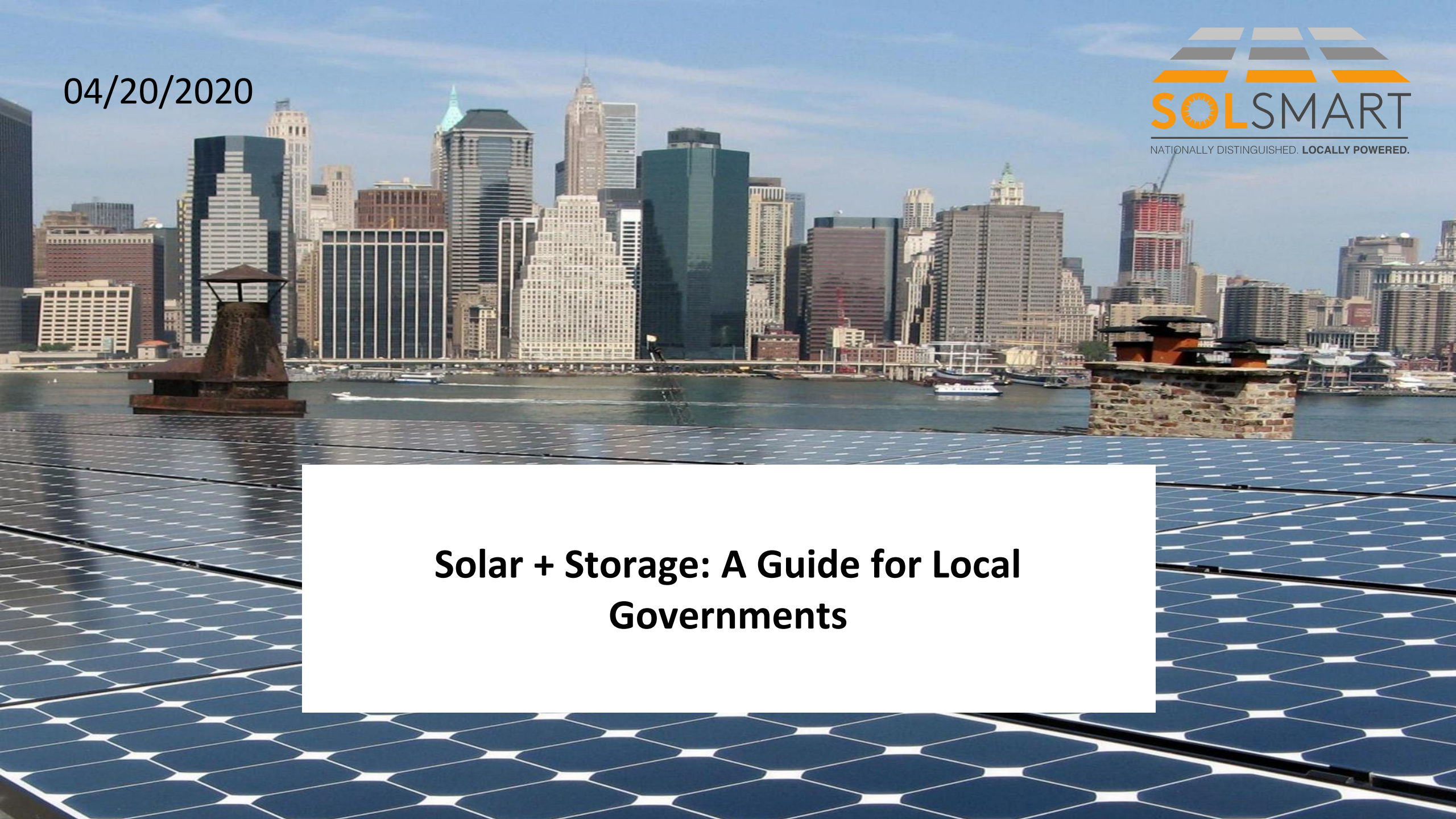


04/20/2020

SOLSMART
NATIONALLY DISTINGUISHED. **LOCALLY POWERED.**

Solar + Storage: A Guide for Local Governments

About SolSmart

Funding

- U.S. Department of Energy Solar Energy Technologies Office

Goal

- Help local governments make it faster, easier, and more affordable for residents and businesses to go solar

Participation

- U.S. municipalities, counties, and regional organizations

Designation

- SolSmart nationally recognizes local solar achievements by designating communities as SolSmart Gold, Silver, or Bronze

Technical Assistance

- Provided at no cost to help communities achieve designation

Program Design and Execution

Technical Assistance Program

The SOLAR FOUNDATION™ for a bright future

CADMUS

NLC NATIONAL LEAGUE OF CITIES CITIES STRONG TOGETHER

NREL NATIONAL RENEWABLE ENERGY LABORATORY

RAP®

BROOKS ENGINEERING

EPRI ELECTRIC POWER RESEARCH INSTITUTE

SEIA Solar Energy Industries Association®

NATIONAL ASSOCIATION of COUNTIES NACo

Designation Program Administrator

ICMA Leaders at the Core of Better Communities

National Civic League

The SOLAR FOUNDATION™ for a bright future

Home Innovation RESEARCH LABS™

CADMUS

SolSmart Categories

The SolSmart scorecard is used to baseline a community's current solar processes and identify areas for technical assistance in 8 categories

- Permitting
- Planning, Zoning, & Development
- Inspection
- Construction Codes
- Solar Rights
- Utility Engagement
- Community Engagement
- Market Development and Finance

Acknowledgment and Disclaimer

- *Acknowledgment:* "This material is based upon work supported by the Department of Energy, Office of Energy Efficiency and Renewable Energy (EERE), under Award Number DE-EE0007155."

- *Disclaimer:* "This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof."

Nadav Enbar

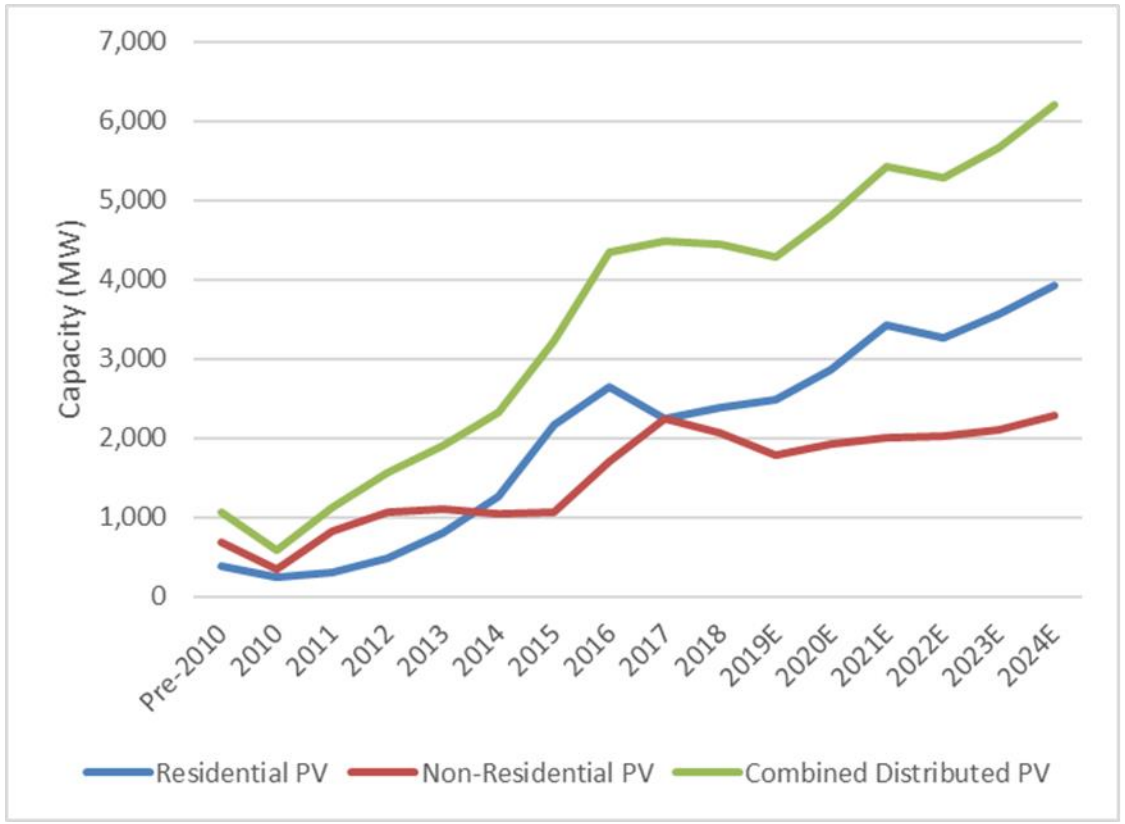
Program Manager, Electric Power Research Institute (EPRI)

Agenda

- The Coming Wave of PV + Storage
  - ✓ Market Developments & Core Drivers
- Permitting: A Key Adoption Challenge
  - ✓ What is Permitting?
  - ✓ What are the Major Barriers?
- Ambitions & Advancements: Areas for Emulation
- Questions

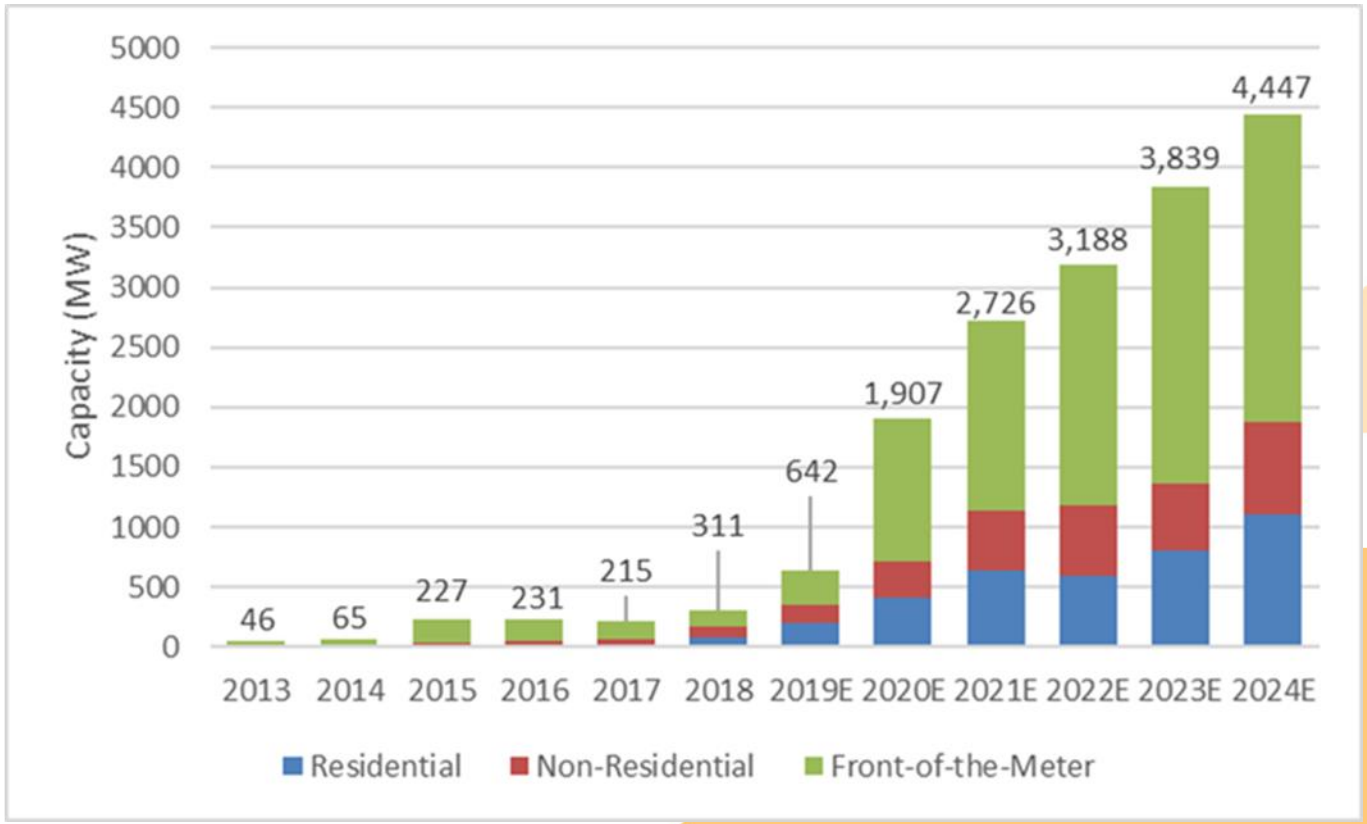
Energy Storage Market Growth Looking a lot like PV's

U.S. *Distributed PV* Installations (MW), 2010-24E



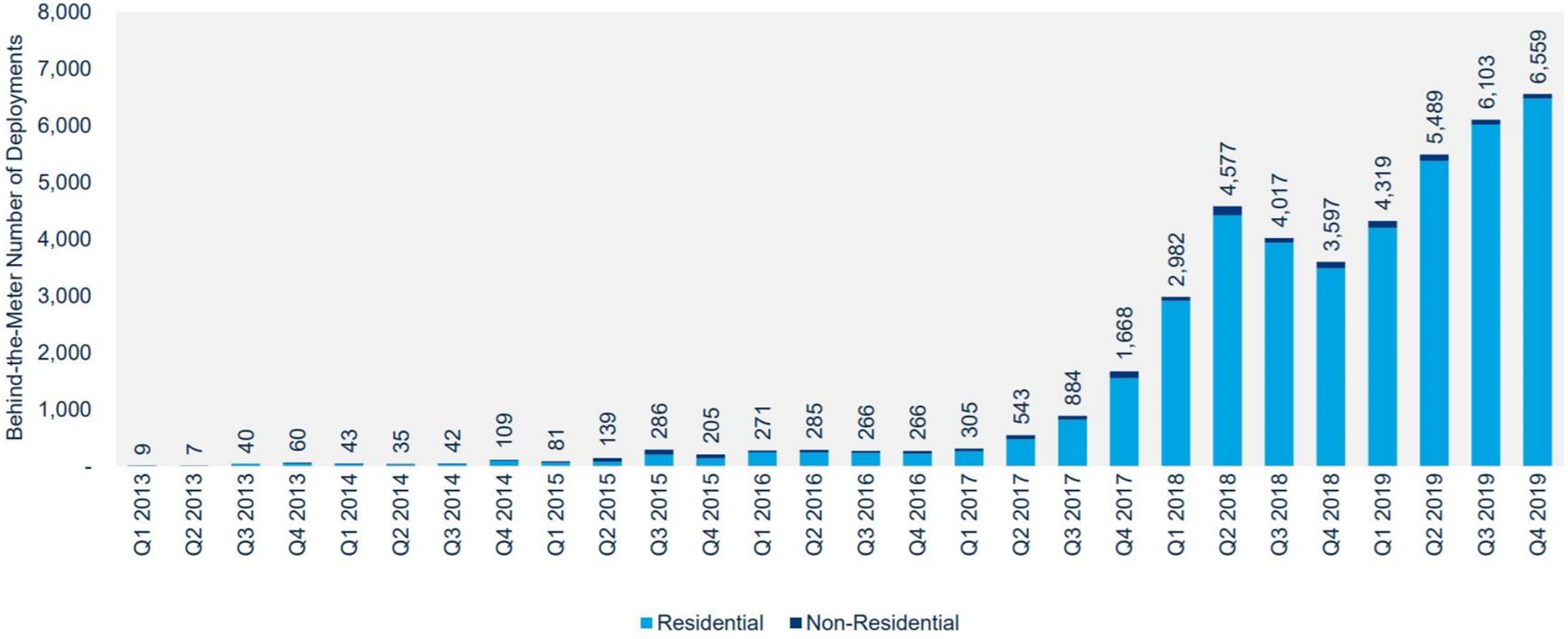
Source: Wood Mackenzie Power & Renewables/SEIA U.S. Solar Market Insight, 2019
Note: Distributed PV installations include residential and non-residential projects, but exclude utility PV projects.

U.S. *Energy Storage* Deployments (MW), 2013-2024E



Source: EPRI, based on data provided by Wood Mackenzie and Energy Storage Association, U.S. Energy Storage Monitor 2018 Year in Review, March 2019.

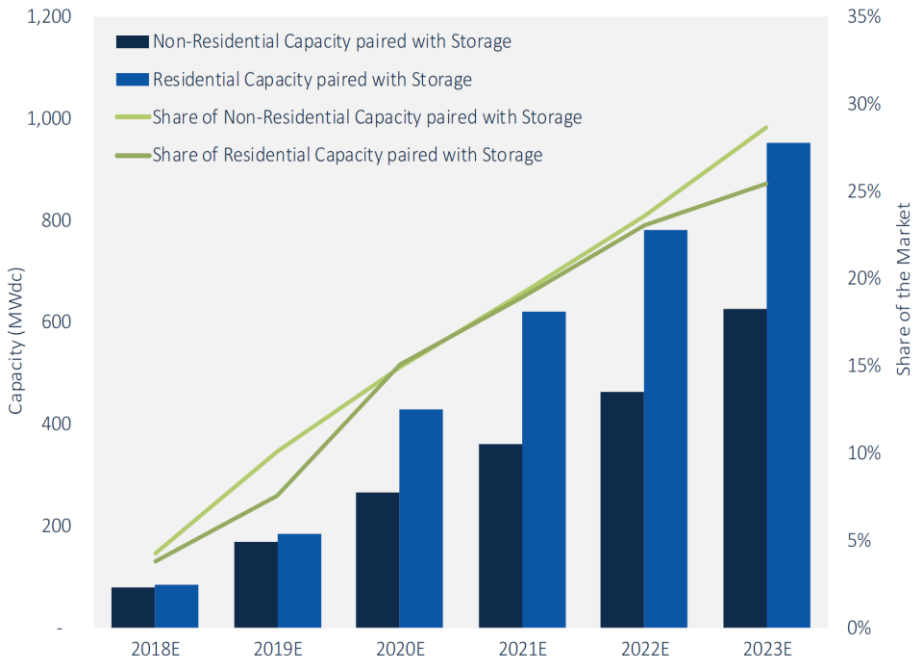
Total Behind-the-Meter Energy Storage System Deployments



Source: Wood Mackenzie Power & Renewables

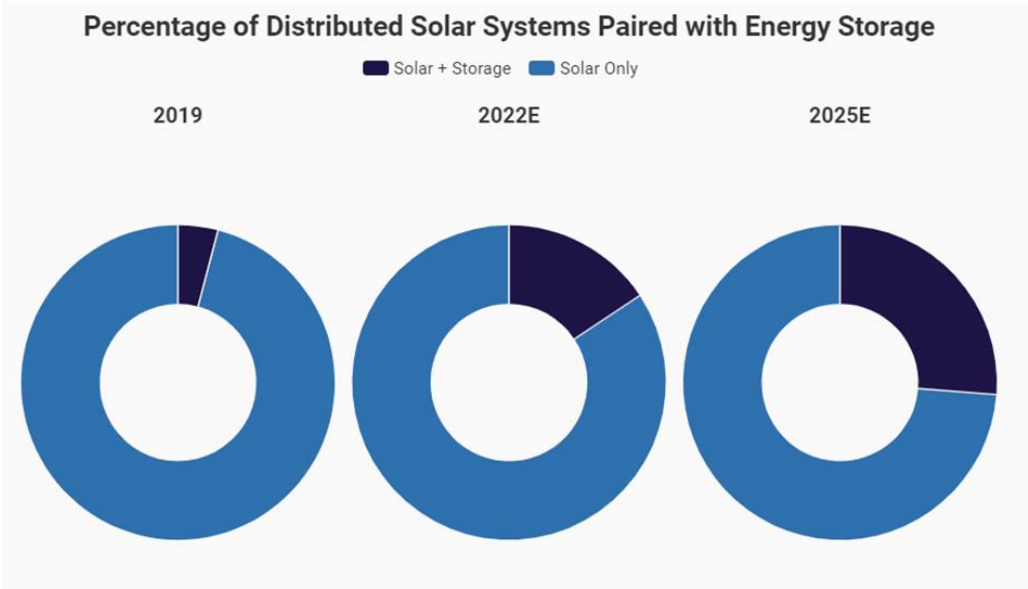
Solar-plus-Storage Deployment Ramping Up Too

Anticipated U.S. Solar-Plus-Storage Deployments by Segment, 2018E-2023E (Dx-connected)



Source: Wood Mackenzie Power & Renewables

Percentage of Distributed Solar Systems Paired w/Energy Storage



What's Driving PV+Storage Adoption?

- "Back Pocket" Economics
  - ✓ Prices Falling, Benefits Growing
  - ✓ Availability of incentives and financing
- Public Safety Power Shutoffs (PVPS)
- Business Model Innovation
- Growing Consumer Familiarity / Confidence

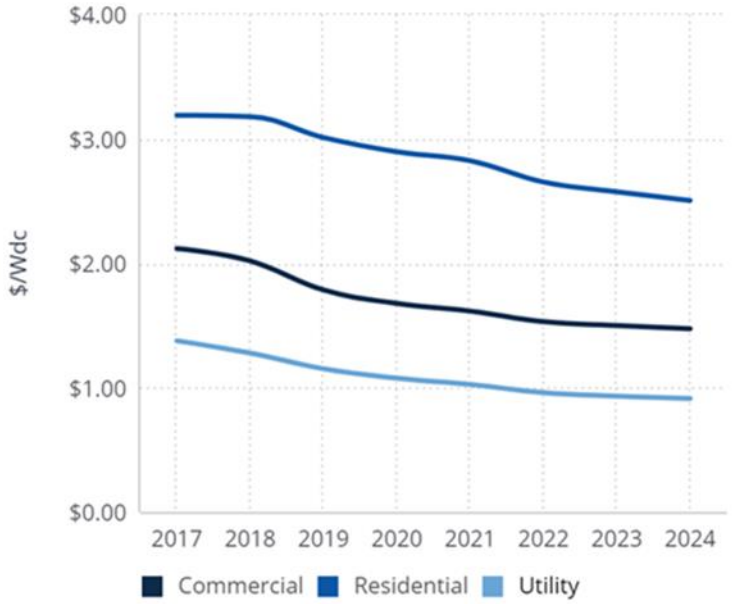
Source: Sunrun (2019)

Battery to New Solar PV Attachment Rates:

- U.S. National Avg: ~15%
- CA State Avg: ~30%
- San Diego Avg: 60%
- SF Bay Area Avg: 60%
- HI State Avg: ~90%

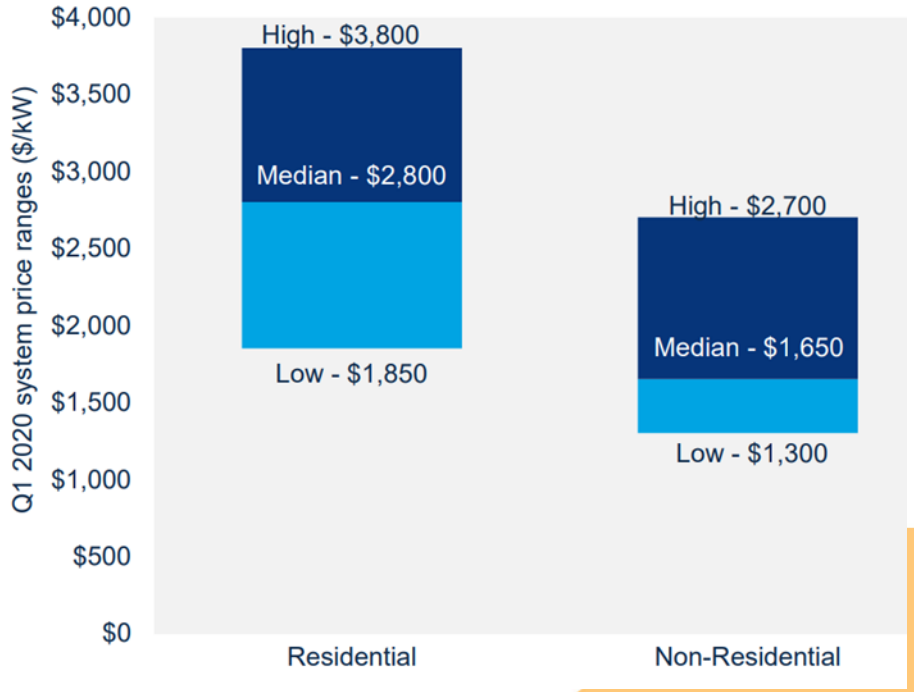
Cost Context:
Solar PV Trending Downward, Storage Flat to Down

Avg. U.S. PV System Pricing by Market Segment



PV Price	Residential	Commercial	Utility-Scale
2007	$8.20/$W_{dc}$	$7.50/$W_{dc}$	$6.20/$W_{dc}$
2017	>$3.00/Wdc	$1.40/$W_{dc}$	$1.00/$W_{dc}$
2022E	$2.63/$W_{dc}$	$1.03/$W_{dc}$	$0.79/$W_{dc}$

Installed BTM System Prices, Q1 2020 ($/kW)



Sources: Wood Mackenzie's Data Hub (2020), EPRI
Note: Prices approximate, based on a blended average ($/Wdc)

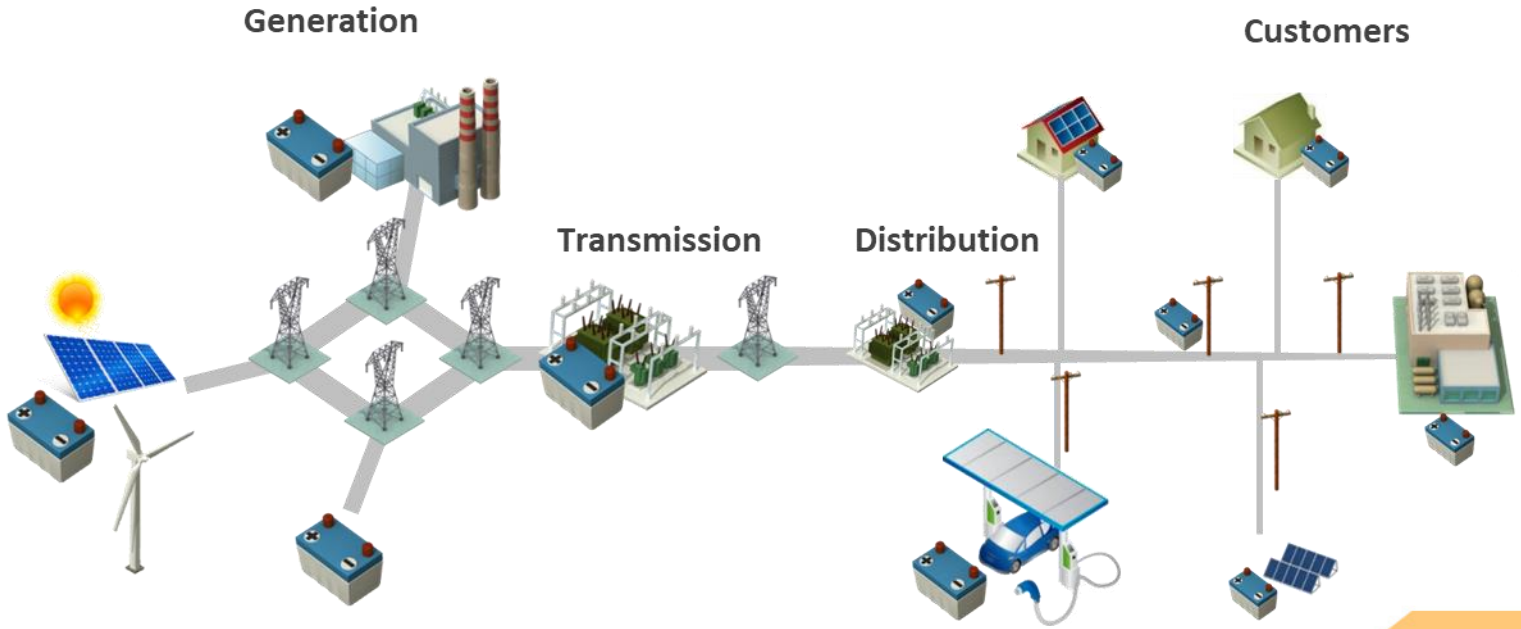
Energy Storage Service/Value

Generation
Resource Adequacy
Energy time-shift / arbitrage
Ancillary Services

↑Transmission
–Investment Deferral
–Congestion Relief

↑Distribution
–Peak load management
–Loss reduction
–Voltage control

↑Customer
–Demand Charge Reduction / arbitrage
–Backup Power
–Solar Self-Consumption

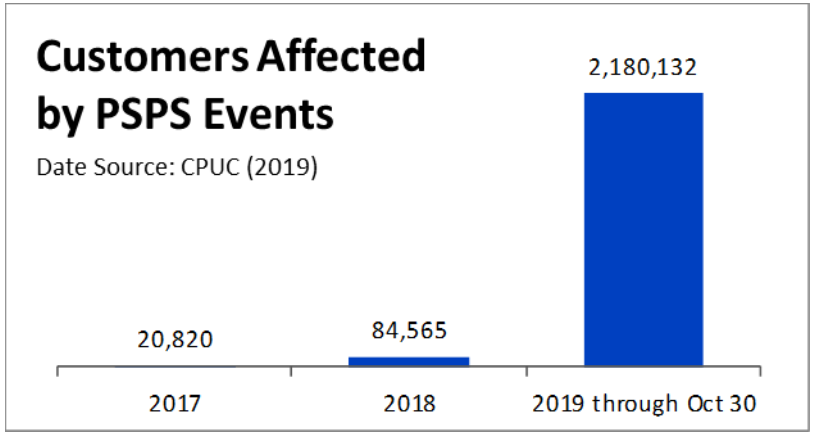


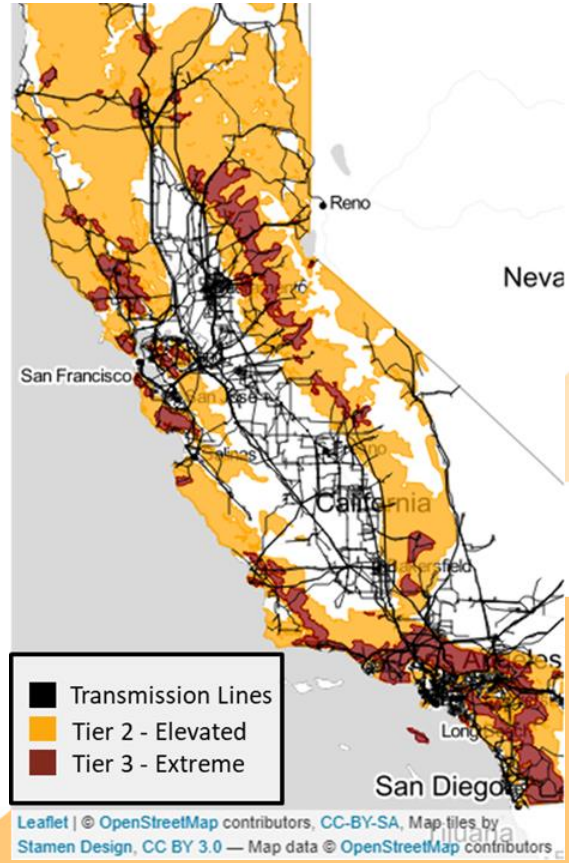
Value streams may be "stacked", depending on needs, location, and control

Public Safety Power Shutoffs in California

Purpose: Reduce wildfire ignition risk through de-energization of power lines passing high fire risk areas

- Number of PSPS events has risen sharply from previous years
- Battery storage vendors seeing an increase in demand in areas affected by outages of ~30% to ~500%
- Outages and PSPS events result in social and economic risks for customers and communities





Data: CPUC (2019) and CEC (2017)

Public Safety Power Shutoffs are Driving Renewed Interest in Backup

Business Model Innovation

Green Mountain Power

- Utility-owned 23kWh units whole home backup
- Customer-owned BYOD units
- Third-party owned demonstration

Rocky Mountain Power

- 600 apartments equipped w/ sonnen units
- Reliability & Frequency Response

National Grid

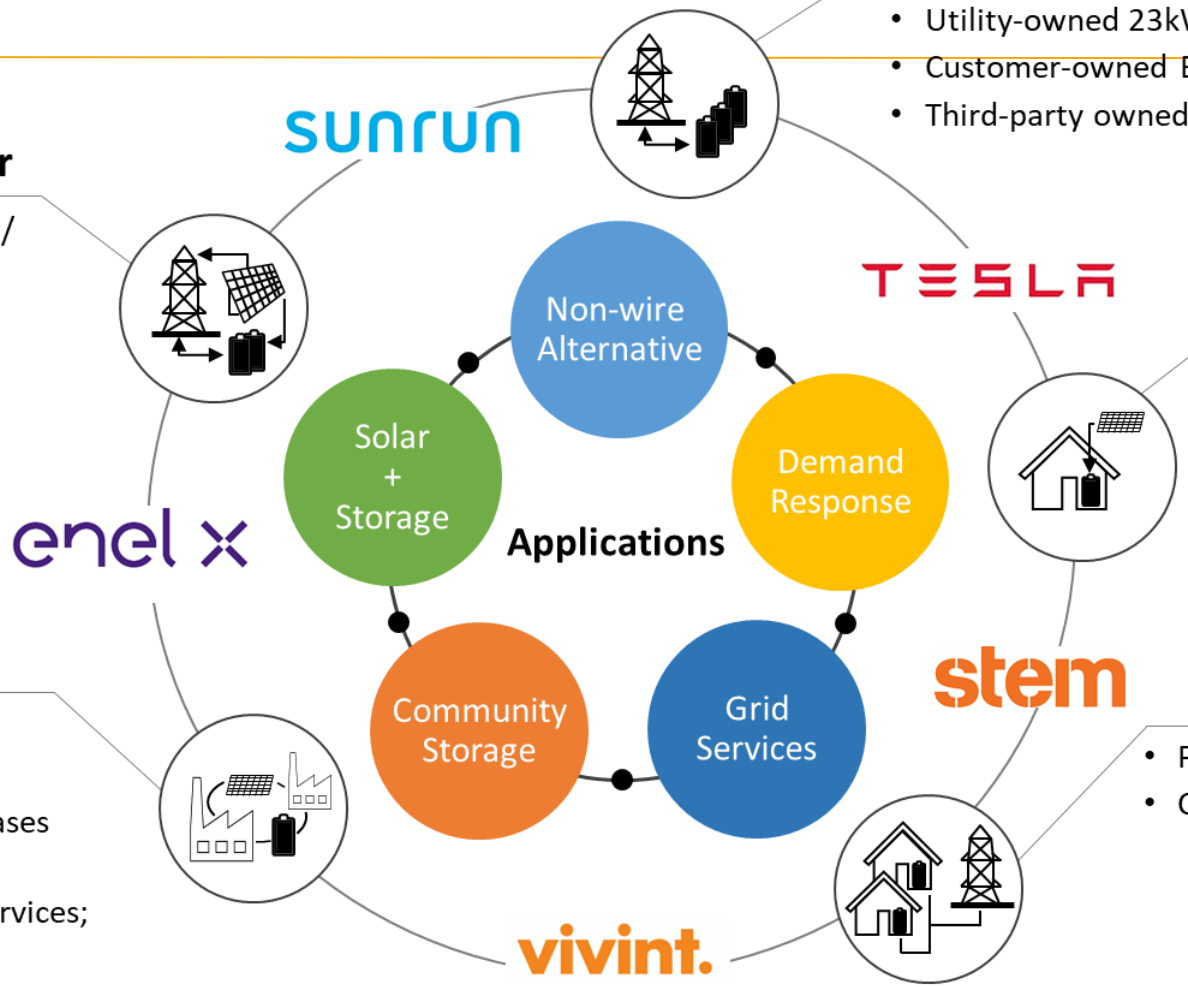
- DR program includes BYOD storage
- Reduction of peak generation requirements through bill incentives

Con Edison

- Largest NYC deployment: 5MW/16MWh
- Enel X (Demand Energy) leases urban box store land
- Primary revenue via grid services; Decoupled from local loads

Hawaiian Electric

- Purchasing Grid Services through VPP
- Capacity and Fast Frequency Response



Confluence of Third-Party and Utility Deployments

Rising Consumer Confidence: Examples of Residential System Installation and Testing

Pika: $ 13,500 (Civic Solar)

SolarEdge/LG: $ 10,500 (Civic Solar)

Tesla Powerwall 2: $ 10,100 (Sun Valley Solar)

Electriq Power: $ 8,500

sonnen eco: $ 16,000 (estimate)

Key Adoption Barrier: Permitting
What is Permitting?

Process of receiving approval for system installation / interconnection to the electric grid

- Requirements stipulated by local government / utilities to ensure compliance with electrical and building codes (read: safety)
- Involves obtaining electrical, building, and/or mechanical permits
  - ✓ Permits vary by location, system type/design, and system size
- System inspection (Pre and post-installation)
- Costs / approval times variable

Source: National Renewable Energy Laboratory

Key Barriers to Speedy Permitting

- Root of Challenges: Uncertainty & Lagging Education
  - ✓ Technical / functional awareness
  - ✓ Safety concerns
  - ✓ Technology and market innovations outpacing regulations

- Outcomes
  - ✓ Permitting delays
  - ✓ Increased costs
  - ✓ Inconsistent jurisdictional rules / requirements
  - ❖ Confusion

Ambitions & Advancements – Areas for Emulation

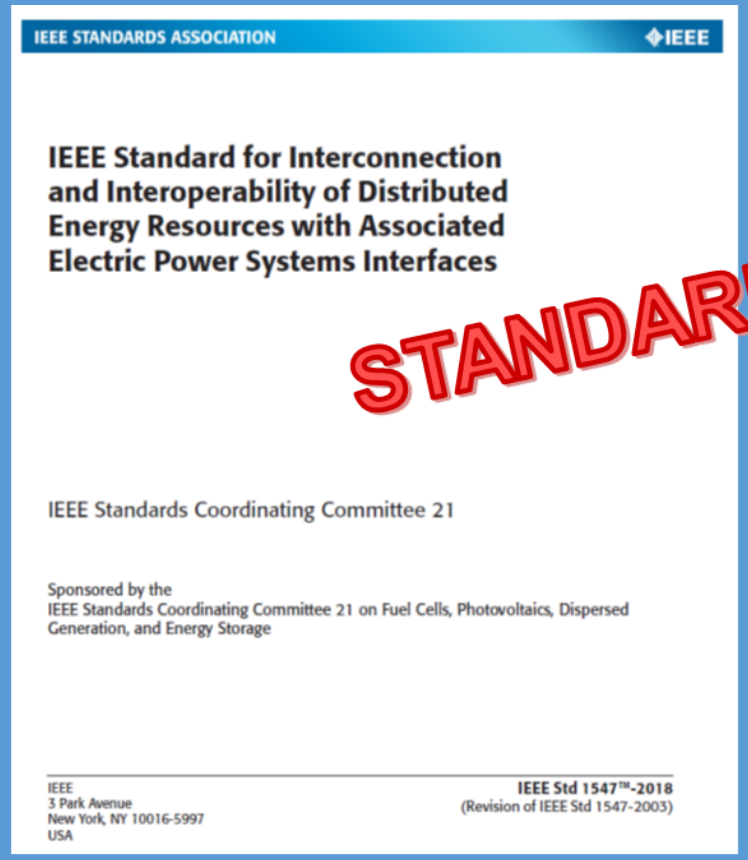
- Education & Documentation
  - ✓ Boulder County Permitting & Interconnection Guide
  - ✓ CA Energy Storage Permitting Guidebook
- Standards & Codes Development
  - ✓ UL9540: Standard for Energy Storage Systems and Equipment
  - ✓ NFPA 855: Standard for the Installation of Stationary Energy Storage Systems
  - ✓ Updates to National Electric Code (NEC), International Fire Code (IFC), others
  - ✓ Updates / Additions to IEEE 1547
- Online permitting
  - ✓ Jurisdictional approaches (e.g., San Diego City & County)
  - ✓ Solar Automated Permit Processing (SolarApp)
- Accrued Experience

NFPA 855 – Standard for the Installation of Stationary ESS

Title		Intention
Standard for the Installation of Stationary Energy Storage Systems		Establish safety criteria for the design, construction, installation, commissioning, operation, maintenance, and decommissioning of stationary ESS
Update	**Enter into force**	
09/11/2019	TBD	

Applicable for ESS exceeding the following values		Requirements are
Lead-acid, all types	70 kWh	• Technology-specific • Location-specific
Nickel (Ni-Cad, Ni-MH, Ni-Zn)	70 kWh	
Lithium-ion, all types	20 kWh	**Points of Discussion are**
Sodium, nickel chloride	20 kWh	• Areas in NFPA 855 with potential to inhibit BTM storage deployment: – Energy maxima – Separation between units – Large Scale Fire Test and UL 9540A Cost • No advantages for alternative chemistries, e.g. flow batteries
Flow batteries	20 kWh	
Other battery technologies	10 kWh	
Batteries in one-and two family dwellings and townhouse units	1 kWh	
Electrochemical double layer capacitors	3 kWh	
All other ESS	70 kWh	

NFPA 855 May Impact Storage Deployments



IEEE 1547 Interconnection Standards Series

STANDARDS

IEEE 1547-2018

IEEE Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces

IEEE P1547.1

[Draft] IEEE Standard Conformance Test Procedures for Equipment Interconnecting Distributed Energy Resources with Electric Power Systems and Associated Interfaces

UL1741

Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use With DERs

NEC NFPA 70e Articles

690 PV Systems

705 Interconnection

480 Storage Batteries

692 Fuel Cell

694 Wind Electric

APPLICATION GUIDES

IEEE P1547.2

[Draft] IEEE Application Guide for IEEE Std 1547

IEEE P1547.9

[Draft] Guide to using IEEE 1547 for Interconnection of Energy Storage Distributed Energy Resources with Electric Power Systems

(upcoming) IEEE P1547.3

Guide for Monitoring, Information Exchange, and Control of DER Interconnected with Electric Power Systems

Safe and Scalable Deployments through Standardization

New York City Permitting and Interconnection Guidelines for Lithium-Ion Outdoor Systems

Released: 04/27/2018

Background: NYC has some of the most stringent permitting rules, a unique situation of population density, a high number of agencies with authority over permitting, and ambitious energy storage goals

Intention:

Ensure safety of lithium-ion systems

Provide transparency of permitting, and interconnection process

Facilitate energy storage deployment

Open Questions:

Impacts on deployment rates of behind-the-meter storage projects in NYC

California Energy Storage Permitting Guidebook

- **Expected:** 2023
- **Background:** Highly varying permitting procedures within California, local requirements as barrier for ESS deployment, increasing customer interest in ESS, and ambitious energy storage goals
- **Intention:**
  - Facilitate energy storage deployment
  - Provide transparency of permitting process
  - Ensure safety of energy storage systems
- **Differences to the NYC approach:**
  - For a wide range of energy storage technologies
  - But only for permitting procedure
  - Focus on streamlined, efficient permitting

Nationwide standardization of permitting and interconnection a long-term goal

ESIC Reference Materials

https://www.epri.com/#/energy_storage

- Energy Storage Implementation Guide
- Energy Storage Request for Proposal Guide
- Energy Storage Technical Specification Template
- Energy Storage Test Manual
- Energy Storage Reference Fire Hazard Mitigation Analysis
- Energy Storage Safety Incident Gathering and Reporting List
- Energy Storage Modeling Bibliography
- Common Functions for Smart Inverters
- Energy Storage Commissioning Guide
- Energy Storage Cost Template and Tool
- Energy Storage Safety: 2016

References with permitting considerations

Questions?

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Bill Brooks, PE

Principal, Brooks Engineering

Energy Storage System (ESS)
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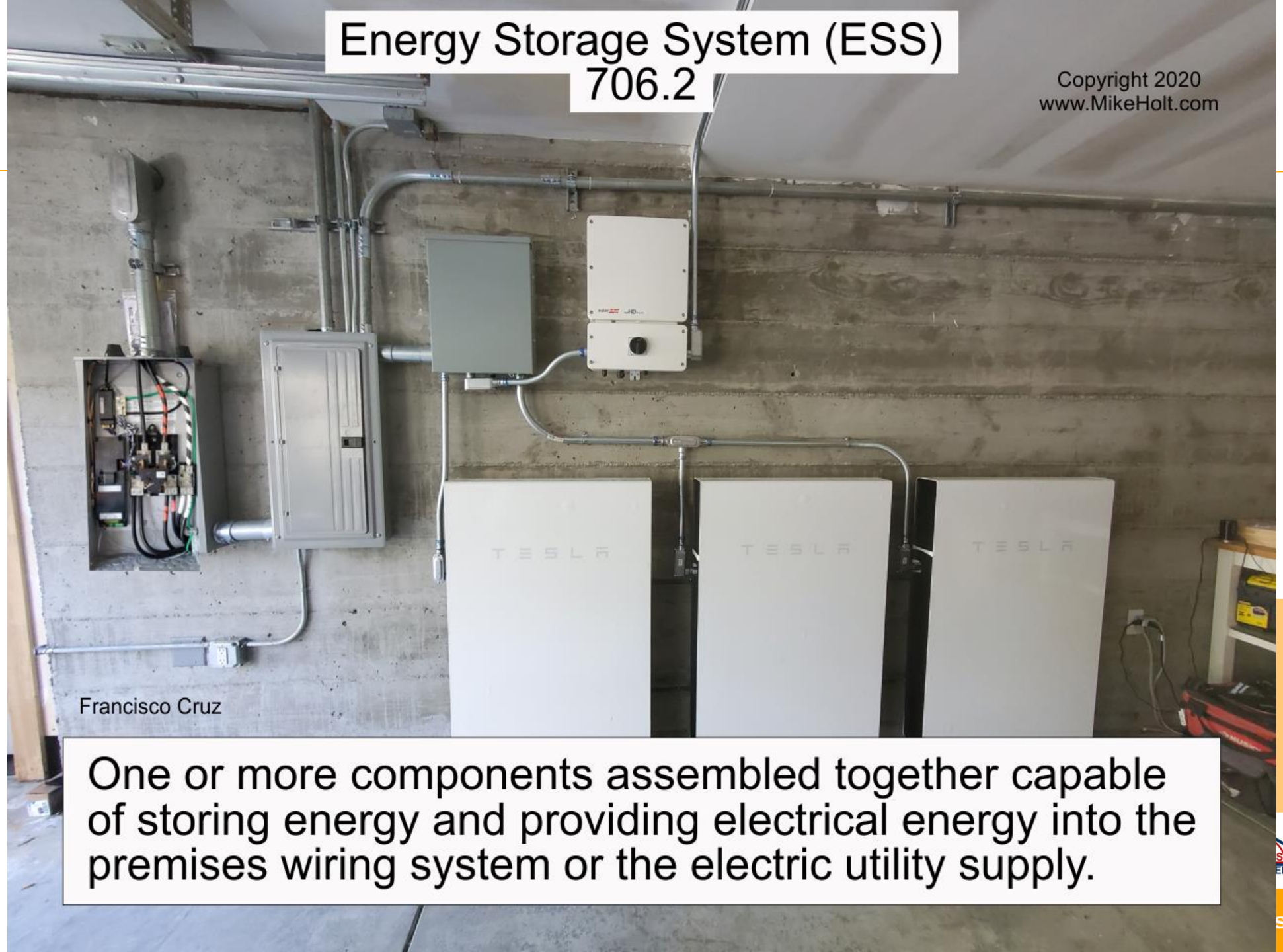
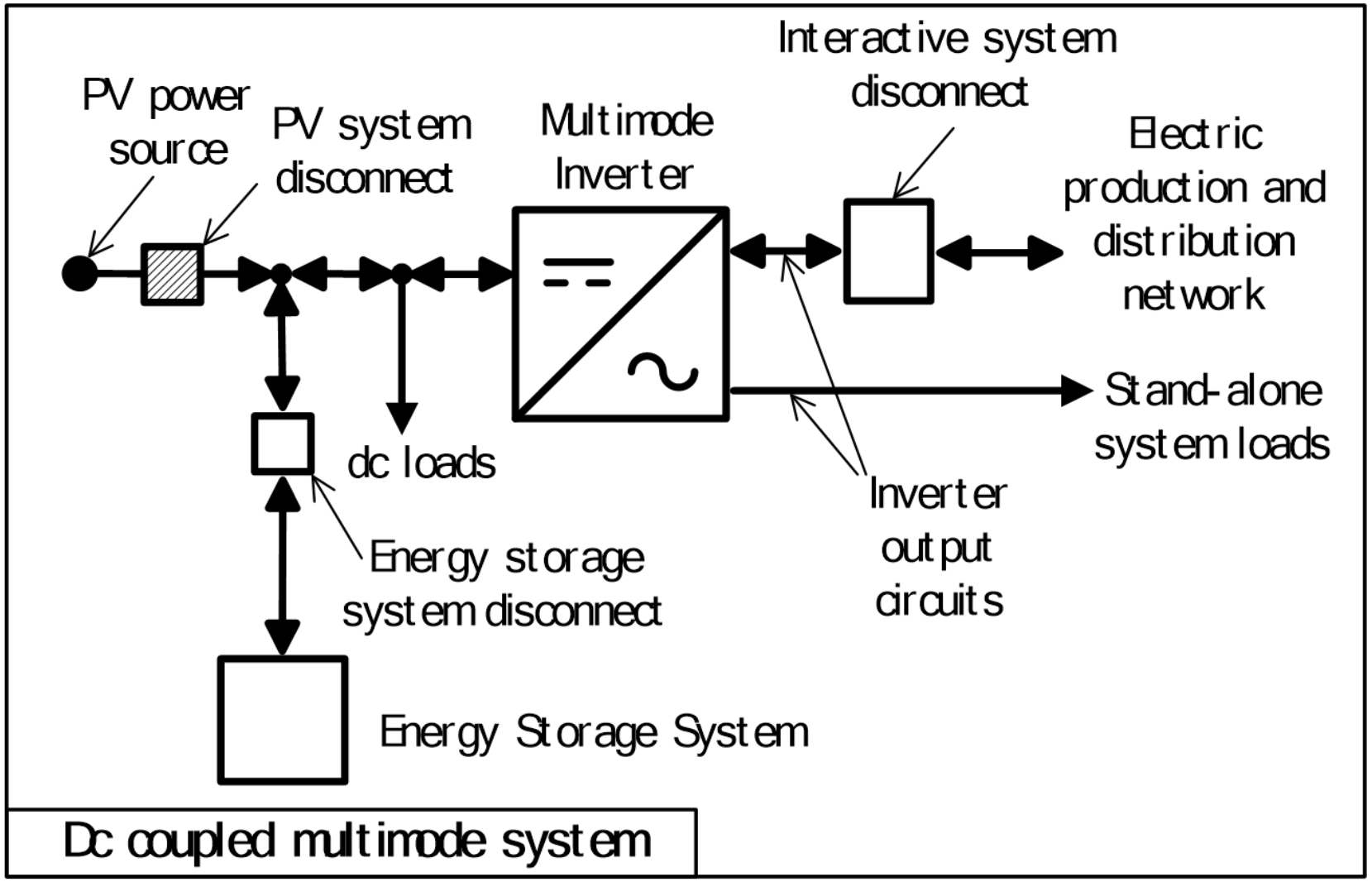


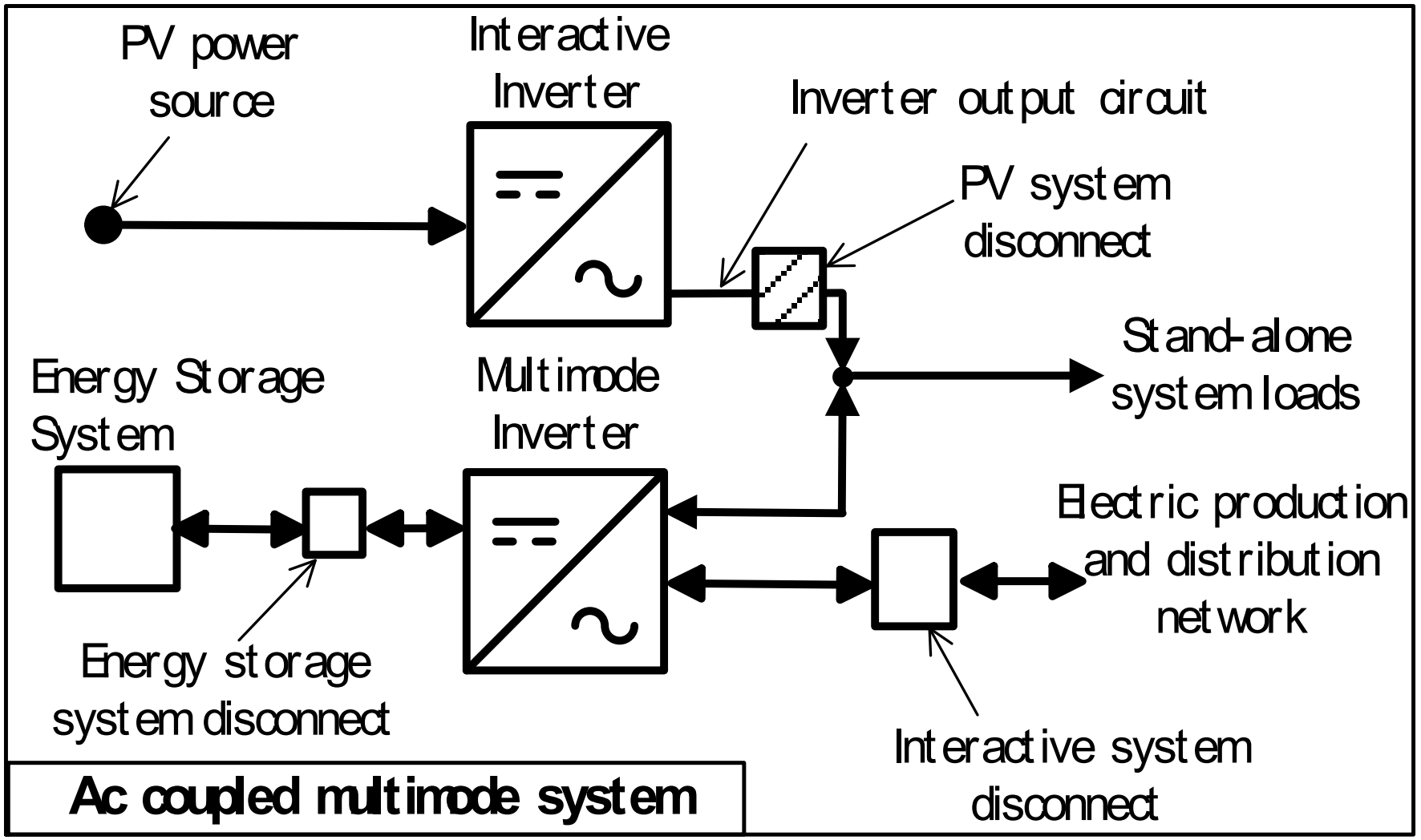
Francisco Cruz

One or more components assembled together capable of storing energy and providing electrical energy into the premises wiring system or the electric utility supply.

PV System Disconnect a key clarification in Article 690 for PV systems and for ESS



PV System Disconnect a key clarification in Article 690 for PV systems and for ESS



Big changes in 2017/2020 NEC and 2015/2018 IFC/IRC

- New Article 706 in 2017 NEC—Given the rapidly growing market for energy storage systems, the NEC established a new Article 706, *Energy Storage Systems* (ESS).
- New article is based on 2014 NEC requirements in Article 690 (Solar PV Systems) and Article 480 (Storage Batteries).
- International Fire Code (IFC) approved new Section 1206, *Stationary Storage Battery Systems*, for 2018 IFC.
- IRC supersedes IFC for one- and two-family dwellings

New Section 1206 in 2018 IFC revised old Section 608

- Section 1206 is heavily revised related to lithium ion batteries.
- New requirements include:
- UL9540, Standard for Energy Storage Systems and Equipment, for prepackaged and pre-engineered energy storage systems.
- UL1973, Standard for Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications, for storage batteries
- Energy management system (battery mgmt.) required for everything except lead acid and ni-cad.
- UL1741 for inverters (same as solar PV)

A lot has changed in 20 years

- Codes and standards are rapidly changing.
- New certification processes are improving safety and design.

Codes and Standards Rapidly Developing

- UL9540 is still a new standard (several products certified so far—mostly with Intertek, UL, and CSA)
- NFPA 855: Standard for the Installation of Stationary Energy Storage Systems is published but not directly enforced in most jurisdictions.
- Language in the 2021 IRC and IFC is similar to NFPA 855 language.

2018 IFC/IRC and ESS: IFC Sect 1206 and IRC Sect R327

- Scope of IFC: Stationary ESS above 20kWh
- Scope of IRC: One- and Two-Family Dwellings
- Listing to UL 9540
- Separation: 50kWh blocks separated by 3’
- UL 9540a Large scale fire testing (LSFT) allows for more than 50 kWh and closer spacings
- Vehicle Impact Protection
  (e.g. Garage side wall, bollards, parking blocks)
- Fire suppression required for IFC *NOT* IRC)

Retrofit of Existing PV systems will be commonplace

Residential Permitting Considerations

The 2018 IRC has some specific wording for ESS:

> All energy storage systems (ESS) installed in homes must be UL9540 listed—lithium-ion batteries since no other technology is currently be listed to UL9540.

ramuk.intertekconnect.com//WebClients/ITS/DLP/products.nsf/vwSearch?SearchView&Query=FIELD%20ListHead%20Contains%209540%20or%20FIE

Company	Title	Standard
CONNECTPV INC. - Poway, CA USA	Energy Storage Systems and Equipment	ANSI/CAN/UL-9540
SOLAREDGE TECHNOLOGIES LTD. - Herzeliya, ISRAEL	ENERGY STORAGE SYSTEMS AND EQUIPMENT	UL-Subject-9540
PANASONIC CORPORATION OF NORTH AMERICA - Newark, NJ USA	Energy Storage Systems And Equipment	ANSI/CAN/UL-9540 CLS
SHENZHEN SINEXCEL ELECTRIC CO., LTD. - Shenzhen, CHINA	Energy Storage Systems and Equipment	ANSI/CAN/UL-9540 REC
NARADA POWER SOURCE CO., LTD. - Hangzhou, Zhejiang CHINA	Energy Storage Systems and Equipment	ANSI/CAN/UL-9540 REC
TESLA, INC - Palo Alto, CA USA	ENERGY STORAGE SYSTEMS AND EQUIPMENT	ANSI/CAN/UL-9540
TOSHIBA INTERNATIONAL CORP. - Houston, TX USA	Energy Storage Systems and Equipment	ANSI/CAN/UL-9540
SONNEN INC. - Los Angeles, CA USA	Energy Storage Systems and Equipment	ANSI/CAN/UL-9540
SUNVERGE ENERGY INC. - San Francisco, CA USA	ENERGY STORAGE SYSTEMS AND EQUIPMENT	ANSI/CAN/UL-9540
TABUCHI ELECTRIC CO., LTD - Osaka, JAPAN	ENERGY STORAGE SYSTEMS AND EQUIPMENT	ANSI/CAN/UL-9540
SHENZHEN SINEXCEL ELECTRIC CO., LTD. - Shenzhen, CHINA	ENERGY STORAGE SYSTEMS AND EQUIPMENT	ANSI/CAN/UL-9540
DYNAPOWER COMPANY, LLC - South Burlington, VT USA	Energy Storage Systems and Equipment	ANSI/CAN/UL-9540
NEOVOLTA INC - La Jolla, CA USA	Energy Storage Systems and Equipment	ANSI/CAN/UL-9540
EGUANA TECHNOLOGIES INC - Calgary, AB USA	Energy Storage Systems and Equipment	ANSI/CAN/UL-9540
BLUE PLANET ENERGY SYSTEMS LLC - Honolulu, HI USA	Energy Storage Systems and Equipment	ANSI/CAN/UL-9540
ENERGPORT, INC. - Fremont, CA USA	Energy Storage Systems and Equipment	ANSI/CAN/UL-9540
PIKA ENERGY, INC. - Westbrook, ME USA	Energy Storage Systems and Equipment	ANSI/CAN/UL-9540
CHINT POWER SYSTEMS AMERICA COMPANY - Pomona, CA USA	Energy Storage Systems and Equipment	ANSI/CAN/UL-9540
OUTBACK POWER TECHNOLOGIES, INC. - Arlington, WA USA	Energy Storage Systems and Equipment	ANSI/CAN/UL-9540
SAAB SENSIS CORPORATION - East Syracuse, NY USA	ENERGY STORAGE SYSTEMS AND EQUIPMENT	ANSI/CAN/UL-9540
HUAWEI TECHNOLOGIES CO., LTD. - Longgang, Shenzhen PRC	ENERGY STORAGE SYSTEMS AND EQUIPMENT	ANSI/CAN/UL-9540
DLG ENERGY (SHANGHAI) CO., LTD - Shanghai, CHINA	Energy Storage Systems and Equipment	ANSI/CAN/UL-9540
SHENZHEN SINEXCEL ELECTRIC CO., LTD. - Shenzhen, CHINA	ENERGY STORAGE SYSTEMS AND EQUIPMENT	UL-Subject-9540 REC
SHENZHEN SINEXCEL ELECTRIC CO., LTD. - Shenzhen, CHINA	ENERGY STORAGE SYSTEMS AND EQUIPMENT	UL-Subject-9540
ENSYNC, INC. - Menomonee Falls, WI USA	ENERGY STORAGE SYSTEMS AND EQUIPMENT	UL-Subject-9540 REC

Energy Storage System (ESS)
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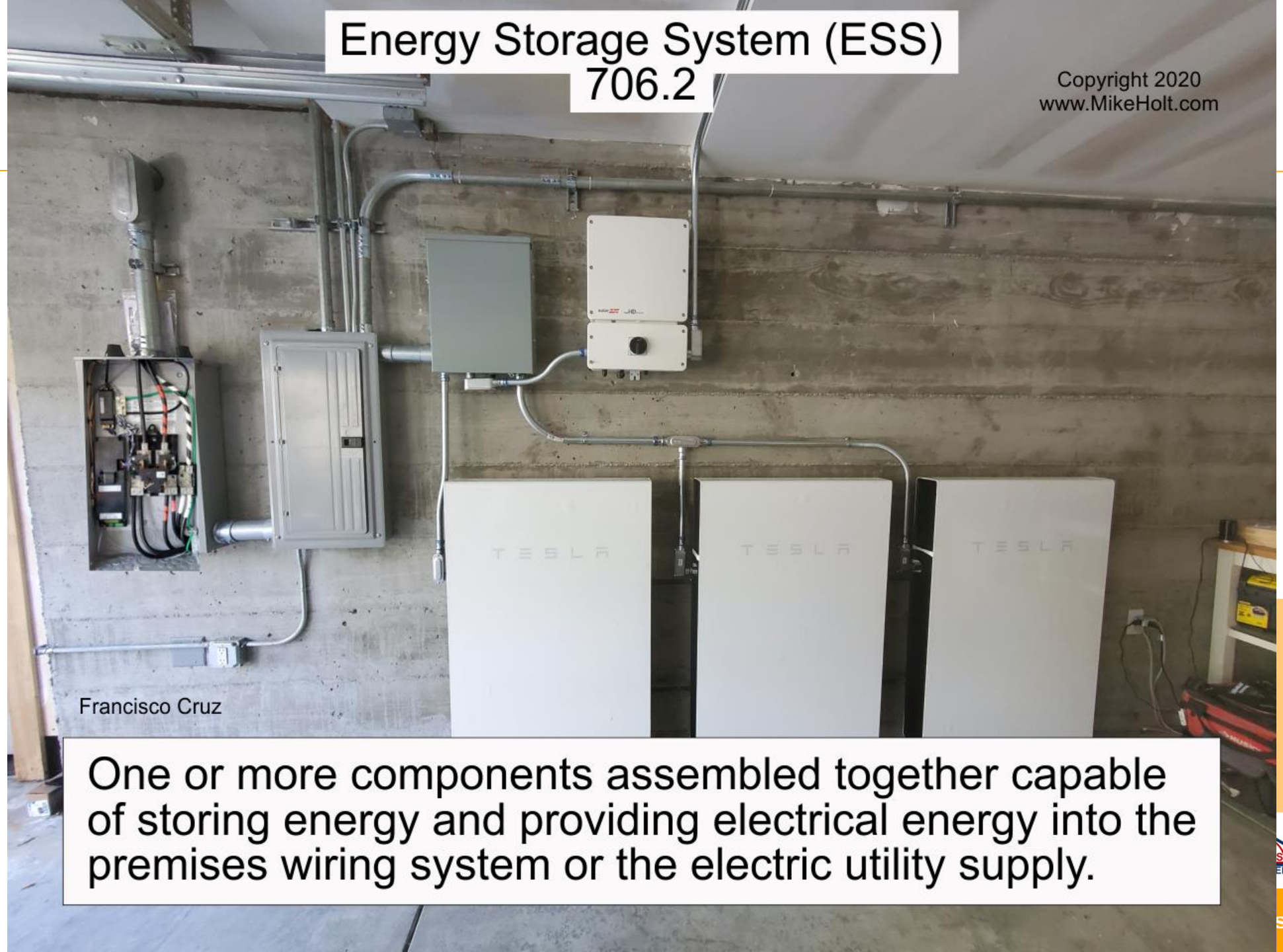

Francisco Cruz

One or more components assembled together capable of storing energy and providing electrical energy into the premises wiring system or the electric utility supply.

csagroup.org/testing-certification/product-listing/

uct records are updated by CSA

o.

Showing results 1-5 of 5

MANUFACTURER	PROV STATE	COUNTRY REGION	CLASS	CLASS DESCRIPTION
Hanwha Q CELLS America Inc.	California	United States	3701-84	ELECTRICAL ENERGY STORAGE SYSTEMS-Certified to US Standard
LG ELECTRONICS INC	.	South Korea	3701-84	ELECTRICAL ENERGY STORAGE SYSTEMS-Certified to US Standard
SolaX Power Network Technology (Zhe jiang) Co. , Ltd.	Zhejiang, 130	China	3701-84	ELECTRICAL ENERGY STORAGE SYSTEMS-Certified to US Standard
BYD Auto Industry Company Limited	Guangdong, 190	China	3701-84	ELECTRICAL ENERGY STORAGE SYSTEMS-Certified to US Standard
Delta Electronics (Shanghai) Co.,Ltd	Shanghai, 020	China	3701-84	ELECTRICAL ENERGY STORAGE SYSTEMS-Certified to US Standard

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Filter by Keyword | Search

UL Category Control Number

× FTBW

Document Type

× Guide Info

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Cancel | Reset | Save Search

Dashboard / Search

4 Results :: *UL Category Control Number: FTBW :: Document Type: Not Guide Info*

Display: General

Document Name	Company Name	UL CCN Description
FTBW.E488100	ENPHASE ENERGY INC	ENERGY STORAGE SYSTEMS AND EQUIPMENT
FTBW.E491068	BattMax Technology Inc	ENERGY STORAGE SYSTEMS AND EQUIPMENT
FTBW.E493642	CUI INC	ENERGY STORAGE SYSTEMS AND EQUIPMENT
FTBW.E505467	United Renewable Energy Co Ltd	ENERGY STORAGE SYSTEMS AND EQUIPMENT

« 1 »

Residential Permitting Considerations

The 2018 IRC has some guidance for location of ESS:

> ESS must be installed in non-habitable spaces such as utility rooms, garages, storage rooms. OR it must be installed outside the home.

Most common installation locations are:

- Attached garages
- Outside wall near garage or service entrance
- Basement
- Utility room

Best Practice for ESS Installation in Dwellings

- The simple requirements in the 2018 IRC are reasonable for now.

- If jurisdictions are looking for more specific language, the new language in the 2021 IRC is much more detailed.

2021 IRC ESS

R327.3 Installation. ESS shall be installed in accordance with the manufacturer's instructions and their listing.

R327.3.1 Spacing

Individual units shall be separated from each other by at least three feet (914 mm) of spacing unless smaller separation distances are documented to be adequate based on large scale fire testing complying with Section 1206.1.5 of the International Fire Code.

2021 IRC ESS

R327.4 Locations.

ESS shall only be installed in the following locations:

1. Detached garages and detached accessory structures.
2. Attached garages separated from the dwelling unit living space in accordance with Section R302.6
3. Outdoors or on the exterior side of exterior walls located a minimum 3 feet (914 mm) from doors and windows directly entering the dwelling unit.

2021 IRC ESS

R327.4 Locations (cont).

4. Enclosed utility closets, basements, storage or utility spaces within dwelling units with finished or noncombustible walls and ceilings. Walls and ceilings of unfinished wood-framed construction shall be provided with minimum 5/8 in. Type X gypsum. ESS shall not be installed in sleeping rooms, or closets or spaces opening directly into sleeping rooms.

2021 IRC ESS

R327.5 Energy ratings.

Individual ESS units shall have a maximum rating of 20 kWh. The aggregate rating of the ESS shall not exceed:

1. 40 kWh within utility closets, basements, and storage or utility spaces.
2. 80 kWh in attached or detached garages and detached accessory structures.
3. 80 kWh on exterior walls.
4. 80 kWh outdoors on the ground. ESS installations exceeding the permitted individual or aggregate ratings shall be installed in accordance with Section 1206.1 through 1206.9 of the International Fire Code.

2021 IRC ESS

R327.7 Fire detection.

Rooms and areas within dwellings units, basements, and attached garages in which ESS are installed shall be protected by smoke alarms in accordance with Section R314. A heat detector listed and interconnected to the smoke alarms shall be installed in locations within dwelling units and attached garages where smoke alarms cannot be installed based on their listing.

2021 IRC ESS Changes

R327.8 Protection from impact. ESS installed in a location subject to vehicle damage shall be protected by approved barriers. (back wall of garage)

R327.9 Ventilation. Indoor installations of ESS that include batteries that produce hydrogen or other flammable gases during charging shall be provided with ventilation in accordance with Section M1307.4. (no UL 9540 systems require ventilation)

NEC Article 706 Highlights

"706.7 [706.15 in 2020 NEC] Disconnecting Means.

A disconnecting means shall be provided for all ungrounded conductors derived from an ESS. A disconnecting means shall be readily accessible and located within sight of the ESS.

NEC Article 706 Highlights

Installation–706.30(A) in 2017 NEC; 706.20(B) in 2020 NEC

(A) Dwelling Units. An ESS for dwelling units shall not exceed 100 volts between conductors or to ground.
Exception: Where live parts are not accessible during routine ESS maintenance, an ESS voltage exceeding 100 volts shall be permitted.
UL9540 precludes exposed live parts so there is NO limitation on voltage within the ESS in the NEC
—the limits are in UL9540.

ESS Permitting Summary

Electrical permit should be the only necessary permit unless building modifications are necessary.

Typical building modifications that may require a building permit include:

1. Installation of Type X gypsum to finish unfinished space
2. Installation of parking protection if ESS is mounted on the back wall of garage and can be reached by cars.
3. Installation of heat detectors in garage or smoke alarms in the house.

Debra Perry

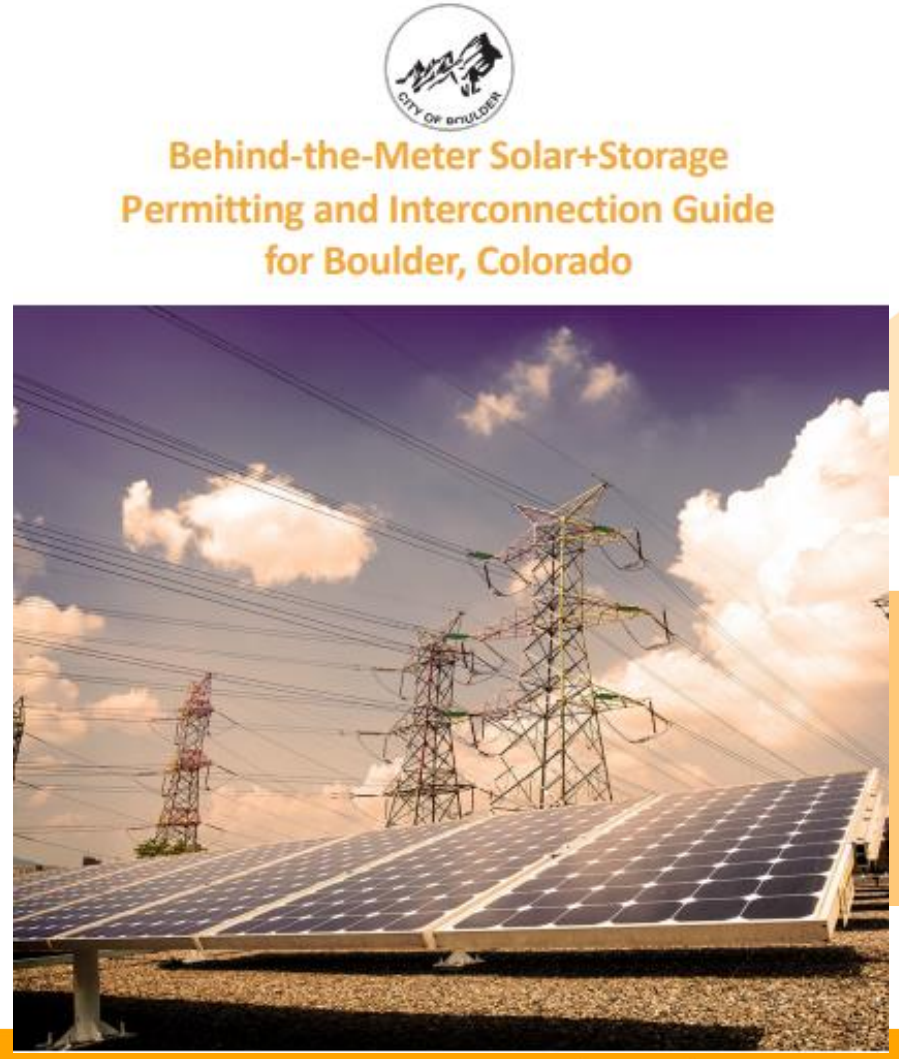
Senior Associate, Cadmus

Getting Started in Your Community

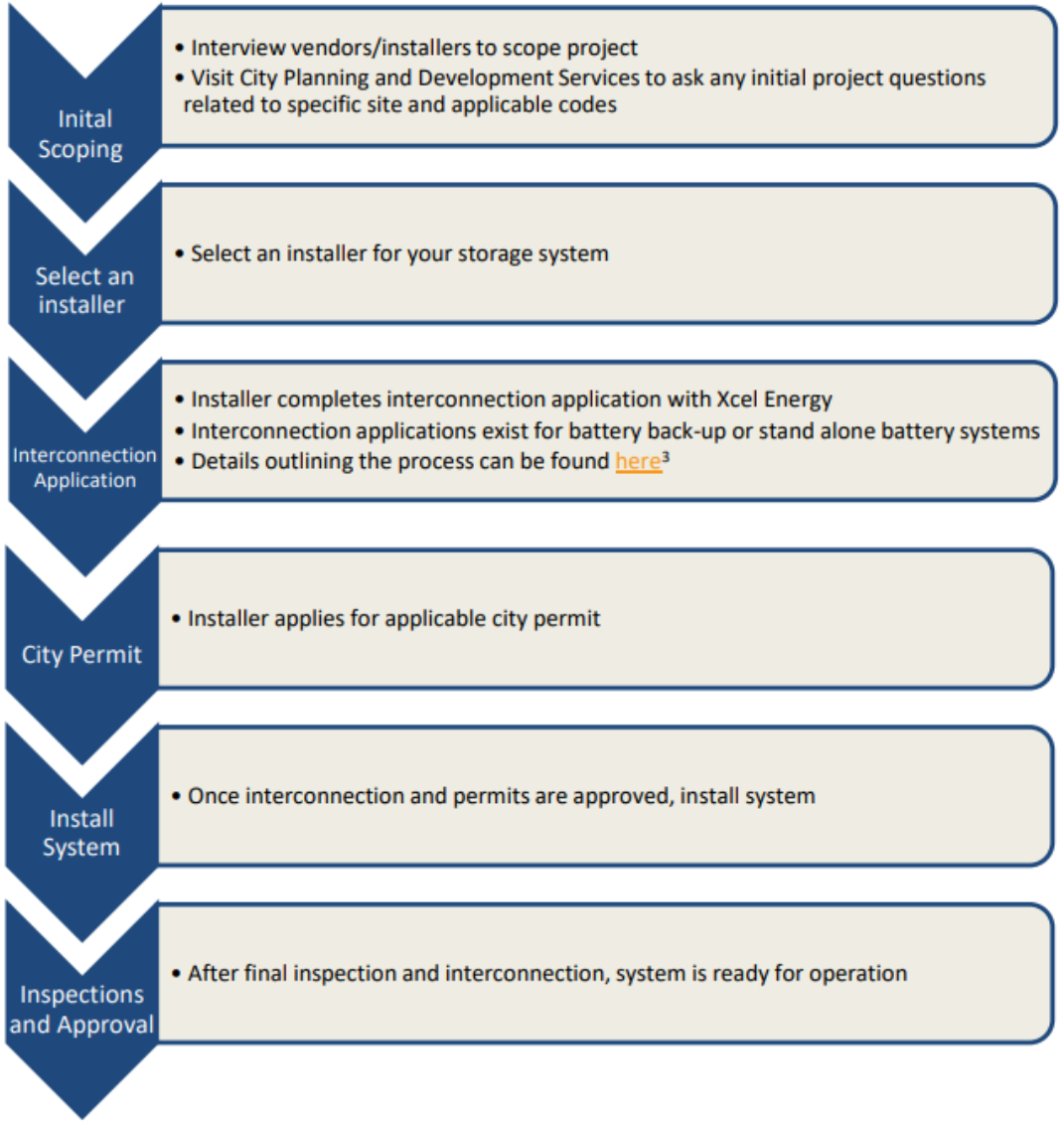
- There is ongoing development of **best practices guidance, case studies, checklists, and other resources** to inform and streamline project development
- Trainings could be of value and tailored to a range of audiences, including:
    - Building Owners
    - Town Officials
    - Building Inspectors
    - Fire Departments

Ex. Boulder Permitting Guide

- Lays out a clear process for **businesses, residents, and developers** to understand the process of getting a system approved for installation and interconnected to the electric grid.
- Provides guidance for permitting and interconnection requirements and processes:
    - **Residential and commercial-scale solar photovoltaic (PV) systems paired with energy storage** technologies
    - Only applicable to **behind-the-meter solar+storage systems**



Boulder Permitting and Interconnection Process



- Provides direction from **initial scoping through final inspections**
- Typical timelines for issuing permits **range from 20 – 60 business days** depending on building type and application

Communities with Permitting Guidance

- While streamlined permitting processes and permitting guidance at the local level are still nascent, there are a number of communities that have taken first steps to tackle the challenge, including:
    - **San Francisco**: Best Practice Guide and SolarResilient Tool
    - **Sonoma City**: Submittal Checklist and Expedited Permitting
    - **Irvine:** Submittal Requirements
    - **Santa Clara**: Inspection Guideline Checklist
    - **Palo Alto:** Step-by-Step Permitting Checklist
    - **Glendale:** Energy Storage Installation Guide

Quick Poll: Community Assistance

- **What kind of support does your community need related to storage?**
  - Introductory Workshops
  - Permitting Process support
  - Safety Training
  - Project Finance
  - Project Siting
  - Other

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