply provide electricity to ratepayers. Oh, how our demands and expectations of the distribution grid have changed, and continue to change, while the grid itself continues to be neglected, and overlooked.

In the last decade, we have developed a series of grid-edge technologies and ideas that require us to reinvent the way we view, care for, and manage the distribution grid. The grid itself is THE platform upon upon which recent, and upcoming technology advances rely. Yet the distribution grid is the most dynamic, most vulnerable, most volatile, least monitored and therefore is the least

understood segment of the entire electricity infrastructure. This stark realization is a fact that should present tremendous concern to our utility, regulator and political leadership.

Globally, we continue investing billions of grid-edge dollars to build a future that embraces advanced technologies and emerging commercial concepts which must ride upon a grid foundation that is aged, is volatile, is under-resourced, and is grossly misunderstood by utility operators. The distribution grid is key to our future, but remains a costly, reactive, inefficient mystery for operators to manage.

We are entering a new paradigm right now....we are moving away from over 65 years of considering the distribution grid to be simply a one-way, linear delivery system comprised of power lines, power poles and transformers. And, we are swiftly moving away from electric utilities being focused upon simply keeping the lights on for all ratepayers.

Now, we are actively evolving the grid into a complex bilateral, multi-purpose, electricity delivering, commerce generating, conservation enabling network. This amazingly active period is the dawn of the Clean Tech SuperGrid™. Our distribution grids must now morph into a stable, secure, reliable, bi-directional, healthy infrastructure that will successfully support and perpetuate our evolving technologies and emerging commercial concepts.

Akin to the once-coined “Information Superhighway” of the 1990’s which subsequently evolved into today’s powerful internet, the distribution grid must now become the world’s Clean Tech SuperGrid. It is upon the Clean Tech SuperGrid that societies will collectively depend for electricity reliability, energy efficiency, conservation enhancements, renewables expansion, tax revenue growth opportunities, and emerging peer-to-peer commercial networking opportunities such as block-chain.

Today’s grids are saddled with aged infrastructure, significant (and increasing) unplanned loading, potentially unsafe and de-stabilizing reverse energy impacts, and massive documented Loss that continues to go insufficiently addressed. Today’s grids undeniably suffer from massive energy inefficiency. But that reality is about to change.

Recent technology advancements have yielded the emergence of cost-effective intra-grid sensors. What is an intra-grid sensor? Imagine a “fitness tracker for the grid”. Fitness trackers for humans are applied to the wrist or ankle. The moment a fitness tracker is attached to a human, the user immediately begins to receive important granular information about his/her body and activities. Similarly, intra-grid sensors function like a fitness tracker for the grid. The moment they are commonly applied to transformers, utility operators immediately have access to critical granular information from within the heart of the grid. Without the benefits provided by intra-grid sensors,

operators unnecessarily remain blind to the perpetually changing grid conditions, and therefore have no meaningful idea where the grid is stressed, compromised, and/or preparing to fail. Operator's present-day costly, reactionary behavior is no longer necessary due to the introduction of cost-effective intra-grid sensors.



This new class of versatile sensor technology has been successfully tested by marquee utilities and others within at least 11 separate countries to date. The intra-grid sensors now provide the global industry with its first-ever “clear vision” experience into the dynamic conditions occurring within the distribution grid. Heretofore, utilities have literally been blind to the ongoing, perpetually changing intra-grid conditions that are pervasive throughout the distribution space. While that may be hard to imagine, it is true that utilities have been merely reactionary to most intra-grid conditions; their awareness of problems has typically been driven by unplanned outages, and/or customer complaints. This costly, inefficient, reactive behavior by operators has financially and operationally burdened rate payers. Now, that undesirable reality can be stopped.

Intra-grid sensors now permit operators to proactively access timely, vital intra-grid information. This capability now permits electric utilities to proactively take action to improve energy efficiency, while simultaneously preparing and monitoring the Clean Tech SuperGrid for its myriad of emerging changes, challenges, new demands, and increased reliability expectations. For the first time, true energy efficiency is now achievable; from decreased operator costs, to reduced Greenhouse Gas (GHG) emissions (upwards of 53 Million Metric Tons/year in the US alone), to improved electricity reliability, to increased productivity, to reduced intra-grid loss, etc...

Now that utilities can finally access critical, timely, accurate, granular intra-grid information via cost-effective sensors, regulators and political leaders must re-evaluate the operational and performance expectations of utility providers. The rules and expectations of the past are now antiquated; improved service and reliability levels, reduced costs, and improved conservation are simultaneously achievable. Intra-grid sensors optimize energy and operational efficiency.

We are indeed experiencing a genuine paradigm shift --- a significant inflection era. New technologies are now changing how we use the distribution grid, how we manage the grid's condition and performance, and how we will create new tax revenues to reinvest into our global societies. Sufficient proof now exists that Advanced Meter Infrastructure (AMI), or smart meters alone are incapable of creating a smart grid. AMI's intra-grid data attempt is flawed due to commonly undetected pre-meter tapping (typically due to power theft which is reported to exceed \$6 Billion/year in the US alone), and perpetually antiquated meter-to-asset mapping errors; collectively resulting in unreliable intra-grid data from AMI sources.

The Clean Tech SuperGrid is the big brother of the evasive smart grid. And the Clean Tech SuperGrid era has now arrived. The need to successfully monitor, protect, and enhance the Clean Tech SuperGrid is undeniable. And the solution to achieving proper, necessary and effective oversight of the Clean Tech SuperGrid is the intra-grid sensor – commonly called a Distribution Transformer Monitor (i.e., DTM).

If we truly aspire to achieve a smart grid, intelligent grid, advanced grid, and/or bilateral functioning grid network which yields sufficient reliability, embraces renewables, drives commerce, reduces Greenhouse Gasses (GHG), and creates increased tax revenues for local/state/federal governments, then we must adopt DTM intra-grid sensors. Utilities, regulators and political leaders must take action in support of embracing the unparalleled value provided by this new class of grid 'fitness tracker' sensors.

"Information is power"....unique, accurate, timely, granular intra-grid information is the foundational, game-changing piece required to successfully fulfill our emerging paradigm shift. We will now use the grid as a bilateral network upon which many technologies and viable commerce activities will flow, causing us to become increasingly dependent upon a stable grid. The Clean Tech SuperGrid, aka the unrealized smart grid of yesteryear, is indeed the "golden goose" that we must now begin to protect and enhance if we seriously aspire to leverage grid-edge technologies and simultaneously create significant upsides for utilities, governments, and ratepayers.

Otherwise, we will soon outstrip the design, capability, and longevity of our distribution grids. And, we will then miss the tremendous opportunities that await us if given a vibrant, healthy, stable and reliable Clean Tech SuperGrid which will serve as the backbone of future advancements. Now is the time to take action. We must properly manage and support our grids since they are the required infrastructure which is necessary to successfully drive tremendous commercial upsides, and achieve necessary energy efficiency gains for societies throughout the world.

The Clean Tech SuperGrid™ --- Smart Grid's Big Brother--- Has Arrived!