



Innovation, proliferation and the conundrum of walled gardens in solar

April 5, 2022

Tigo's Chief Marketing Officer, James (JD) Dillon, guest starred on Solar Power World with an article covering the importance of universal compatibility in the solar + storage industry. Read the article where he covers how compatibility can impact five different optimization vectors and the future of solar.

The engineers and installers who design and deploy energy systems benefit from the ability to tailor energy systems precisely to customers' desires, needs or budgets. Since no two households or businesses have the same desires, needs or budgets, both will benefit from a high level of flexibility in purchasing energy systems. Compatibility and interoperability have been key enablers of the advancement of countless technologies. From the width of railroad tracks that enabled trade and travel between countries to the computing revolution, the spirit of human innovation unleashes when things work together. The advent of distributed renewable energy, which remains an emerging space, is no different.

In the solar + storage market, installation companies range from one or two employees to hundred-million-dollar companies with thousands of employees, which gives customers many options to choose from for home or business energy needs. Similarly, companies that make solar, storage, and related products produce everything from point-solutions to all-in-one energy systems. And while consumers, and commercial solar buyers, often find comfort in single-source solutions, the proverbial walled gardens of all-in-one product suites restrict innovation, customer satisfaction and the overall market adoption of renewables. Quick, name the top four smartphone operating system options around today.

Today, no single company in the solar + storage industry can claim to provide a full stack of components that are universally compatible with all others from within the ecosystem, competing or complementary. There are, however, companies that work toward compatibility and flexibility and others in whose technology stacks no third-party component can play. This distinction is true for hardware components, but increasingly and critically for software elements too. If a system's solar generation and storage management software does not communicate, customers lose out on some of the most compelling benefits of solar + storage. Therefore, installers are confronted with a decision: to maintain the flexibility and freedom to choose and use the components that would best do the job, or go with the all-in-one system?

It must be mentioned that organizations such as Underwriters Laboratories (UL) and the California Energy Commission (CEC) also serve an important role in ensuring that products meet certain baseline standards. For example, PV rapid shutdown equipment (PVRSE) and PV rapid shutdown systems (PVRSS) from UL define standards to ensure safety from risk of shock and fire and protect firefighters and installers while performing their duties on or in buildings with PV arrays. Similarly, the CEC in its 2022 California Energy Code set forth that new single-family homes must be "battery-ready," adding requirements such as a minimum 225-amp busbar, four backed-up circuits (two of which must be the refrigerator and bedroom receptacle outlet), and either a subpanel or split-bus main panel for those circuits. These kinds of standards, however, do not always address the incompatibility issues that vex installers and homeowners in the interest of protecting market share with proprietary systems and interfaces.

The many options and opportunities offered by the compatibility of components will benefit installers and system owners. While no one company provides a fully, broadly compatible set of solar + storage components, manufacturers can differentiate themselves by operating with a philosophy of compatibility, having aspirations of compatibility, and actively engineering products to make broad compatibility a reality. At Tigo Energy, for example, we work extensively with inverter partners to ensure that installers enjoy seamless compatibility between third-party solar inverters and our MLPE products for rapid shutdown, monitoring and optimization. This effort for compatibility opens up previously unavailable options and choices for installers. While full, universal compatibility is probably an unrealistic and unattainable ideal, operating in the spirit thereof is attainable and represents one of the most pro-customer (homeowners, building owners, installers) postures a supplier can take.

In solar (to include storage and other configurations), the most important optimization vectors are financial, performance, deployability and serviceability. Any given customer will favor (read: buy based on) some constellation of priorities among these four vectors. A fifth vector is reputation — being seen as caring for the planet and environment — but this factor is beyond the scope of this discussion.

The money

With few exceptions, households and businesses march to the drumbeat of budgets and cash flow, placing financial considerations at the bottom (most universal and primary) level of the solar version of Maslow's hierarchy of needs. During the planning phase, the end customer wants to spend the least amount of money on a system that will best serve their defined or perceived needs. Some will be willing to pay for module-level monitoring, some will spend more money upfront for more performance through optimization, and others only want to invest in battery backup that keeps a refrigerator, lights and cell phone charging running. An all-in-one energy system that does not play nice with third-party components significantly limits the ability of the installer to design the Goldilocks configuration for which the customer is ready to pay. For the installer, on the other hand, a closed technology ecosystem makes it exceedingly difficult to design a system for a customer who either does not care about cost or is highly cost-sensitive. The budget system does not need all the bells and whistles that some all-in-one solutions price into their offerings by default, and the high-end system will call for features that may be difficult to add to a walled-garden system. In either case, incompatibility and technology lock-in do no favors to either the solar customer or the installer from a financial perspective.

The power

While undoubtedly closely tied to the financial vector, the performance vector proves just as problematic with closed systems and incompatible components or software. Whether it's optimization for energy production due to module shading or soiling, or critical load backup vs. whole-home backup, the freedom to put the right components in play is essential. Again, customer requirements and constraints represent an almost atomized level of system specifications; no two systems (read: customer requirements) are the same. Why push a Tesla Model X on a customer when an electric Vespa is more than sufficient, or vice-versa? The transportation analogy is not perfect, but a Tesla can be had with more or less giddyup or battery capacity, and Piaggio is even offering its iconic Ape (much larger, three-wheeled scooter) with electric propulsion. Back to energy, utilities in Hawaii have largely moved to zero-export tariff protocols for solar, meaning that a homeowner in the state whose system over-produces energy during the day must send their precious solar-derived electrons into the ground. This dynamic has profoundly changed how residents and businesses in the

Aloha State view energy storage systems and, consequently, how installers approach selling, sizing and design. The flexibility provided by solar and storage electronics, which are compatible across manufacturer brands, have allowed solar to adapt and survive the zero-export policy change in Hawaii.

The work

Whether residential, commercial or utility-scale, installing solar and storage systems is yeoman's work; you can't phone it in or get it done in pajamas on a video call. An older home addition, done on the cheap, might not have studs installed at 16 inches on-center, an asphalt shingle is hiding a rotted-out section of OSB sheathing, the service panel is out of code compliance by a decade, and so on. Anything other than a perfect building will increase installation time. Therefore, the solar and storage components should not also add labor above and beyond the budgeted baseline. Installers who bind themselves to closed, all-in-one systems may benefit from reduced training requirements due to standardization, but the resulting inflexibility is not beneficial when equipment deploys in the real, imperfect world.

The service

After the installers finish their work, solar and storage systems begin their productive lives. As complex technology products that spend their lifetimes exposed to the elements, however, not everything will always last and function as intended in perpetuity. As the frontline of customer service, installers must have insight into the systems within their fleets to protect their reputations. Remote monitoring allows preventative maintenance, problem identification and efficient scheduling of costly truck-rolls. Such fleet monitoring systems, therefore, must be as flexible and compatible as possible with equipment in the field; here, again, the walled garden approach to technology ecosystems is not a strategic differentiator, rather a drawback. Open systems allow a single view of a heterogeneous fleet on a single pane of glass instead of monitoring several proprietary systems individually.

Relatedly, while the manufacturer is technically responsible for any equipment failure or underperformance, the installer is ascribed responsibility in the eyes of the customer. A failed component could be one of the few unlucky parts per million, or it may have failed because of an error during installation. To the customer, there is almost no distinction between the two. The reputation damage is done first and foremost to the installation company, which adversely impacts reputation and, by extension, referral business. Since the quality, longevity and warranty support of energy technology products tend to improve over time, a high level of compatibility and interoperability enables flexibility when it comes time to replace a failed or underperforming component. The same goes for upgrades of older components to add features or boost system performance.

If our shared goal — across homeowners, businesses, technology companies, installers, and so on — is to increase the use of clean solar energy, then it should follow that we must also have other similarly aligned goals. Deploying more solar is a matter of market adoption, requiring more solar system sales. The frontline of solar (and storage) system sales are, once again, the legions of solar installation companies and contractors who must juggle customers' desires, needs or budgets with their own, along the vectors of optimization discussed here. The ascent of compatibility and interoperability are vital enabling factors that allow sales teams to offer the just-right system configurations that their prospective customers will buy. Further, these enabling factors also allow installers to be efficient with installation and maintenance, enabling them to operate viable businesses. As a varied and heterogeneous ecosystem, a philosophical and practical commitment to compatibility and interoperability is central to ensuring the growing concern of solar at large. As such, these are ideals worth striving toward.