

INTERCONNECTION
REFORM TO
ACCELERATE
RESIDENTIAL
SOLAR & STORAGE

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Tesla Energy

NJ BPU Grid Modernization, Interconnection Process
Stakeholder Meeting 4 Submission
01/28/2022



SMART HOMES AT EASTON PARK DRIVEN BY UTILITY TECHNOLOGY APPROVALS



RESIDENTIAL STORAGE INTERCONNECTION REFORM ESSENTIAL FOR GRID MODERNIZATION



Problem

- A future of high residential solar penetration requires battery storage
- Solar + Storage installations can be costly and complex
- Interconnection and electric service rules are slow to evolve

Solution

- **Develop a transparent pathway for distributed generation interconnection solutions to go through EDC technical, field, and legal review and approval**
- Tesla Backup Switch reduces cost and install times for residential storage: an adapter that locates between customer meter socket and EDC revenue meter, it reduces storage install times by 10X and reduces project costs
 - Compliant with National Electric Code
 - Certified to UL 414, UL 2735, UL 916, UL 1741 PCS
 - Approved by utilities in other states

PROBLEM: PV-STORAGE HOME INSTALLATIONS ARE COMPLEX

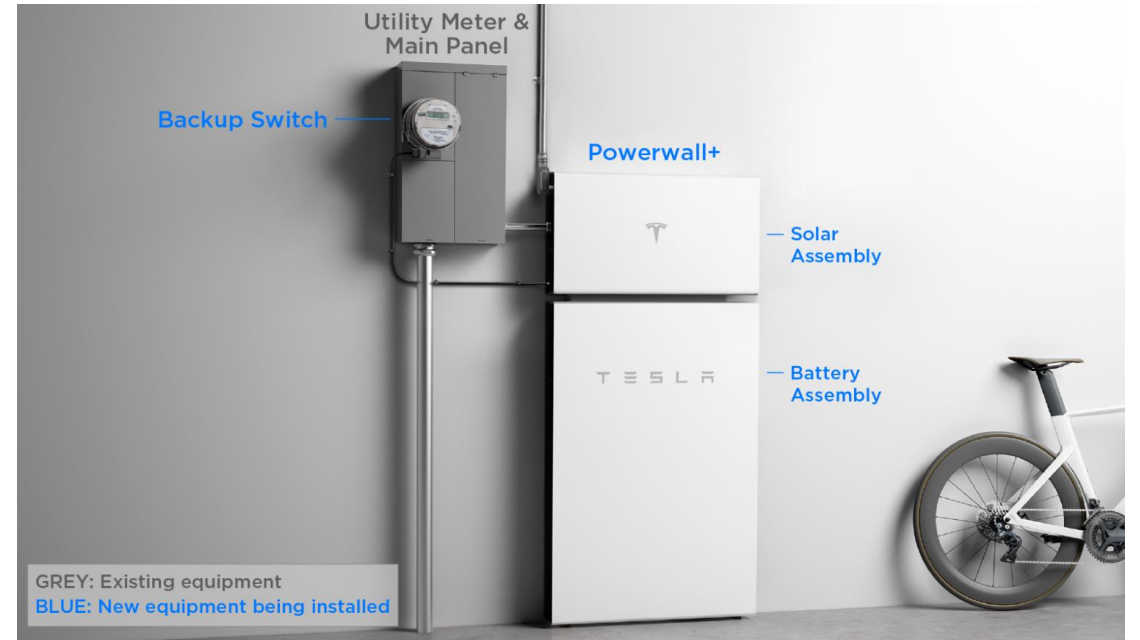
- Whole-home backup requires extensive re-wiring of the home electrical panel
 - Either re-wiring the service disconnect and main panel grounding
 - Or re-wiring each individual home load circuit
- Multiple additional boxes are added to the customer's wall.
- Dozens of wire terminations are required
- Resulting installation is costly
- Resulting installation can be confusing for emergency personnel/contractors/EDC employees



SOLUTION: ISOLATION DEVICES AT CUSTOMER METER SOCKET



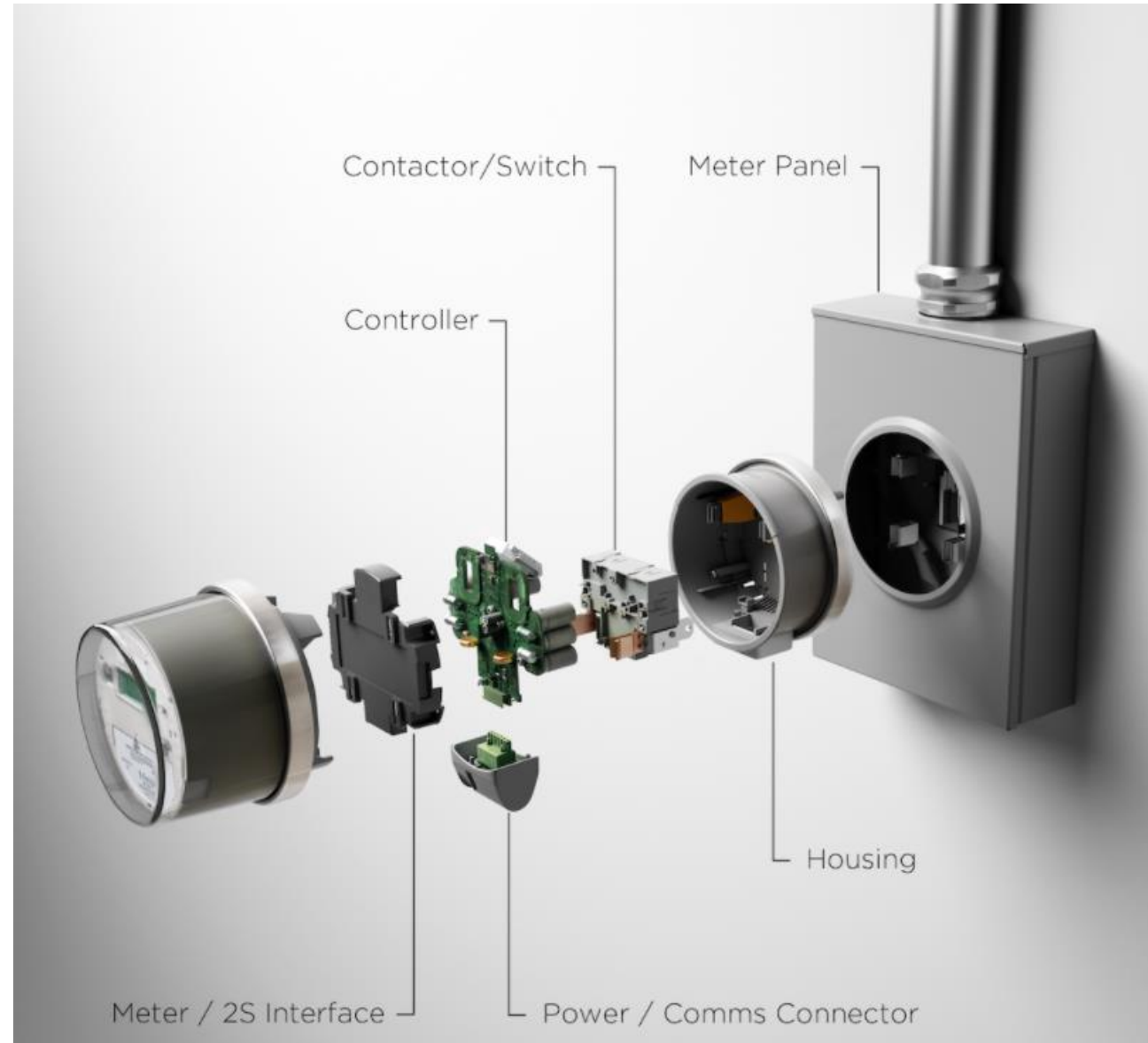
Old Way



New Way

TESLA BACKUP SWITCH

- Less intrusive for customer & more streamlined installs on diverse property sizes and configurations
- Improved aesthetics & customer experience
- Easier to install on more premises, 10X faster installs = less stress on available labor, easier logistics, improved install safety
- Less material and labor costs passed to customer (e.g. realized in \$500 Tesla credit for customers using Backup Switch)
- No EDC maintenance requirements (any issue at the site, simply pull it out)



Customer-sited Switches and Adapters present the biggest single-change potential for residential DG customer installation cost savings

Tesla Backup Switch	Tesla’s solar and storage installation for residential homes; installs under an hour and allows for safe disconnects and whole-home backup with the battery when the grid is in an outage
Simple ConnectDER	A meter panel adapter that reduces install time under an hour, allows resident to quickly “swap in” additional self-generation components on the home as they are introduced to the market, installed nationwide
Smart ConnectDER	The Smart ConnectDER™ goes beyond Simple ConnectDER by including onboard metering, communications, and controls. For utilities, it unlocks alternative tariff models and grid management capabilities like load unmasking. This meter collar operates in parallel with the utility’s grid and can be factory-configured to terminate DER field wiring to either the load side or line side of the utility meter. For homeowners and installers, it comes with all the same benefits of the Simple ConnectDER – lower cost and fewer boxes and wires on the side of your house.
EZ-Connect	UL Listed, 200-amp manual transfer switch automatic disconnect for solar when the grid goes into an outage, allows transfer load to your back-up device, being developed for use nationwide.
SolarLink	During a power outage, PV systems shut down to prevent dangerous back-feeding of the utility lines. If these systems did not shut down, solar panels could energize the utility lines, creating an extremely dangerous situation for line-workers. SolarLink avoids this issue by automatically disconnecting from the utility grid when utility power is lost. It will be made available in a meter panel/socket-based adapter and surface mount.
Green Meter Adapter	Used in California PG&E, the GMA is an alternative for solar and solar-storage installations to upgrading an electric panel and service to save time and additional cost; installed in meter panel.
RMA – Renewable Meter Adapter	The device simplifies the interconnection process, allowing customers to bypass electric service panel upgrades that are often required to support rooftop solar systems. This allows customers to eliminate the hassle and cost of associated construction to walls, stucco and landscaping, which can cost upwards of \$10,000, as well as related delays and additional permitting requirements. Since becoming available in 2015, more than 6,500 SDG&E customers have saved nearly \$8 million in solar installation costs by using the Renewable Meter Adapter.
Generlink	UL-listed, socket-mounted transfer switch that provides a safe and convenient way to connect portable generator power to the home; installed behind utility revenue meter, the GenerLink delivers generator power directly to customer breaker box, eliminating the hassle of running power cords through the home.

N J G R I D M O D E R N I Z A T I O N O B J E C T I V E

R E M O V E B A R R I E R S T O R E S I D E N T I A L D E R I S O L A T I O N A D A P T E R S O N C U S T O M E R M E T E R P A N E L

3.11 **Meter Attachments**

No attachments by the customer or the customer's agent are permitted to Company-owned meters, meter circuits, or ancillary meter devices. This includes grounds attached to meter sockets from the telephone or CATV companies.

The following are considered **un-authorized** connections when not made, installed, or performed by a FirstEnergy employee or an authorized representative of FirstEnergy:

- Any adapter placed between the revenue meter and meter socket.
- Attachments or connections to the potential or current circuits of transformer rated revenue meters.
- Any connection inside the meter socket.

The Company will supply, upon request by a customer, kWh and/or kvarh pulses from a Company-owned meter for demand control purposes. A cost will be assessed to the customer in accordance with specific Company charges for this connection.

Source: JCP&L Customer Guide for Electric Service (NJ) – October 2018 at pp. 11

<https://www.firstenergycorp.com/content/dam/customer/service%20requests/files/Customer-Guide-for-Electric-Service-NJ.pdf>

N J G R I D M O D E R N I Z A T I O N O B J E C T I V E

R E M O V E C O N F L I C T W I T H N E W J E R S E Y U N I F O R M C O N S T R U C T I O N C O D E (N . J . A . C . 5 : 2 3 - 1 . 3)

Construction Code Communicator



State of New Jersey
Philip D. Murphy, Governor
Volume 33, Number 4

Department of Community Affairs
Lt. Governor Sheila Y. Oliver, Commissioner
Winter 2021

[Sources:
https://www.nj.gov/dca/divisions/codes/publications/pdf_ccc/CCC_Winter_2021.pdf](https://www.nj.gov/dca/divisions/codes/publications/pdf_ccc/CCC_Winter_2021.pdf)

https://www.state.nj.us/dca/divisions/codes/codereg/pdf_regs/njac_5_23_1.pdf

Tesla Meter Sockets

I would like to take this opportunity to remind everyone of the Intent and Purpose (N.J.A.C. 5:23-1.3) of the UCC. This section tells us that the intent and purpose of the regulations are: "to permit to the fullest extent feasible the use of modern technical methods, **devices** and improvements..." and "to eliminate restrictive, obsolete, conflicting, and unnecessary construction regulations that tend to unnecessarily increase construction costs or retard the use of new materials, **products**, or methods of construction, or *provide preferential treatment to types or classes of materials or products or methods of construction.*"

It has come to the Department's attention that several local enforcing agencies, as well as a few electric utilities, may have overlooked this section of the regulations.

Tesla has developed a product that inserts between the utility meter and the meter enclosure. This product is intended to monitor the utility power and communicate with an electrical storage system installed in the owner's premises. Under 2017 NEC, Article 230.82(6), this equipment is permitted to be installed prior to the service disconnecting means.

This product has UL approval under Standards 414 Meter Socket, 2735 Electric Utility Meters, and 916 Energy Management Equipment. The Department received multiple calls/emails about local enforcing agencies and electric utility companies refusing to accept this product. Under 5:23-3.8(d)2i, only products listed, labeled, and approved from a NRTL are acceptable. This product has met the requirements of the regulations.

It is not our authority to dictate that products meet a particular standard unless the Code gives us that authority. If the product being proposed has met the requirements of 3.8(d)2i, then we, in the code enforcement community as well as the public utilities, should not refuse the use of this product.

If you have any questions regarding this topic, contact the Code Assistance Unit at (609) 984-7609.

Note: This issue has been discussed internally within the Board of Public of Utilities (BPU); they do not endorse or otherwise approve the specifications, installation, or usage of the equipment, as it is not their area of work. However, BPU sees no reason to oppose this article nor take any position on this situation.

Source: Scott Borsos
Bureau of Construction Project Review

EXAMPLE: UPDATED ELECTRIC SERVICE RULES

3.5.1 Acceptable Meter Sockets

Acceptable meter sockets are those manufactured in accordance with current EUSERC, ANSI-C12, and UL/ANSI-414 requirements. The customer must provide and install the meter socket, complete with terminal lugs, meter jaws, manual link bypasses or safety sockets (when required), and sealing means for all sections. All sockets shall be ring-type. The meter socket and service equipment shall be NEMA type 3R (rainproof), in good condition with no holes, dents or damage, and plumb in all directions. The installation shall be made with sufficient materials and installed such that it remains plumb for the duration of the service.

Consult the Power Company for approved meter socket types, or refer to the lists of acceptable meter sockets online at <https://www.pacificpower.net/working-with-us/builders-contractors/electric-service-requirements.html> and <https://www.rockymountainpower.net/working-with-us/builders-contractors/electric-service-requirements.html>.

Stainless steel meter enclosures are recommended for coastal areas and corrosive atmospheres. This will prevent early failure due to corrosion.

3.5.6 Additional Fixtures on Meter Installations

The meter socket, cabinet, and enclosure are provided by the customer for the exclusive use of the Power Company. The customer shall not make or allow the attachment of any device or fixture on any meter socket, cabinet, or enclosure, except as indicated below.

Where permitted by the authority having jurisdiction, one inter-set device may be installed between the meter socket and the meter. The customer must obtain approval from the authority having jurisdiction for the device and its listed and intended application. The company reserves the right to remove the device and return it to the customer if it adversely affects its ability to deliver power to any customer. Contact the Power Company at 1-888-221-7070 to request the specific requirements for installing an inter-set device.



This manual shall be distributed and interpreted in its entirety. Individual pages will not represent all the requirements necessary for an installation. © 2019 PacifiCorp.

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Source: Rocky Mountain Power Electric Service Rules,
https://www.rockymountainpower.net/content/dam/ppcorp/documents/en/pp-rmp/electric-service-requirements/ESR_CH3.pdf (underlines added)

EXAMPLE: CLEAR PROCESS AND CONTACT INFO ON EDC WEBSITE

Meter Collar Devices

RULES FOR ELECTRIC METER AND SERVICE INSTALLATIONS (REMSI)

Collars are installed between the residential electric meter and a meter socket. Now, when you interconnect with PPL, we will install this device at no cost to you. The Smart ConnectDER™ allows for an easy connection between the utility meter and your DER installation as well as providing the necessary communications to collect and report data from your installation.

Manufacturer's model number designation is subject to change by the manufacturer at their discretion. The manufacturer does not support multiple meter collars installed on the same meter base/socket.

This list will be updated as additional models / manufacturer's equipment are reviewed. However, the review will be done on an as-need basis only or by specific request.

Additional Meter Collar Devices

The following lists the manufacturers and model numbers that have been submitted on previous projects, reviewed by PPL EU, and accepted for use. If other manufacturers or models are proposed for use, please submit all pertinent technical information to PPL Electric Utilities for review.

Manufacturer's model number designation is subject to change by the manufacturer at their discretion. The manufacturer does not support multiple meter collars installed on the same meter base/socket.

This list will be updated as additional models / manufacturer's equipment are reviewed. However, the review will be done on an as-need basis only or by specific request.

- **Global Power Products – [GenerLink](#) Transfer Switch Meter Collar**

Safely Connect a Portable Generator to Your Home Without Rewiring.

- MA23-N, Non-Surge (30 AMP)
- MA23-S, Surge (30 AMP)
- MA24-N, Non-Surge (40 AMP)
- MA24-S, Surge (40 AMP)

- **Tesla Backup Switch**

Meter collar that communicates directly with Powerwall; the Backup Switch automatically detects grid outages, providing a seamless transition to backup power.

- Model #1624171

Source: PPL, Rules for Electric Meter & Service Installations

<https://www.pplelectric.com/utility/about-us/electric-rates-and-rules/remsi/approved-metering-and-equipment-tables-index/meter-collar-devices> (underlines added)

EXAMPLE: SMART HOMES AT EASTON PARK, TX

RAPID INTERCONNECTION ENABLERS

- 06/09/2021
 - First *Powerwall* + Install in Utility service territory (shared Solar/Storage Inverter)
- 09/30/2021
 - Tesla *Backup Switch* Approval + Install Guidelines Issued by Utility - available at [https://bluebonnet.coop/Bluebonnet/media/pdf/Reports%20and%20Forms/\(MS-507T\)-Renewable-Interconnection-Less-Than-50kW-At-Meter-With-Tesla-Disconnect-Collar-Backup-Switch.pdf](https://bluebonnet.coop/Bluebonnet/media/pdf/Reports%20and%20Forms/(MS-507T)-Renewable-Interconnection-Less-Than-50kW-At-Meter-With-Tesla-Disconnect-Collar-Backup-Switch.pdf)
 - Tesla immediately begins providing \$500 Point-of-Sale rebate for all PV+ Powerwall Purchases in Utility Service Area
- 10/14/2021
 - First 9 Solar Roofs Installed in Easton Park new homes
- 10/18/2021
 - First Tesla Backup Switch & Powerwall + Installs in Easton Park
- 1/10/2022
 - Standardized Interconnection Package for all new homes includes install specs for each DER component on homes

COLORADO: CLEAR PROCESS FOR CUSTOMER-SITED TECHNOLOGY APPROVAL

(A.5) A QUALIFYING RETAIL UTILITY'S INTERCONNECTION STANDARDS FOR DISTRIBUTED ENERGY RESOURCES MUST ALLOW FOR CUSTOMER OWNERSHIP AND USE OF A METER COLLAR ADAPTER TO PERMIT THE INTERCONNECTION OF DISTRIBUTED ENERGY RESOURCES AND FOR ELECTRICAL ISOLATION OF THE CUSTOMER'S SITE FOR ENERGY BACKUP PURPOSES. THE QUALIFYING RETAIL UTILITY SHALL, WITHIN ONE HUNDRED EIGHTY DAYS AFTER THE EFFECTIVE DATE OF THIS SUBSECTION (1)(e)(I)(A.5), ADOPT A TRANSPARENT PROCESS FOR APPROVING CUSTOMER-OWNED METER COLLAR ADAPTERS THAT MEET MINIMUM SAFETY REQUIREMENTS. THE COMMISSION SHALL RESOLVE ANY DISPUTES CONCERNING THE SUBSTANCE OR PROCEDURES INVOLVED IN THE APPROVAL PROCESS OR ITS APPLICATION IN ANY SPECIFIC CASE. THE APPROVAL PROCESS MUST TAKE NO MORE THAN SIXTY DAYS AFTER THE DATE OF SUBMISSION FOR APPROVAL OF A SPECIFIC METER COLLAR ADAPTER BY THE PROPOSING PARTY. APPROVED METER COLLAR ADAPTERS MUST BE UL LISTED AND MUST BE SUITABLE PER THE ADAPTER'S UL LISTING DOCUMENTATION FOR USE IN METER SOCKETS OF UP TO TWO HUNDRED AMPERES. THE QUALIFYING RETAIL UTILITY SHALL DEFINE AND PUBLISH IN ITS TARIFFS A PROCESS TO REQUEST AND INSTALL A METER COLLAR ADAPTER, WHICH PROCESS IS TIMELY AND NOT UNDULY BURDENSOME TO THE CUSTOMER. THE QUALIFYING RETAIL UTILITY SHALL POST ON ITS WEBSITE ITS LIST OF APPROVED METER COLLAR ADAPTERS, WHICH LIST MUST BE UPDATED AT LEAST ANNUALLY.



2.8 CUSTOMER-OWNED METER EQUIPMENT RESTRICTIONS

Exception 1: CO Service Territory

- b. Manufacturers requesting a meter collar adapter product to be reviewed by the Company shall provide in writing a request to the Company. The request shall provide the following information at a minimum:
 - i. Product bulletin providing specifications and part numbers for the meter collar product to be reviewed.
 - ii. Product installation manual and internal collar wiring diagram.
 - iii. Product's Nationally Recognized Testing Laboratory (NRTL) certification and detailed test data.
 - iv. Manufacturer's temperature and UV testing results for each product.
 - v. Manufacturer to ship at no cost to Company, two production samples of the product. Shipping details will be provided to the manufacturer once a written request is received.
 - vi. Written requests shall be submitted via email to EMStandardsExceptionRequest@xcelenergy.com
 - vii. For questions, contact the Meter Support Tech Line at 800-422-0782 option 1.
- c. Once all required documentation and product samples are received, the Company will notify manufacturer within sixty (60) days if the meter collar product is accepted for use within the PSCO service territory.

[Blue Book - 2021 Standards for Electric Installation Use](#). Sec. 2.8, pp 21-22 –
[Proposed Elec. Service Rule Changes Dec. 2021](#) – [Xcel Energy](#)

Colo. Rev. Stat. [Section 40-2-124 \(1\)\(e\)\(I\)\(A-5\)](#) - Renewable energy standards - qualifying retail and wholesale utilities - definitions - net metering - legislative declaration Amended by 2021 Ch. 52, § 1, eff. 9/7/2021.

DER INTERCONNECTION MODERNIZATION ACROSS THE US

Backup switch approvals by these utilities allow Tesla to pass on \$500 savings per customer (PV-Solar):



Adoption discussions underway in these utility service areas:



NEW DEVICE PILOT:
LINK DEVICE INSTALL RATE TO EDC RENEWABLE TECHNOLOGY
ADOPTION RATE

Example – Utility Pilot Timeline and Approach

Month
1

- Execute Test Plan and Field Pilot MOU between Equipment Vendor and EDC (EDC may have internal partners – DER Incubator, Innovation Sandbox, Meter Lab, Meter Vendor Lab)

Month
6

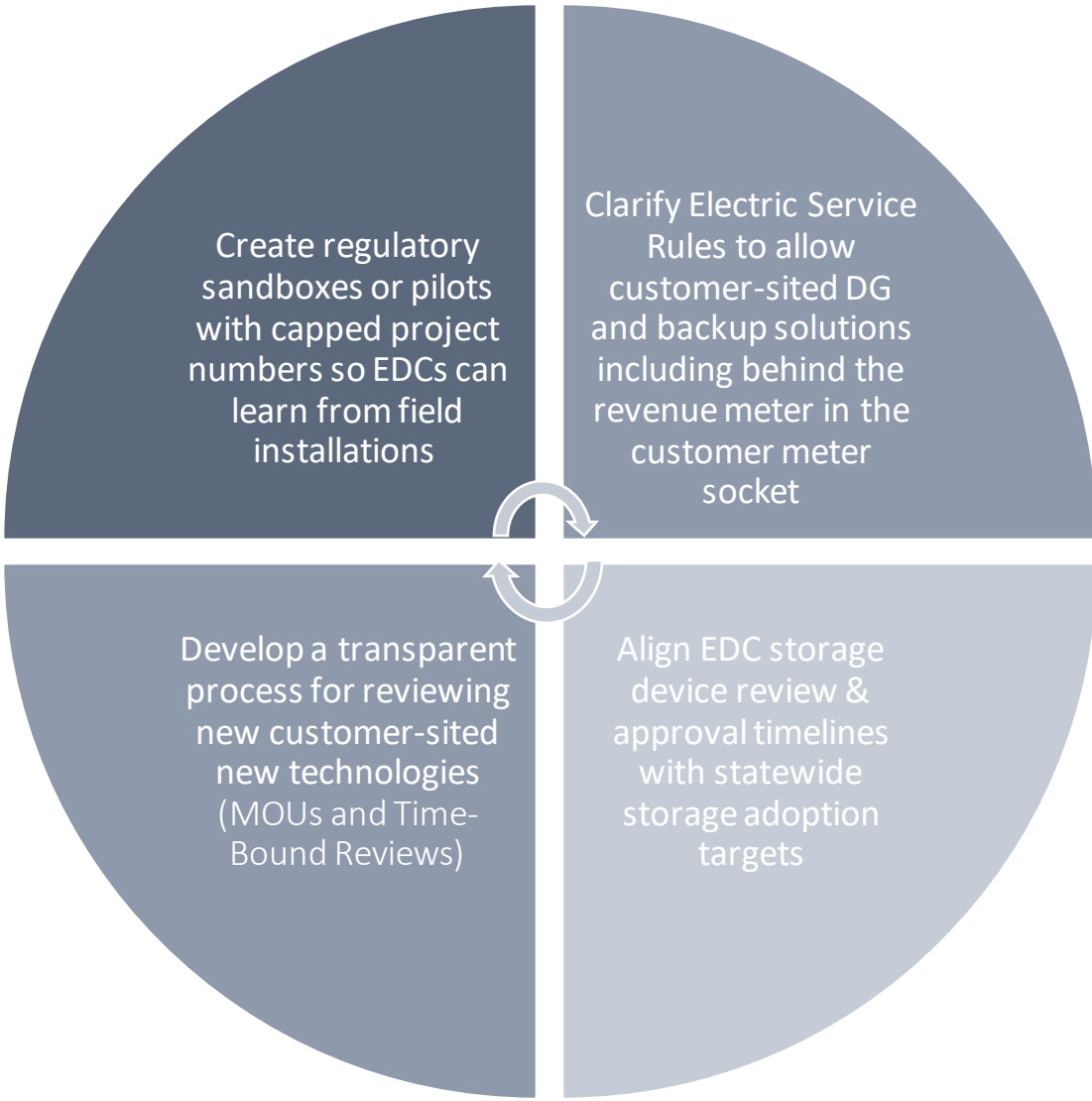
- 6 month in-field pilot. Example: can install Backup Switch with Powerwall Battery in up to 50% of the anticipated residential battery volume in the state

** Coordinate Pilot Review and Approval via Environmental Engineering Staff,
Division of Energy, NJBPU

Proposed General Terms based on other pilots

- Clear installation parameters - who installs, removes devices, duration of removal, commitment to comply with utility rules
- Develop communications process between utility staff and vendor/customer agents
- Stipulate necessary training documentation, in-person demos for personnel
- Clarify grey areas in electrical service rules – what is an extension of the customer-owned meter socket, what is utility property or process requiring permission?
- Provide assurances about the term of a pilot, demonstration, cap on customers enrolled in a program

MULTIPLE PATHWAYS TO ALLOW NEW CUSTOMER-SITED DER TECH



OPINION

Now is the time for regulatory sandboxes in energy and utilities

Published Oct. 22, 2021

By Brien J. Sheahan



Brien Tucker/Utility Dive

The following is a contributed article by Brien J. Sheahan, former Chairman and CEO of the Illinois Commerce Commission, and former chairman of the National Association of Regulatory Utility Commissioners' Presidential Task Force on Innovation.

"Energy-specific sandboxes must be carefully and thoughtfully designed, and ... there are good arguments for ... target[ing] the energy industry, particularly the power sector. The energy system is transforming toward a largely distributed and renewables-based future that will require an updated regulatory framework. Trialing some targeted policy changes now, at limited scale, will help ensure that the rules governing the system keep pace with the energy transformation."

[Guidehouse](#)

- Support Accelerated EDC Learning from Field Installations
- Provide Regulated Forum for Organized Study of New Technology and New Processes

ADDITIONAL RECOMMENDATIONS – GRID MODERNIZATION

Feedback on January 14 EDC Readout Stakeholder Session

- ✓ Increase Level 1 Scope to 15 - 20 kW, expedite processing and reducing costs for Small Customer DERs
- ✓ Smart Homes Ecosystem Upgrades Initiative in New Jersey, Sandbox approach - BPU/EDCs, create consistent process for Residential Upgrades
- ✓ Online Portal for Application Tracking, Submission , Pre-population of forms by EDC staff where possible, tracking/accountability features
- ✓ Electronic Payments and Signatures (*ref.* New NJ Law [A5033/S3279](#) for Auto Sales E-Signature)
- ✓ Better data access (enhance existing repositories of information, streamline access – e.g. pre-app reports, dist. system maps)
- ✓ Fund a DER IX Ombudsman Position (e.g., Interconnection Ombudsman, NY Central Hudson Electric; DG & Clean Energy Ombudsperson , MA DPU)



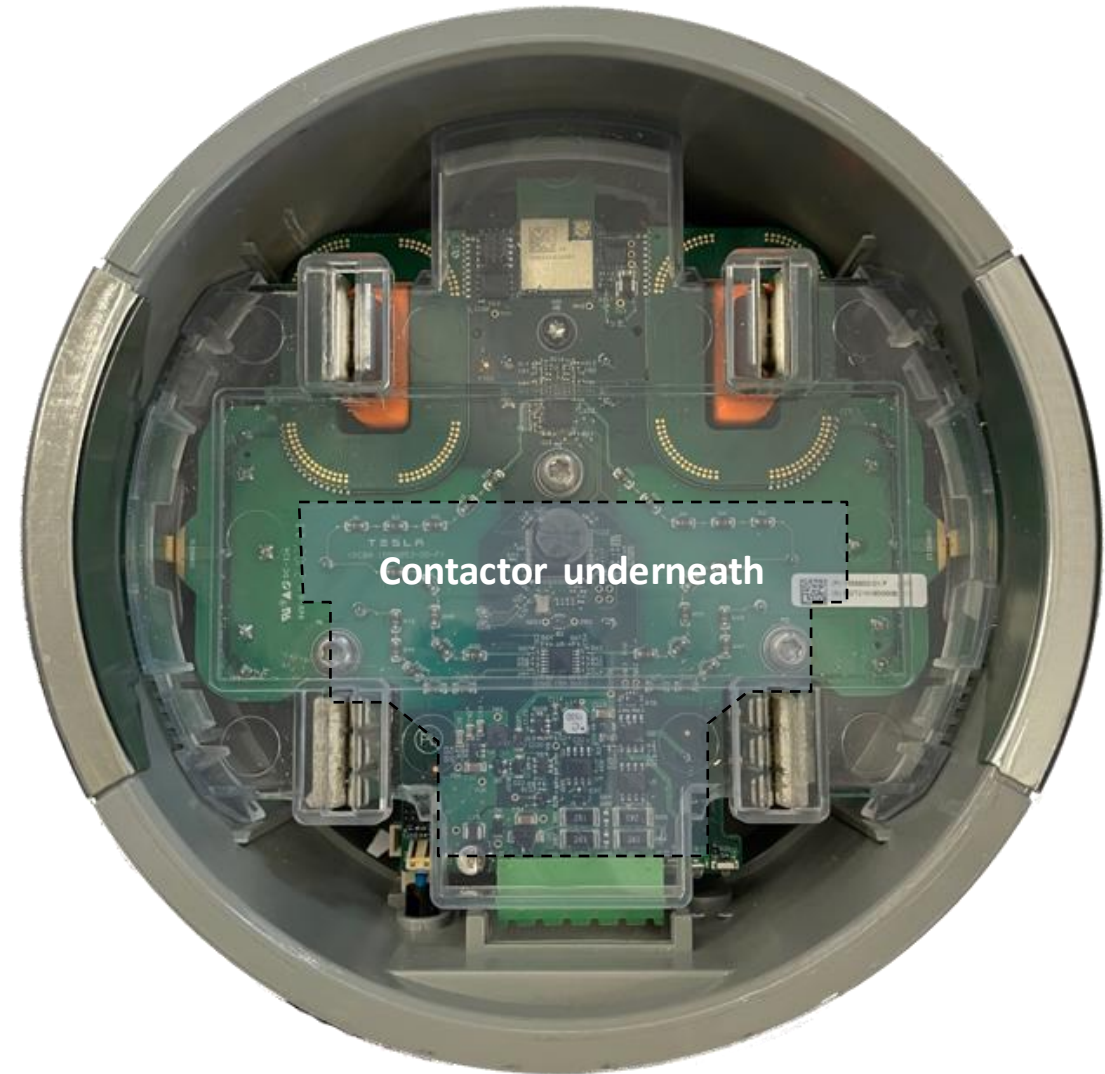
Appendix

TESLA BACKUP SWITCH CERTIFICATIONS

Production Sample

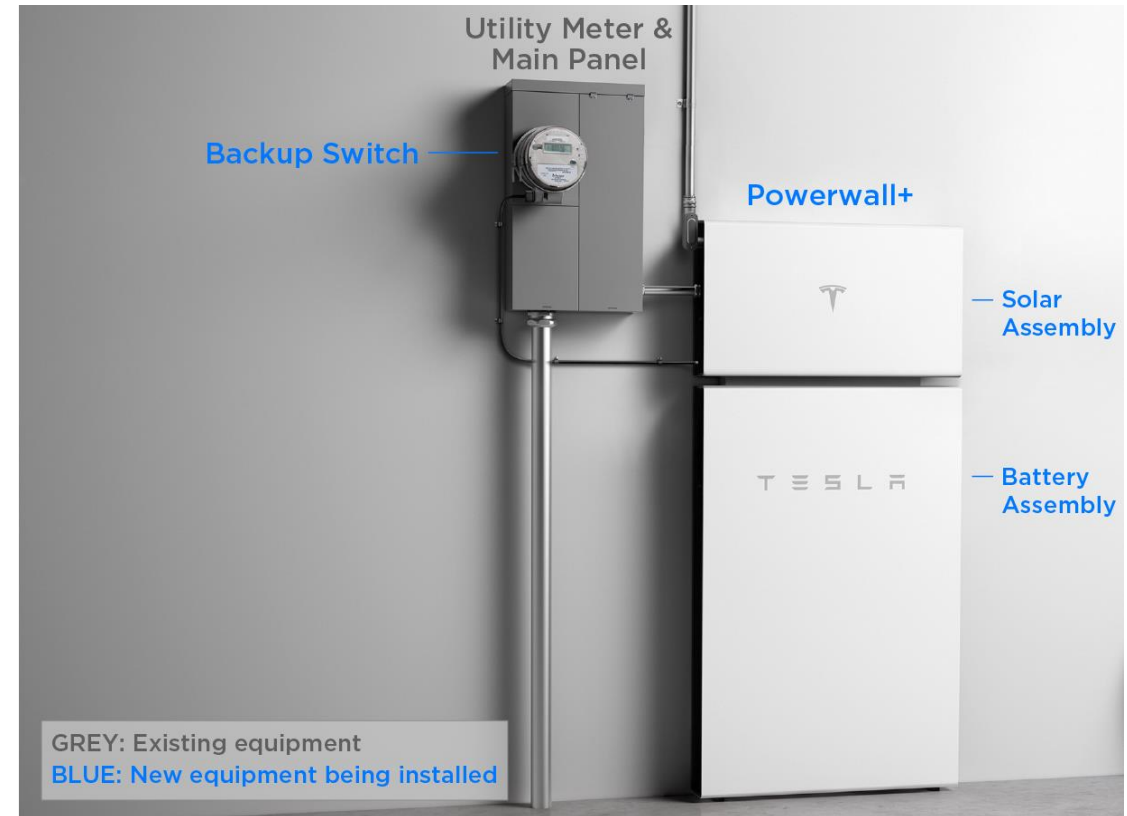
Meter collar device/adaptor to safely island the home from the grid

- The biggest single-change potential for customer cost savings
- **Not** a means for electrically connecting a generation source
- **Not** a line side tap
- The Backup Switch contains:
 - A latching relay to disconnect the home from the grid so that it can be backed up safely
 - Sensing equipment so that we can safely operate the relay and backup power sources
 - Intelligence and communication to ensure safe operation
- Certified under the same **UL 414 standard** as the **meter socket**.
 - Additional certification: UL 2735, UL 916, UL 1741 PCS



ENABLING LOW-COST ISOLATION

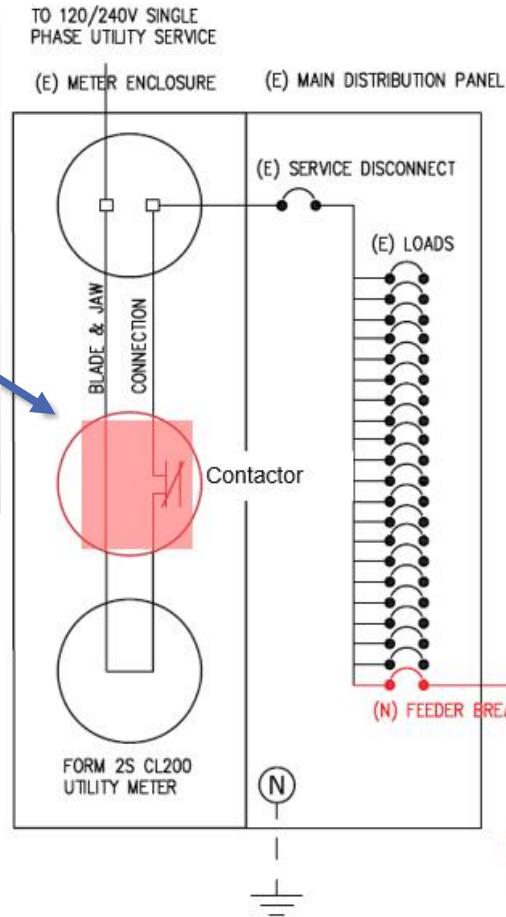
- Safe whole-home backup from a battery energy storage system requires an integrated, automated means of disconnecting the home from the grid.
- Today's hardware requires ~ 10++ hours on site for installation
- The ANSI type 2S meter socket is a standard interface available in customer homes which allows a simple, safe alternative to rewiring the home
 - Governed by existing safety standards
 - Backup Switch is an example of a clean energy DG solution that takes less than 1 hour by installing at the customer meter panel
 - <https://www.tesla.com/support/energy/powerwall/learn/tesla-backup-switch>



TESLA BACKUP SWITCH - LOCATED BETWEEN CUSTOMER METER SOCKET AND UTILITY METER



Backup Switch



Red (N): New Tesla installed Equipment
Black (E): Existing Equipment

Residential PV-Storage installation with no load relocation

TESLA BACKUP SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

Continuous Load Rating	200A, 120/240V Split phase
Short Circuit Current Rating	10 kA with any breaker ¹ 22 kA with minimum 22 kA breaker ¹
Communication	CAN
Product Compatibility	Powerwall 2 with Backup Gateway 2, Powerwall+
Expected Service Life	21 years
Warranty	10 years

¹ See section 27.12.4 in UL 414.

COMPLIANCE INFORMATION

Safety Standards	USA: UL 414, UL 2735, UL 916 CA Prop 65
Emissions	FCC, ICES

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-40°C to 50°C (-40°F to 122°F)
Storage Temperature	-40°C to 85°C (-40°F to 185°F)
Enclosure Rating	NEMA 3R

MECHANICAL SPECIFICATIONS

Dimensions	176 mm x 205 mm x 74 mm (6.9 in x 8.1 in x 2.9 in)
Weight	2.8 lbs
Meter and Socket Compatibility	ANSI Type 2S, ringless or ring type
External Service Interface	Contact manual override ² Reset button
Conduit Compatibility	1/2-inch NPT

² Manually overrides the contactor position during a service event.