



Power Systems Design: Empowering Global Innovation

Smart Grid Band-Aids

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They have a problem in Europe. On bright, sunny, windy days, they have too much “alternative energy;” and the clocks are running too fast. Something needs to be done, and urgently. The problem is more serious than clocks running fast. The “European 50.2 Hz Problem” means that if the frequency ever reaches 50.2 Hz, under regulations introduced in 2005, most PV inverters will switch off-line. All at once.

Thou shalt apply a Band-Aid! *Retrofit 400,000 inverters!*

The SunSpec control model, embodied in IEC 61850-90-7, doesn't fix the problem, it covers it up. The frequency can now drift to 50.5 Hz. Italy went further. In addition to the frequency-controlled shutdown, CEI 0-21 adds a command interface so that the power grid providers can turn the inverters off remotely. California's updated CPUC Rule 21 is the most sophisticated yet, with bells and whistles optimized for remote control. Many feel that it fails to address the fundamental problems and may have far-reaching unintended consequences.

Thou shalt apply a Band-Aid! *Apply central command authority to all new inverters!*

Who are we to judge, sitting smugly and arrogantly on the sidelines, throwing brickbats? We do not have all the answers, but we can report a general feeling of unease among those attending APEC who design inverters. The latest revision to CPUC Rule 21 was fast-tracked, they say, broadsiding them.

Mistrust of central authority concerns some, with good reason, considering how the electric power market already is perverted by parochial interests. Who decides who is shut off and who can sell their power? Who will write the software? Will they get it right? What happens when the computer crashes, or is hacked?

Security is a big worry. The ability to communicate, control functions, and update firmware is the power to hack. Security relies upon encryption keys, and the Heartbleed Bug shows how vulnerable they are. Even if protected from the bad guys in the Middle East, security measures are easily circumvented by a knowledgeable insider. 80% of attacks are inside jobs, by disgruntled employees, consultants or contractors.

Clearly, there is a need for frequency stabilization in inverters and active loads. Anecdotes abound about companies that have proposed methods for grid stabilization but have been ignored by regulators in favor of Band-Aid solutions.

It seems fundamentally wrong and unfair that we are encouraged to install alternative energy, but can be turned off remotely so that we cannot sell our power and recover our investment. Energy storage may be the key, but it will take large scale seasonal energy storage like The **Drake Landing Solar Community** in Okotoks, Alberta. Large bore hole thermal energy storage is quite popular in Europe, and resistance heaters in them could absorb virtually unlimited surplus energy for later use, carbon free.

Abengoa's Solana plant in the desert near Gila Bend, Arizona is now operational. Solana's thermal storage system can produce clean energy for six hours at maximum power (280 MW). Similar energy storage systems

installed at moth-balled coal-fired plants might give them a new life as “super batteries” to store excess carbon free energy for later use.

Some jurisdictions throw in the towel without a fight, by limiting alternative energy penetration to as little as 4 percent. Do they have a strong coal lobby, or are they just running scared? We think that it is the latter. They recognize that the Band-Aid solutions only put off the day of reckoning and are expensive. They may be waiting for the perfect solution, which is perpetually elusive. In some cases, “perfect” is the enemy of “good enough.” Oh, for a happy medium.

The opinions expressed are the author's, not those of PSMA.

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