BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking Regarding Policies, Procedures and Rules for the California Solar Initiative, the Self-Generation Incentive Program and Other Distributed Generation Issues.	Rulemaking 12-11-005 (Filed November 8, 2012)

COMMENTS OF SOLARCITY CORPORATION ON THE ASSIGNED COMMISSIONER'S RULING REGARDING SAFETY CONSIDERATIONS RELATED TO ENERGY STORAGE

KEYES, FOX & WIEDMAN LLP
Jason B. Keyes
Thadeus B. Culley
436 14th Street, Suite 1305
Oakland, CA 94612
Tele: (510) 314-8203
(510) 314-8205
Email: jkeyes@kfwlaw.com
tculley@kfwlaw.com

Counsel for SolarCity Corporation

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Pursuant to the *Assigned Commissioner's Ruling Regarding the Safety Considerations for Interconnection of Energy Storage Systems Paired with Renewable Generators Eligible for Net Energy Metering* (ACR) filed on January 6, 2014, SolarCity Corporation (SolarCity) respectfully submits the following responses to address the Commission's safety concerns related to energy storage. SolarCity previously submitted comments and reply comments on the *Assigned Commissioner's Ruling Regarding Interconnection of Energy Storage Systems Paired with Renewable Generators Eligible for Net Energy Metering* issued on October 17, 2013, and appreciates the opportunity to provide these supplemental comments and requests that the Commission move expeditiously to establish certainty in the interconnection process for energy storage devices paired with eligible NEM systems.

I. SolarCity's Responses to Questions Related to Safety and Reliability Impacts on the Utility Distribution System.

Question 1: Are there any safety or reliability concerns associated with the interaction of customer-side energy storage with the utility grid that are not currently being addressed through Rule 21?

No. The specific intent of Rule 21 is to ensure safe and effective interconnection of distributed energy resources to the utilities' distribution systems. In the recent settlement addressing modifications to Rule 21, the scope very specifically included interconnection of storage devices. Here is how the Settling Parties described the objectives of Rule 21 and the success of their negotiations in arriving at a settlement that achieves those objectives:

> "Electric Rule 21 (Rule 21) has successfully facilitated the interconnection of tens of thousands of net energy metered (NEM) and non-exporting generating facilities within California. However, Rule 21 in its present form is not designed to facilitate the interconnection of large numbers of generating facilities that export significant amounts of electric power to the State's electric distribution and transmission systems, or to interconnect energy storage devices. Recently, the Commission has implemented a number of new procurement programs targeting smaller scale renewable generators, combined heat and power (CHP) facilities, and new technologies, such as energy storage. Given the existing limitations of Rule 21, an updated distribution-level interconnection process is necessary to support the success of these programs."
>
> During the past seven months, a diverse group of stakeholders, Commission Staff, and the state's largest IOUs have worked collaboratively in a consensus-based process to update Rule 21 so that the tariff may better facilitate the interconnection of exporting generating facilities and storage technologies. The result of those discussions is a proposed Settlement Agreement that maintains the safety, reliability and power quality of the state's electric distribution and transmission systems while balancing the need for transparent requirements and procedures to make the generating facility interconnection process as predictable, timely and reasonably priced as possible."[1]

The Commission agreed with this characterization and approved the settlement in D.12-09-018, stating the following:

[1] R.11-09-011, "Motion For Approval Of Settlement Agreement Revising Distribution Level Interconnection Rules And Regulations" at p. 2 (March 16, 2012).

> "… the Proposed Settlement supports the federal and state policy goals of operating a safe and reliable electric grid. Safe and reliable operation of the electric grid has always been a central purpose of Rule 21.97 Even as the Commission moved to a more-efficient screen-based review of interconnection applicants in 2000, safety and reliability remained the core purpose of Rule 21. The Revised Rule 21 continues to support the safety and reliability of the electric grid by, for example, retaining eight of the screens included as part of the presently effectively Rule 21 Initial Review process under the Revised Rule 21. These screens pose key technical questions that relate to system safety and reliability, such as starting voltage drop, short circuit current contribution and short circuit interrupting capability, and line configuration. In addition, Section H (Generating Facility Design and Operating Requirements) of the presently effective Rule 21 is unmodified and continues to refer to accepted national and international standards for operation of an electric grid.
>
> On the basis of the above, the Proposed Settlement serves the public interest by supporting federal and state energy policy goals related to distributed generation, including increased standardization of interconnection terms and conditions, the development of the distributed generation market as an alternative energy supply, and the operation of a safe and reliable electric grid."[2]

Given the Commission's recent approval of the settlement—and the scope of the settlement, itself—SolarCity does not believe that there are any issues that pertain to the safe interconnection of storage systems that are currently unaddressed by Rule 21. We further note that to date, relatively few storage systems have been approved for interconnection despite compliance with Rule 21 and all other permitting requirements. This state of affairs provides little opportunity for project developers or the state to gain any practical experience with storage system deployments.

While understandable, the Commission's inquiry into this area is somewhat duplicative given the vast amount of time and resources expended by the Commission and stakeholders to create an interconnection regime that includes energy storage systems. Indeed, the Rule 21 reform process represents over eight months of intensive discussions among stakeholder in a Commission-facilitated process. While we acknowledge the Commission's responsibility to ensure a safe and reliable electrical system, this is an instance where the issue has been asked and answered via an extensive and highly technical Commission inquiry into interconnection related issues. That inquiry culminated in a Commission decision adopting the current Rule 21 framework a little over two years ago.

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[2] D.12-09-018 at pp. 34 – 35.

Question 2: *If certified equipment is used, should any other protections be required that would prevent a customer from tampering with the equipment, potentially compromising the anti-islanding or other safety features installed on the device?*

It is important to note that that all customer-side distributed energy resources are subject to multiple layers of regulatory and safety review beyond simply using certified equipment. UL certification, coupled with local permitting requirements, which reflect national and state electric, building and fire codes, and the existing Rule 21 interconnection requirements, are adequate to ensure the safe and reliable deployment of storage systems that already have features to provide reasonable protections to prevent customer tampering. For example, Article 110 of the California Electrical Code includes provisions that among other things, address tampering. The goal of UL certification and the various permitting and interconnection requirements is to comprehensively address the issue of customer and grid safety. We believe these overlapping and complementary regimes provide multiple and effective layers of review and oversight to ensure that storage systems are deployed safely and in a manner that safeguards against customer tampering

Furthermore, we do not believe that there is any basis to support the notion, implicit in this question, that customers are likely to ignore the warning labels, the terms of their system warranties or storage leases, or common sense to engage in tampering that would put their safety at risk. Given this, customers would need to be strongly motivated, economically or otherwise, to tamper with storage or related equipment, such as an inverter. However, it is unclear what those motivations might be. Additionally, if the Commission believes such motivation or risk of tampering exists, to the extent these same risks apply to other distributed energy resources, we contend that Rule 21 may be the more appropriate proceeding to address this issue.

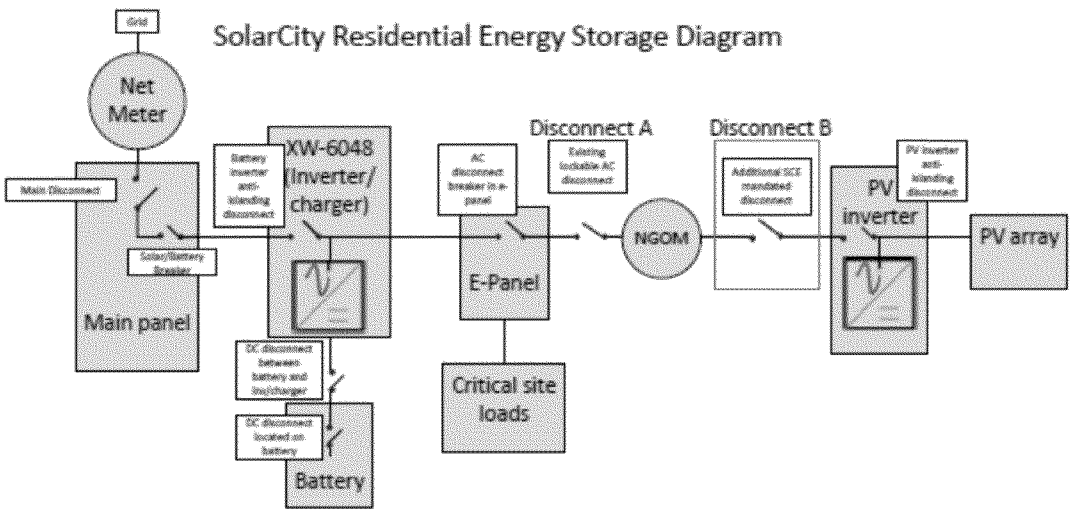
Unless these or other risks are inherent to energy storage technologies, it is unreasonable to subject energy storage systems to additional, *ad hoc* requirements that go beyond what is currently required of other distributed energy resources that interconnect to a utility's distribution system. As a case in point, we note that despite the fact that SolarCity's storage projects meet all interconnection and permitting requirements, they have been subjected to what appears to be the very type of *ad hoc* requirements that Rule 21's comprehensive regulatory framework was designed to avoid. Not only do these requirements create an environment of uncertainty for customers and project developers, and create unnecessary barriers to a technology that the Commission has deemed an integral part of the future of the California grid, they do nothing to demonstrably improve safety and, in some instances, may actually do the opposite.

Recently, SCE has rejected a number of SolarCity storage projects for not including an additional, unnecessary disconnect. In Figure 1, below, we show our standard system configuration inclusive of the additional disconnect SCE has required as a condition of approving interconnection. For purposes of this discussion, our focus is on Disconnect A and B. "Disconnect A" in the diagram is currently included in our proposed configuration while "Disconnect B" represents the additional disconnect that SCE is mandating. As explained in more detail below, not only does SCE's requirement add additional costs to the storage system, it also may actually serve to reduce safety.

When disconnect A is triggered it ensures that no power can flow to the Net Generation Output Meter (NGOM) from the grid or from the storage device. Additionally, when triggered, this disconnect, coupled with the required anti-islanding features of the solar system, ensures that the solar inverter trips off. Thus no power will flow from the solar system to the battery or to the NGOM if a utility employee were to need safe access to it. In other words, the NGOM is

completely isolated. In light of this, the additional disconnect SCE is requiring is superfluous and may actually compromise safety. If only Disconnect B is triggered safety personnel may mistakenly believe that the system is no longer "hot" which would not be the case unless they also trigger Disconnect A, as triggering Disconnect B does not stop the flow of energy from the grid or the battery to the NGOM. The safest solution is to have a single and secure disconnect that will ensure that any portion of the system that a utility would need to access is isolated from any electrical current.

Figure 1: Storage Configuration and Disconnects



With regard to the costs, we estimate that for storage systems that are already installed and awaiting interconnection, the costs of the additional disconnect are approximately $320 to $350 given the incremental costs of sending a truck and employee to the customer premises to install the disconnect. If included as part of the system configuration from the outset, the costs are less, though still non-trivial, at $70-$100 in parts and labor. Additionally, the additional

disconnect necessarily expands the footprint of the system, which can raise space and aesthetic concerns, that, while not necessarily determinative, can reduce customer satisfaction and uptake.

SCE's approach amounts to a trifecta of bad outcomes: customers are subject to higher costs, the market is faced with arbitrary rules, and safety may actually be compromised. Although SolarCity is attempting to resolve this issue with SCE and similar issues with SDG&E (which has also requested multiple redundant disconnects), in the event that those discussions do not bear fruit before issuance of a decision in this proceeding, we ask the Commission, in addressing these issues, to direct SCE and SDG&E to allow SolarCity's projects, configured with disconnects as illustrated in Figure 1 excluding Disconnect B, to move forward.

Going forward, to facilitate timely resolution of technical disputes that may arise between the IOUs and project developers like SolarCity, we suggest the Commission retain an independent technical consultant to assist Commission staff in resolving such disputes. The current process, under which the IOUs appear to enjoy unilateral authority to impose additional requirements beyond what is required or necessary under Rule 21 or any other permitting authority, has led to extensive delays, and additional costs, to the detriment of market development and transformation, ratepayers, and programs such as the Self-Generation Incentive Program.

II. SolarCity Responses to Questions Related to Safety Impacts on Customer Premises.

Question 3: *There appear to be three types of safety concerns related to the interaction of the energy storage device within the home/business environment: a) fire hazards, due to overheating or exposure to open flames, b) electric shock hazards to emergency responders, and c) containment of hazardous materials in the event of fire or other disasters. To what extent does Rule 21, and the equipment certifications required therein, address these safety concerns?*

SolarCity submits that each of these areas of concern fit squarely within the jurisdiction of local permitting authorities, as is current practice, rather than that of the Commission. The scope of the Commission's interventions should be limited to the impact customer-sited energy systems may have on the safety and reliability of the grid and on utility equipment that may be located on a customer's property (in this case the NGOM). Beyond those circumstances, all of these issues are already well-addressed by UL requirements and appropriate building codes, as enforced by local permitting authorities.

The UL listing process ensures that equipment passes a number of safety checks and performs as designed. Battery storage systems typically are designed with multiple and redundant safety systems that prevent thermal events and contain hazards in case of a fire. Additionally, the process to acquire a permit to install an energy storage system requires a safety review by the Authority Having Jurisdiction, including an on-site inspection of all work performed. Existing Rule 21 requirements prevent a project from interconnecting to the grid if this inspection is not passed.

As with many other kinds of equipment that might pose a hazard to emergency personnel, appropriate signage at the main meter and on all related equipment ensures that that proper protocol will be used to keep emergency responders safe. This is required by most permitting authorities and is standard practice for SolarCity.

The California Energy Storage Alliance's (CESA) overview of safety issues as they pertain to storage systems provides a good summary of the various requirements to which storage systems are currently subject. To supplement and support what CESA has provided, SolarCity additionally provides as Attachment 1 to these comments, a list of relevant, safety-related codes/regulations beyond Rule 21.

Question 4: *As part of the Rule 21 interconnection application process NEM applicants are required to provide evidence of the final electric inspection clearance from the governmental authority having jurisdiction over the generating facility. Does this provision typically involve every relevant regulatory and permitting authority that needs to be notified of the installation, such as local fire districts?*

As a practical matter, all relevant permits for a battery storage system are required as a condition of interconnection approval. Final electrical approval can only be obtained when an inspector verifies on site that all permitting requirements have been met. As an example and consistent with this, section D.4 of PG&E's Rule 21, for example, requires the following: "A Producer shall ascertain and comply with applicable Commission approved tariffs of Distribution Provider; applicable FERC-approved rules, tariffs, and regulations; and *any local, state or federal law, statute or regulation which applies to the design, siting, construction, installation, operation, or any other aspect of Producer's Generating Facility and Interconnection Facilities* [emphasis added].

Furthermore, section D.5 of Rule 21 authorizes the distribution provider to review the design of generating and interconnection facilities, inspect such facilities prior to the commencement of operation, and require any modifications to comply with Rule 21. Section D. 8 requires a producer to operate and maintain facilities in accordance with "Prudent Electrical Practices" and in compliance with Rule 21. Section D. 9 authorizes the distribution provider to limit or curtail operation or require the disconnection "at any time…in the event of an Emergency, or to correct Unsafe Operating Conditions" or if the provider determines that the facility is not in compliance with Rule 21. Thus, should the provider determine that the producer has not complied with a local ordinance, for example, consistent with D.4, the provider has the authority to limit or curtail the facility. Clearly, the Commission has empowered distribution

providers to exercise broad review, oversight, and enforcement authorities over generation and interconnection facilities to ensure compliance with all local, state or federal laws.

Question 5: Are there different safety requirements currently in place for solar PV that are not required for energy storage and that could be easily modified for application to storage projects? Examples may include clear labeling and accessible manual disconnects for emergency responders.

Clear labeling is required in some jurisdictions for solar PV systems and is already required for storage in many cases as well. SolarCity's systems have multiple manual disconnects (two DC disconnects, two AC disconnects) that are clearly labeled for emergency personnel or customer use.

Question 6: Do existing rules and procedures address the use of used battery devices for energy storage? For example, if an electric vehicle battery is placed in service for stationary storage, will it be required to meet different UL certification standards?

Beyond noting that the batteries would have to be connected to an inverter and as such UL 1741/IEEE 1547 rules apply, as would Rule 21, SolarCity does not comment on this issue at this time as all of SolarCity's storage systems rely on new batteries.

Question 7: If the existing rules and procedures do not adequately address the safety impacts of energy storage, what are the appropriate roles of the CPUC, utilities, local government agencies or other state agencies to develop and implement improved safety standards? How can the CPUC help improve the coordination among the various agencies and permitting authorities involved to increase procedural efficiency?

Overall, SolarCity believes the existing rules and procedures provide a robust approach to address safety impacts of customer-sited energy storage. Regarding the role of the CPUC and the IOUs in the context of safety, any additional oversight should be focused on those issues or circumstances where there is a clear nexus between the storage systems being deployed and their interaction with utility functions and the distribution system. Rule 21 deals principally with the ensuring that customer-side, distributed energy resources are interconnected in a way that maintains the safety or reliability of the distribution system. Outside the confines of the distribution system, we believe that any safety issues are best addressed by local permitting authorities consistent with all applicable electrical, building and fire codes and standards.

On the issue of coordination, given the vast number of local permitting authorities with whom developers need to work, we believe there are opportunities for state-level action to improve the consistency of permitting approaches across jurisdictions. As we have noted before, the Governor's Office of Planning and Research (OPR) has in the past undertaken efforts to develop a set of best practices that seek to improve and standardize permitting for solar as well as alternative-fueled vehicle fueling and charging infrastructure. Similar efforts could be undertaken for energy storage, with OPR or other, similarly situated entity, coordinating the development of permitting best practices and guidance for local permitting authorities to consider.

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II. Conclusion

SolarCity urges the Commission to move expeditiously to adopt a proposed decision to make explicit the existing statutory exemption for NEM-paired storage device from additional charges, including interconnection and standby charges.

Respectfully submitted at San Francisco, California on January 8, 2014,

By /s/ Jason B. Keyes

KEYES, FOX & WIEDMAN LLP
Jason B. Keyes
Thadeus B. Culley
436 14th Street, Suite 1305
Oakland, CA 94612
Tele: (510) 314-8203
(510) 314-8205
Email: jkeyes@kfwlaw.com
tculley@kfwlaw.com

Counsel for SolarCity Corporation

ATTACHMENT 1

Customer-Side of the Meter Safety-Related Codes and Regulations

Below, SolarCity identifies key regulatory authorities beyond Rule 21 that pertain generally and directly to energy storage systems and the safety issues raised by the Commission in this ACR. As evidenced by the information below, storage systems are subject to a very large body of regulation that comprehensively addresses the safety of the equipment itself, as well as the manner in which it is deployed. In addition to the high level authorities that apply generally to electrical equipment and systems including battery storage, we have also identified certain key sections of the regulations that pertain specifically/exclusively to battery storage systems.

Underwriters Laboratories (UL) Standards

Underwriters Laboratories provide testing and certification services to ensure that systems meet specified safety and performance standards.

- UL 1973 – UL listing for stationary battery packs
- UL 1741/IEEE 1547 – UL listing for the battery storage inverter which incorporates IEEE 1547
- UL 1642 – UL listing for lithium batteries

Title 24 Requirements

Published by the California Building Standards Commission, Title 24 encompasses the various state regulations that govern the design and construction of buildings, related facilities and equipment. It applies to all building occupancies throughout California and contains requirements pertaining to structural, mechanical, electrical, as well as plumbing systems, and requires measures for energy conservation, green design, construction and maintenance, fire and life safety, and accessibility. Cities and counties are required by state law to enforce Title 24 and it various provisions, though they have the discretion to establish more stringent requirements. Below are key parts within Title 24 that are relevant to safety issues and energy storage.

Title 24, Part 2: California Building Standards Code

The California Building Standards Code establishes minimum requirements governing how buildings are designed and constructed to ensure the safety of the built environment.

- Chapters 16 and 23 (and ASCE 7-05 Section 13.3) – Design calculations for anchorage of battery on stud wall.

Title 24, Part 3: California Electrical Code (CEC)

The CEC establishes minimum requirements related to the installation of electrical devices and systems and is intended to, in the words of the code itself, "safeguard the public health safety and general welfare through structural strength means of egress facilities, stability, access to persons with disabilities, sanitation, adequate lighting and ventilation, and energy conservation; safety to life and property from fire and other hazard attributed to the built environment,' and to provide safety to fire fighters and emergency responders during emergency operations." The CEC is based substantively off of the National Electrical Code, which is drafted by the National Fire Protection Association. Below are key articles that specifically relate to storage systems.

- Article 480 – specifically addresses battery energy storage
- Article 690 – addresses photovoltaic systems including those paired with battery energy storage
- Article 110 – requirements for electrical installations, including anti-tampering requirements
- Article 705 – addresses interconnected electric power production sources

Title 24, Part 9: California Fire Code (CFC)

The CFC provides installation requirements that ensure that battery systems will not cause or exacerbate fire risk. More generally, the fire code "establishes the minimum requirements consistent with nationally recognized good practices to safeguard the public health, safety and general welfare from the hazards of fire explosion or dangerous conditions in new and existing buildings, structures and premises, and to provide safety assistance to fire fighters and emergency responders during emergency operations."

- Section 608 – Addresses stationary battery systems

Occupational Safety and Health Administration

The Occupational Safety and Health Administration promulgates regulations to ensure safe conditions for workers/employees. Within that broad mandate, OSHA establishes regulations that relate to the type of informational materials that ensure emergency personnel are aware of how to safely handle equipment during emergency situations.

- Hazard Communication Standard – 29 CFR sub-part 1910.1200 – requirements for manufacturers to develop informational materials describing safe handling procedures for use by first responders.