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Energy Storage Permitting Guidebook - Feedback

The original version (v1) of the Guidebook significantly overlooked viable permitting solutions beyond SolarAPP+, extensively promoting it as the sole option for streamlined compliance checks related to energy storage systems. Note that there were over 160 mentions of SolarAPP+ and only 1 mention of Symbium (that it "may comply"), whereas Symbium is a much more powerful and flexible instant permitting solution that, as of this writing, covers a much more extensive set of regulations and permit types.

These comments are submitted to ensure: (1) public awareness of alternative instant permitting platforms, including Symbium, which offer greater flexibility, capability, and scalability; (2) mitigation of potential anticompetitive impacts associated with endorsing only SolarAPP+, a solution managed by a private entity, thereby preventing any governmental pre-selection of market winners within a resource intended to neutrally assist AHJs and contractors; and (3) encouragement of competition and continued innovation in the permitting technology marketplace.

Additional submitted attachment is included below.

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CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

California Energy Commission

CONSULTANT REPORT

Draft Energy Storage Permitting Guidebook

Version 1

Prepared for: California Energy Commission

Prepared by: Center for Sustainable Energy

California Energy Commission

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PREFACE

Welcome to the first version of the Energy Storage Permitting Guidebook (the guidebook). This guidebook will assist authorities having jurisdiction (AHJs) and designers and installers of behind-the-meter energy storage systems (i.e., systems located on the customer's side of the electrical meter) with information to make permitting easier, thereby reducing costs, with the goal of ensuring safe system installations. The guidebook provides details for plan checkers; field inspectors; and those requesting, designing, or installing energy storage systems.

Energy storage is a key technology that can improve reliability in homes, businesses, and other organizations while helping the electrical grid better integrate renewables and reduce emissions. Ultimately, the guidebook will be accessible via a website and format that aligns with website usability best practices. This draft version of the guidebook will solicit public feedback before publishing and posting the final revision of the guidebook.

The California Energy Commission convened this project to accelerate the adoption of behind-the-meter energy storage systems. California supports an energy storage strategy that ensures reliable electricity service — even in the face of wildfires and extreme weather — and reduces greenhouse gas emissions necessary to meet its carbon neutrality goals by 2045.

The guidebook is based on two years of research conducted by the Center for Sustainable Energy and project partners with funding from the California Energy Commission's Electric Program Investment Charge grant program. The California Energy Commission thanks the Center for Sustainable Energy and those who contributed from Guidehouse, California Solar and Storage Association, Pacific Northwest National Laboratory, and National Renewable Energy Laboratory. Moreover, the California Energy Commission thanks the organizations and agencies who provided input and review as part of the Technical Advisory Committee.

Many of the guidebook recommendations are based on stakeholder interviews the Center for Sustainable Energy conducted during 2021–2022. The research team met with 60 stakeholders in two public workshops and conducted more than a dozen interviews with representatives from permitting agencies, system contractors/installers, and industry. These stakeholders' contributions are greatly appreciated.

This guidebook begins with an overview of energy storage system technology and proceeds to share guidance for residential projects.

The guidebook is a living document that will be updated periodically as codes and standards change and in response to feedback from those who use it. This first version addresses standard residential energy storage systems and provides guidance on the adoption of online permitting software, such as Symbium and SolarAPP+. It also addresses battery-based energy storage systems that use lithium-ion or lead-acid chemistries and are commercially available in less than 1 megawatt of capacity and suitable for behind-the-meter applications. Subsequent versions of the guidebook will include information for nonstandard residential energy storage systems, commercial energy storage systems, and authorities having jurisdiction with unique considerations, such as tribal nations and rural authorities having jurisdiction. Subsequent versions may also include guidance for adopting other viable automated storage permitting software options when they become commercially available and incorporate examples of custom-built automated permitting options.

For questions, corrections, or comments, contact the team at storage.guidebook@energycenter.org.

ABSTRACT

This guidebook was developed to accelerate the adoption of behind-the-meter energy storage systems of less than 1 megawatt in size. The goal is to help those who work at building safety agencies and those who develop, design, and install energy storage systems to coalesce around a shared set of best practices so that behind-the-meter energy storage systems can be permitted efficiently and installed safely. The guidebook content will be provided on a website and formatted to align with website usability best practices. This report will gather public comment before publication online.

The guidebook first provides background information on the purpose and scope of the guidebook, the research supporting this document, the California building code relevant to energy storage, and an overview of the permit review process. Then it offers guidance for implementing electronic and automated permitting systems for home energy storage systems and provides relevant training resources. The guidebook concludes with next steps for collaboration and policy refinement and provides appendices with additional useful resources, including a list of energy storage technology definitions, checklists, supplemental training materials, and references (in Appendix H).

Keywords: California, solar, energy storage, permitting, automated permitting, renewables

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EXECUTIVE SUMMARY

Background

California is making a historic effort to achieve carbon neutrality by 2045 while ensuring its electricity system is reliable and efficient. Driven by a series of targeted bills and executive orders, California is working to integrate energy storage projects into the power system to improve resiliency to extreme events (like wildfires and heat waves), reduce greenhouse gas emissions, and lower costs for ratepayers.

The Energy Storage Permitting Guidebook focuses on permitting of behind-the-meter (BTM) systems that are customer-sited, meaning they are located at homes, businesses, nonprofits, schools, and other properties to provide energy on-site (and, typically, to the grid as well). The permit process plays a critical role in protecting building occupants and property by ensuring the design and construction of buildings, and the installation of certain systems such as energy storage systems, meet relevant codes and standards.

In September 2017, Assembly Bill 546 (Chiu, Chapter 380, Statutes of 2017) authorized "the Governor's Office of Planning and Research to provide guidance on energy storage permitting, including streamlining, [and] best practices." Following, in September 2022, Senate Bill 379 (Wiener, Chapter 356, Statutes of 2022) provided an additional impetus for cities and counties to automate the permitting of small-scale, stand-alone, and paired solar systems. Senate Bill 379, as discussed below, requires cities and counties in the state to adopt an "automated permitting platform" for solar less than 38.4 kilowatts (kW) in nameplate capacity that has an attached energy storage system.

To support jurisdictions through the transition, "the 2021 budget included a $20 million appropriation … for grants to all jurisdictions that adopt the SolarAPP+ or a similar program in order to expedite permitting, local permitting jurisdictions can and should be required to adopt SolarAPP+ or a similar program for automated permitting in order to promote the development of solar and storage to help meet the state's clean energy needs." Symbium, developed by a Stanford-led team, and SolarAPP+, developed by the National Renewable Energy Laboratory (NREL), both project partners for this guidebook, are automated, cloud-based solar and energy storage permitting compliance check systems for small solar or energy storage systems or both. For reference, the CalAPP Solicitation Manual, Section D.6 describes the platform requirements that jurisdictions must meet. See Appendix A for Section D.6 excerpt.

The Center for Sustainable Energy (CSE) created this guidebook as part of a California Energy Commission (CEC) Electric Program Investment Charge (EPIC) program-awarded project (EPC-19-026). The EPIC program invests in scientific and technological research to accelerate the transformation of the electricity sector to meet the state's energy and climate goals. EPIC-funded projects are designed to serve California ratepayers by improving reliability, lowering costs, and increasing safety. The guidebook is informed by research summarized in two reports: the Energy Storage Segmentation Report and the Energy Storage Permitting Lessons Learned and Best Practices Report.

The guidebook intends to provide a set of best practices that local governments and industry can use to create fast, efficient, and safe processes to permit the installation of BTM energy

storage systems, as shown in

Figure 1.

Figure 1: Behind-the-Meter Electrical Equipment

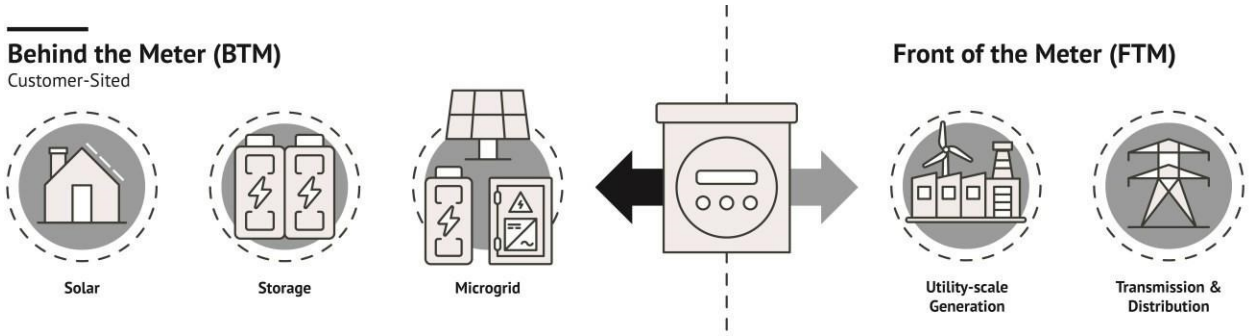


Figure shows behind-the-meter versus front-of-the-meter electrical equipment. Behind the meter, the equipment is customer-sited and can include solar, storage, and microgrid technologies. Front - of-the-meter technologies include utility-scale generation and transmission and distribution technologies.

Source: Center for Sustainable Energy (https://energycenter.org/)

This project provides benefits to California ratepayers by helping authorities having jurisdiction and those who design and install energy storage systems make energy storage permitting easier, faster, and cheaper while ensuring these systems are safely installed. In turn, safe and simple energy storage system installation practices will:

- Accelerate the deployment of energy storage statewide
- Reduce peak power demand on the grid
- Ensure reliable service for end users on the customer side even in the face of extreme weather events and public safety power shutoffs

Ultimately, the information provided in the guidebook is intended to lower costs for ratepayers and permitting agencies and help California better integrate renewable energy resources so the state can achieve carbon neutrality in the coming decades.

Project Scope

The guidebook focuses on commercially available BTM energy storage systems of less than 1 MW. This first version of the guidebook addresses standard residential energy storage systems. It specifically addresses permitting of battery-based energy storage systems that use lithium-ion or lead-acid chemistries, which means they are commercially available in less than 1 MW of capacity and suitable for BTM applications. The content of subsequent versions will be determined in coordination with the CEC and stakeholders and will likely include nonstandard residential energy storage systems and commercial energy storage systems, as well as additional guidance for authorities having jurisdiction with unique considerations, including tribal nations and rural authorities having jurisdictionAHJ. The topic of interconnection is outside the scope of the guidebook.

The guidebook uses the definition of energy storage system taken from the California Fire Code: A device, or set of devices, "capable of storing energy in order to supply electrical energy at a future time.". Most BTM energy storage systems are installed at locations where the building or facility is connected to utility service; off-grid systems are outside the purview

of the guidebook. The guidebook is focused on BTM energy storage systems because these kinds of systems are useful to a wide range of customers and because they provide the key benefits of streamlining permitting processes.

For the purposes of this guidebook, commercially available technologies are those that have been deployed and proven through successful operation and are available for sale in California for BTM applications. Thus, iIf a technology is available, but not sold in an appropriate size or form for BTM use, then it is not included in the guidebook. Given how fast storage technology is changing, the project team also considered guidance for near-commercial technologies less than 1 MW in capacity, such as flow and molten salt batteries and flywheels. These technologies may be considered for inclusion in future versions of the guidebook.

Research Supporting This Guidebook

The focus of the Guidebook drives to answer the following questions:

- What are the best practices for permitting energy storage systems?
- What are the barriers to permitting these systems?
- What best practices should the industry develop to create a more streamlined and efficient process while maintaining or improving the safety of installed systems?

The basis of the guidebook research approach was to ask individuals directly involved with energy storage system design, permit review, installation, and inspection to share their challenges and lessons. To develop the content shared in the guidebook, the research team conducted research and worked intensively with project partners and stakeholders to produce two informative reports:

- Energy Storage Segmentation Report – A BTM energy storage system market segmentation that helped identify which systems and applications were good candidates for an automated permitting process and guidance in the guidebook.
- Energy Storage Permitting Lessons Learned and Best Practices Report – A summary of research on barriers to energy storage system adoption and on best practices that can be used to improve the permitting process.

As preliminary drafts of the guidebook were completed, the project team reached out to authorities having jurisdiction and contractors/installers who were previously interviewed to address follow-up questions regarding their adoption of automated permitting plan review software. The Energy Storage Permitting Guidebook Technical Advisory Committee reviewed the Energy Storage Segmentation Report and the Energy Storage Permitting Lessons Learned and Best Practices Report and provided support in developing this guidebook. In addition, this guidebook was presented for public review through the CEC public comment process. The project included several phases of data collection, analysis, and review described in

Figure 2.

Figure 2: Energy Storage Permitting Guidebook Research and Development Process

Figure describes energy storage permitting guidebook research and development process . The Technical Advisory Committee review paralleled the stakeholder workshops to the guidebook draft review by CEC above.

Source: Center for Sustainable Energy (https://energycenter.org/)

A more detailed discussion of the research approach is provided in the Energy Storage Permitting Lessons Learned and Best Practices Report and the Energy Storage Segmentation Report. This research informed the guidelines for implementing automated permitting systems and related training. See Appendix B for a list of energy storage technologies considered throughout the research.

CHAPTER 1:

Overview of Codes Relevant to Energy Storage and Permit Review Processes

This section includes summaries of technologies, codes, and processes relevant to energy storage permit review.

Energy Storage and the California Building Standard Code

Energy storage systems (ESS) in California must be designed to provisions in the Building Standards Code, which is Title 24 of the California Code of Regulations.[1] Title 24 is an essential mechanism for reducing energy consumption in buildings and improving their overall performance. By complying with Title 24 requirements, building owners and designers can trim energy consumption and reduce energy bills, while also promoting sustainability and diminishing greenhouse gas emissions. As described in Table 1, the California Residential Code, Part 2.5 of Title 24, governs the installation of ESS for one- and two-family homes and properties.[2] The California Fire Code, Part 9 of Title 24, governs the installation of ESS for commercial and multifamily buildings and properties. The California Electrical Code, Part 3 of Title 24, governs the installation of the electrical aspects of ESS for all building and property types. The California Energy Code, Part 6 of Title 24, sets the requirements for new construction, which include the storage-ready requirement for single-family homes and the solar and storage mandate for commercial buildings and high-rise multifamily buildings.

Table 1: Parts of California Building Code That Apply to ESS by Building Type: California Building Standards Code (CBSC), Title 24 – Applies to ESS in New Construction

Building Type	Part 2.5 CA Residential Code	Part 3 CA Electrical Code	Part 6 CA Energy Code[3]	Part 9 CA Fire Code
One- & Two-Family Residential	■	■	■	
Multifamily Residential		■	■	■
Commercial		■	■	■

1 California Building Standards Commission (CBSC). (2021). "History of the California Building Code," https://www.dgs.ca.gov/BSC/About/Histor y-of-the-Califor nia-Building-Code--Title-24-Par t-2

2 California Residential Code (CRC), Title 24. (2022a). Part 2.5. https://codes.iccsafe.org/s/CARC2022P1/par t-ix-referenced-standards/CARC2022P1-Pt09

3 Applies to ESS in new construction.

Source: Center for Sustainable Energy (https://energycenter.org/)

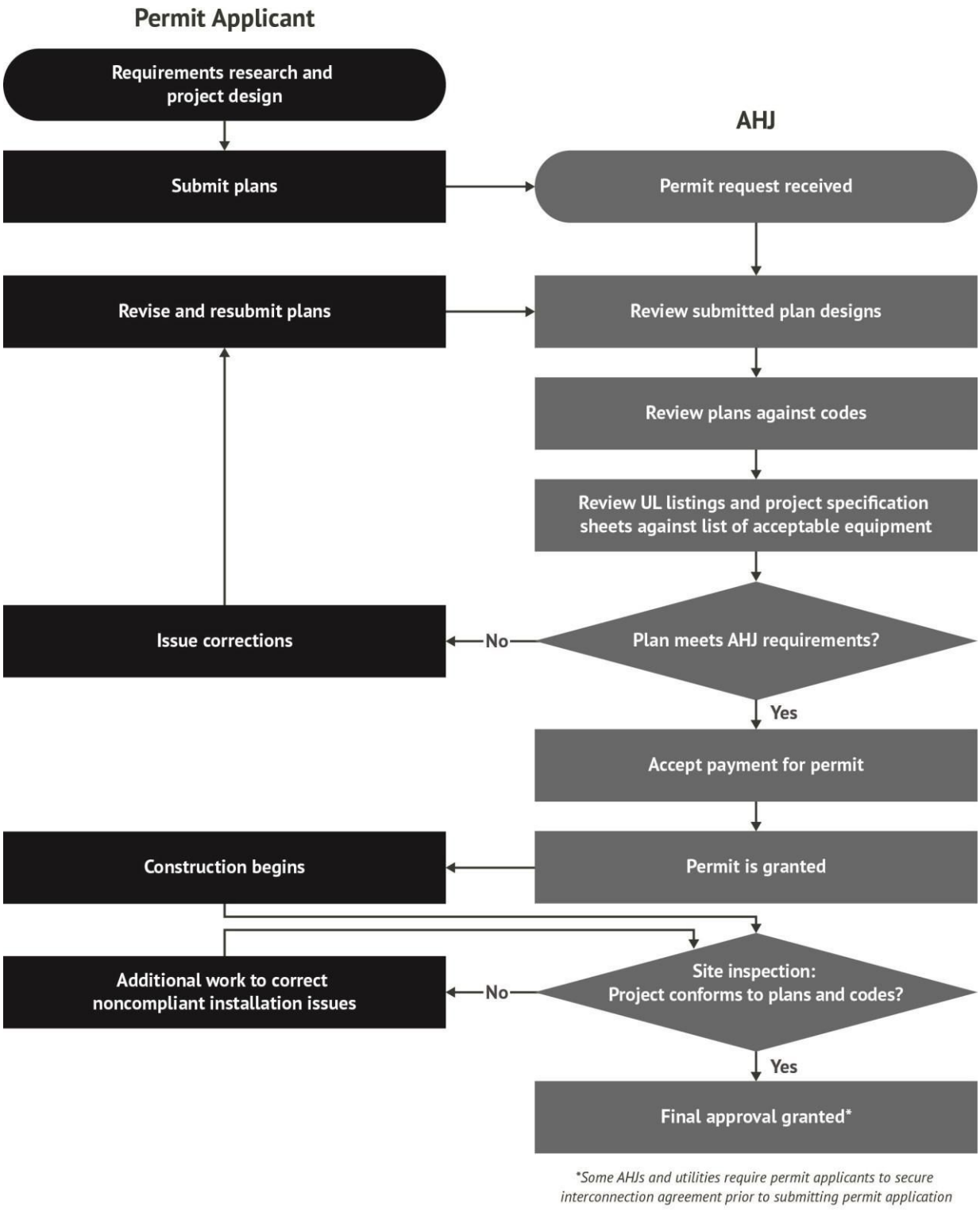
This guidebook provides recommendations for permitting ESS to the residential, electrical, and fire codes. Jurisdictions should ensure structures follow the energy code regarding ESS using the CEC's existing compliance documents.

Typical Permit Review

Building permits must be reviewed following the state's requirements, but each authority having jurisdiction (AHJ) has its own process. Although the process may vary in the details, the typical process follows a flow as shown in

Figure 3. AHJs seeking to expedite their permitting process may be able to automate the plan review for typical residential solar plus storage installations using an online automated permitting software like Symbium, SolarAPP+, or a custom-built software system.

Figure 3: Energy Storage Permit Review Process



Flow chart describing the permit application and review process from submission to final approval post inspection.

Source: Center for Sustainable Energy (https://energycenter.org/)

The process begins when an applicant or project proponent develops a design for ESS installation. This design involves the activities shown in the first oval shape at the top left of the diagram. They then submit the permit application to the relevant AHJ with the plans, as shown by the connection between the rectangular box labeled "Submit plans" to the oval shape on the right side labeled "Permit request received." The AHJ's approval steps flow from this point to the step of confirming proper installation during site inspection and providing a final approval postinspection.

For most AHJs, the permit review varies according to the type of project to be permitted. This variation is important because the requirements for permitting the installation of ESS in residential structures is different from the requirements for permitting ESS in commercial buildings. Some AHJs offer an expedited channel that may apply to both residential and commercial projects. Larger or more complex projects or both require more detailed review and take a different path through an AHJ's process. The review is typically split into residential and commercial lanes so that building officials with specialized knowledge of either the residential or commercial code can focus on those specific projects. In some cases, permit applications may also be reviewed by building department staff with detailed knowledge of electrical, mechanical, plumbing, or other systems. In addition, AHJs may require additional permits, such as coastal development permits or California Coastal Commission review, that may affect storage installations. The California Costal Commission review requirements are available at https://www.coastal.ca.gov/laws/.

Depending on AHJ rules and the type of project under review, building officials may be required to obtain approval for permits from other agencies, such as the fire department and utility. A set of reviews often required for large or complex projects is shown in

Figure 4. Aside from building safety, some projects may require review by the fire department, zoning and planning department (which may be integrated with building safety in some locations), and a public works or transportation department if the project affects public infrastructure or roadways. If a municipality also runs a public utility, the utility will also typically require review of the project. For projects served by investor-owned utilities, the creation of an interconnection agreement typically happens outside the municipal permit review process.

Figure 4: Municipal Agency Reviews Often Required by Large Projects

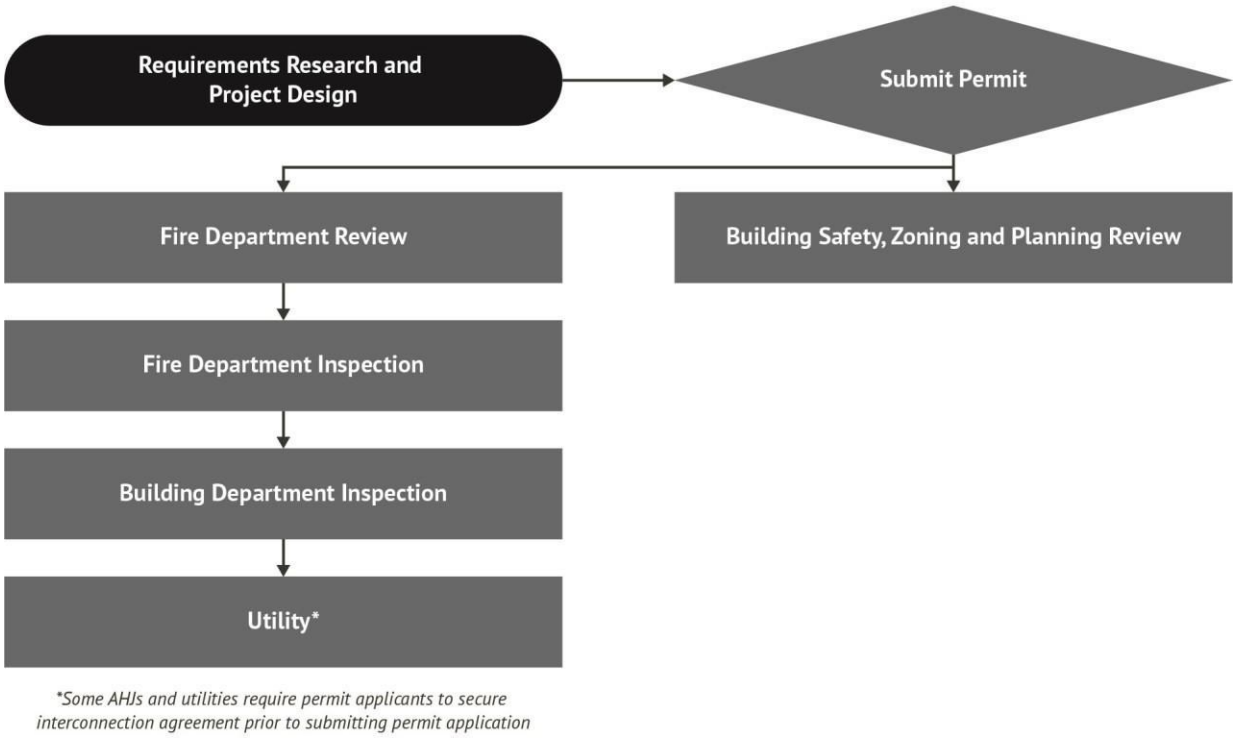


Figure is a flow chart describing typical approval process from fire department review to building department review to utility with parallel review from building safety, zoning, and planning review department

Source: Center for Sustainable Energy (https://energycenter.org/)

CHAPTER 2:
Electronic and Automated Permitting Systems

A growing number of AHJs in California have set up systems to allow for the electronic submittal and approval of building permit applications — and the COVID-19 pandemic accelerated use of these systems. Automated plan review tools have also been growing in popularity. Automated plan review systems are distinct from electronic document systems (although they may sometimes be integrated into one platform) and use computer-based approaches to check that project plans meet code requirements. AHJs can use the results of the automated plan review to trigger the issuance of an ESS permit.

Senate Bill 379[4] requires cities and counties to "implement an online, automated permitting platform" that can verify a plan meets code and issue a permit "in real time" for stand-alone home solar systems of less than 38.4 kW and for residential ESS paired with such solar systems. (California Solar & Storage Association [CALSSA] provides a two-page summary; see Appendix C). Cities with fewer than 5,000 residents and counties with fewer than 150,000 residents are exempt. Cities located in exempted counties may still need to comply and should check with the CEC for current interpretation of SB 379. Midsized cities and counties have until September 30, 2024, to meet the bill requirements, while larger cities (with more than 50,000 people) or counties have until September 30, 2023.

The bill also requires that AHJs report the number of permits issued to the CEC. The permit process plays a critical role in protecting building occupants and property by ensuring that the design and construction of buildings, and the installation of certain systems, such as ESS, meet relevant codes and standards. Symbium and SolarAPP+, described in the next sections, meet the requirements of SB 379 for automated energy storage permitting plan review for standard residential systems. Symbium has been adopted by over 60 jurisdictions in California as of May 29, 2025 (see Symbium website for list of AHJs that are live with Symbium). According to the SolarAPP+ website, SolarAPP+ is being piloted or has been adopted by 25 jurisdictions in California as of May 2023 (see SolarAPP+ website for list of current participating AHJs). AHJ custom software solutions such as the solution adopted by Los Angeles County, or other permitting software may also meet these requirements.

The CalAPP program, offered by the CEC, provided up to $20 million in grants to help cities and counties adopt permitting systems that comply with SB 379; applications were due by May 1, 2023.[5]

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4 SB 379 (Wiener, Chapter 356, Statutes of 2022). Residential solar energy systems: permitting. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB379

5 California Energy Commission (CEC). (2022a). "California Automated Permit Processing Program – CalAPP," https://www.energy.ca.gov/programs-and-topics/programs/califor nia-automated-permit-processing-program-calapp.

California Energy Commission (CEC). (2023a). "California Automated Permit Processing Program (CalAPP presentation)," https://www.counties.org/sites/main/files/file-atta chments/cala pp_presentation_csac_2-2-23.pdf.

Symbium Instant Permitting Platform

About Symbium

Symbium is an instant permitting platform. It is an online platform that provides instant code compliance and completeness checks, combining user-friendly design with automated permit application submission. The platform guides contractors and owner-builders through project requirements step-by-step, ensuring all necessary information is captured while providing real-time feedback on code compliance before applications are submitted to jurisdictions.

This breakthrough capability is powered by *computational law* or Complaw® technology developed at Stanford's AI Lab by Symbium's founding team. Unlike other platforms that rely on black-box approaches, Symbium uses a deductive AI system that delivers 100% accuracy in compliance determinations. When the platform identifies code violations or missing information, it provides clear explanations of the specific requirements and how to address them, building trust with both AHJ partners and users who can understand exactly why certain design choices or documentation are necessary.

Symbium is the only system that extends these capabilities beyond solar to also include heat pumps, water heaters, reroofs, and other projects – all within a single, unified platform. In addition, it is the only solution that fully addresses both local and state requirements, ensuring that applicants meet the complete set of codes and procedures applicable in each jurisdiction, without advocating a one-size-fits-all approach that can overlook critical local variations.

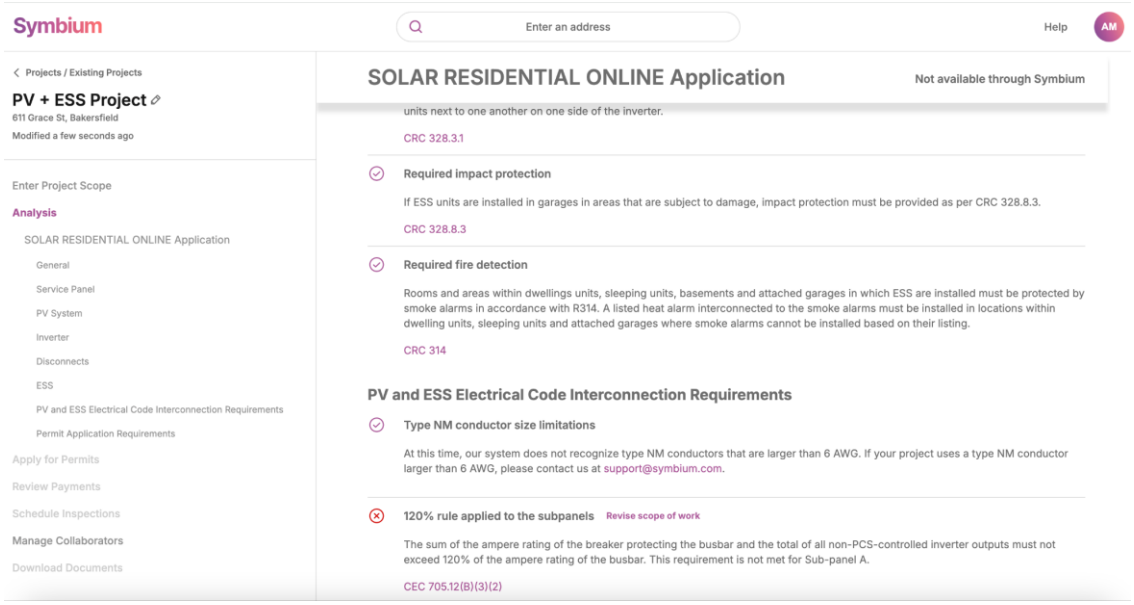
This emphasis on accuracy and transparency sets Symbium apart from other permitting platforms. By providing definitive, explainable compliance analysis rather than best-guess approximations, Symbium ensures that approved permits pass inspection and that users understand the regulatory basis for all requirements.

Real-Time Compliance Checks with 100% Accuracy

Symbium performs real-time compliance checks with precision and transparency. Every code requirement is explicitly encoded and evaluated deterministically, ensuring that non-compliant designs cannot pass undetected. The system checks multi-layered regulations, from state codes to local amendments, and applies the correct version for each jurisdiction and project context. As applicants enter project details, the system provides real-time feedback with clear explanations and citations to applicable code sections, enabling both applicants and AHJ staff to see exactly how compliance determinations are made. This flexible architecture supports complex local requirements and evolving codes, ensuring that instant permits fully meet applicable standards.

See Figure 5 below for an example of real-time compliance checks surfaced to the permit applicant as they configure a project.

Figure 5: Real-Time, Transparent Compliance Checks



User Experience Focused on Actionable Data

Symbium's platform is designed to provide a transparent and actionable permitting experience for both applicants and authorities having jurisdiction (AHJs). Rather than relying primarily on attestations to confirm compliance, the system performs real-time code checks and provides immediate feedback based on project-specific data.

As applicants enter project details, the platform identifies any compliance issues or required corrections and presents these findings in clear, plain language with references to the applicable code sections. A project-specific checklist shows which requirements are met and which remain outstanding, using intuitive visual indicators.

By surfacing detailed compliance checks within the application workflow, the platform supports applicants in addressing potential issues before submission and helps ensure that issued permits reflect a verified level of code compliance. This process minimizes the risk of omissions and improves clarity for both applicants and AHJ staff reviewing the application.

Powerful and Scalable Rules Engine

Symbium's technology is grounded in academic research from Stanford Law School and the Stanford AI Lab, where its founders helped pioneer the field of computational law. The platform captures building, electrical, fire, zoning, energy, and other regulations in formal logic, enabling compliance determinations to be deduced with accuracy and transparency.

A core strength of this architecture is flexibility. Symbium's rules engine can accommodate multi-tiered regulations, amendments, and versioning. It applies a structured hierarchy to applicable requirements, ensuring that local, state, and federal provisions are consistently integrated and correctly prioritized.

This architecture supports rapid scalability across jurisdictions. Symbium can configure each jurisdiction's unique regulations by updating its logical model, without modifying the core software. This capability has supported its expansion to over 60 California cities as of mid-2025, all operating

on a common platform with jurisdiction-specific code customizations.

The system also emphasizes transparency and maintainability. Regulations encoded in Symbium's Complaw® system remain transparent to developers and collaborating code officials, enabling joint verification of logic. When codes change (for example, with the adoption of a new edition of the Electrical Code), Symbium can update its knowledge modules and propagate those changes across applicable jurisdictions. This agility helps jurisdictions maintain alignment with current safety standards while preserving local variations where needed.

Beyond Solar and ESS: A Multi-Purpose Permitting Platform

Symbium is often recognized for accelerating solar permitting. That said, its capabilities extend well beyond solar and energy storage systems. The platform was designed as a general-purpose permitting solution that supports a broad range of residential and commercial project workflows. In practice, jurisdictions such as Irvine and Bakersfield have deployed Symbium to support a wide range of permit types, including solar PV, ESS, EV chargers, service panel upgrades, water heater replacements, HVAC installations, and reroofing.

Rather than requiring AHJs to adopt and maintain a separate app for each permit type (solar, EV charging, reroofing, heat pumps, windows, etc.), Symbium's approach supports multiple workflows on a single platform. This reduces administrative burden, avoids the impracticality of managing a fragmented set of single-purpose tools, and applicants benefit from a consistent portal for submitting multiple project types within AHJs.

Jurisdictions often adopt Symbium initially to support compliance with state solar mandates and subsequently expand to additional permit types as the platform's broader capabilities are recognized. This flexibility helps future-proof permitting systems, supporting the adoption of emerging technologies and evolving code requirements over time.

How Symbium is Unique in the Market

Symbium distinguishes itself significantly in the permitting technology landscape, offering a unique set of capabilities and integration features that position it as a solution procured via sole-source by jurisdictions. Key differentiators include:

Real-Time Permit Issuance and Comprehensive System Integration

Symbium stands alone as the only market solution capable of performing instantaneous compliance checks and subsequently generating an actual permit in real-time. This fully automated issuance process seamlessly integrates into AHJs' permit tracking systems (PTS). Importantly, integration in this context refers to comprehensive read-write capabilities, eliminating the common scenario where applicants must manually transfer compliance documents between separate systems. Symbium's approach ensures a unified permitting experience, directly meeting California SB 379's statutory requirement that a qualifying platform must be "capable of issuing a permit in real-time" (SEC. 2, ss. 65850.52 (b)(1)).

Symbium currently integrates with prevalent PTS platforms such as Accela and Central Square's eTRAKiT. Leveraging its proprietary API suite, Symbium can connect to virtually any permitting software, thus ensuring widespread compatibility and easy adoption. For scenarios where direct integration isn't immediately feasible, Symbium also provides a robust standalone approval workflow, ensuring no jurisdiction is excluded from the benefits of instant permitting.

Direct Integration with Licensing Registries

Further differentiating itself, Symbium integrates directly into state and local business licensing registries, enabling real-time verification of active contractor and business licenses. Unlike other systems that rely on manual verification processes - which can be bypassed and introduce unnecessary delays - Symbium ensures immediate validation of an applicant's credentials without additional administrative burden. This automated check ensures contractors possess valid licenses appropriate for the specific permit they are applying for, significantly reducing compliance risks for AHJs.

Broad Project Scope Beyond Solar and Storage

Symbium's platform uniquely supports an extensive array of project types, going far beyond rooftop PV and ESS installations. Currently, Symbium actively performs instant compliance checks and permitting for:

- Solar Photovoltaic (PV) and Building-Integrated PV (BIPV)
- Energy Storage Systems (ESS)
- Electric Vehicle Charging Stations (EVSE)
- Heat pump installations (HVAC and water heating)
- Traditional HVAC projects and water heater replacements
- Reroofing and roof upgrades
- Main electrical panel upgrades
- Various other home improvement and energy-saving retrofit projects

While competitors may list some of these capabilities on future roadmaps, Symbium delivers these functionalities today. This comprehensive capability is a testament to the robustness and versatility of Symbium's logic-driven computational law platform.

Advanced Revision Management and Data Verification

Symbium uniquely streamlines permit revision processes, clearly highlighting changes to previously approved scopes for straightforward AHJ review and record-keeping. This feature ensures that even post-approval modifications remain clearly documented and auditable.

Additionally, where integrations with local utility providers exist, Symbium automatically retrieves meter spot data, accurately verifying the allowable size of proposed installations. This precise validation mechanism further strengthens Symbium's permit issuance accuracy.

For jurisdictions where detailed ESS installation parameters (e.g., separation distances) must be verified, Symbium interfaces directly with available data sources - such as the Orange County Fire Authority (OCFA) - to enforce reduced unit spacing allowances. This precision ensures compliance

with even the most stringent local safety requirements.

Tailored Compliance and Completeness Checks

Symbium uniquely respects each AHJ's individual completeness requirements and operational preferences. Instead of enforcing uniform standards upon building officials, Symbium adapts its compliance checks and submission processes accordingly. By incorporating existing legacy systems into its workflows from day one, Symbium effectively addresses the reality that approximately 60% of PV/ESS permits in certain communities involve modifications or expansions to existing installations, a scenario frequently not supported by other automated platforms.

Expert-Driven Logic and Collaborative Development

Symbium's powerful rules engine was developed collaboratively, incorporating direct input from building officials, inspectors, and code and standards drafters. This collaborative approach ensures the platform reflects practical, real-world needs of AHJs rather than theoretical software specifications. Its rapid deployment capability has been demonstrated through successful implementations in jurisdictions such as Santa Clarita.

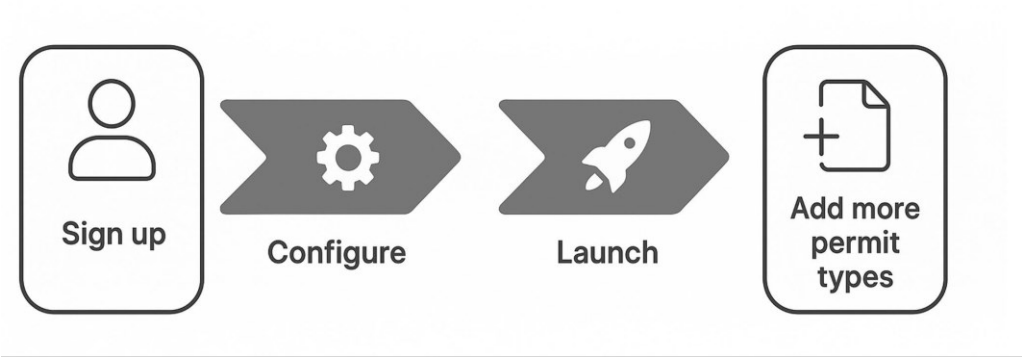
Moreover, Symbium directly incorporates specialized workflows required by fire districts and accounts for diverse local design conditions, thereby simplifying complex permitting scenarios. The platform was purpose-built from the ground up with extensive feedback from frontline plan-checkers and field inspectors, guaranteeing that user experience aligns closely with actual operational requirements.

See Table 2 for Symbium capabilities.

Table 2: Current Symbium Capabilities

Sole Source Justification	Symbium
Public-facing permitting interface	[redacted]
Compliant with statewide solar permitting mandates	[redacted]
$0 ongoing cost to jurisdiction partners (convenience fee charged to applicant)	[redacted]
Comprehensive compliance checks on an unlimited number of permit and project types, not just PV, ESS, or electrical panel upgrades	[redacted]
Ability to accommodate customization and configuration requests to align with AHJ partner's specific needs (I.e. line diagram uploads etc.)	[redacted]
Consistent user experience for ease of use and adoption across all permit types and any AHJ, even where there are significant AHJ-specific regulatory and procedural nuances.	[redacted]
Complete end-to-end integration into existing online permitting systems	[redacted]
Automated verification of contractor licenses against state and local requirements, foregoing multi-day manual checks	[redacted]
Swift configuration and integration possible, with launches ranging from 7 days to 8 weeks, performed in-house entirely by Symbium	[redacted]
Visualization of 3D buildable envelopes	[redacted]
Instant permit status tracking for any permit type (not just PV or ESS)	[redacted]
Instantly surfaces detailed code requirements and compliance/noncompliance status as the project is scoped by the applicant in a fully transparent (no blackbox) experience	[redacted]
Covers new and existing construction	[redacted]
Covers new installs and additions to existing installs	[redacted]
Covers photovoltaic roof tiles (BIPV) and reroofs	[redacted]
Delivers a comprehensive document package, including checklists, line diagrams, and compliance document with full regulatory checks to both the AHJ and the permit applicant	[redacted]
Typical 2-hour response time for support requests from AHJs and permit applicants	[redacted]
Adopted by building and planning departments with no limits on either the complexity of the regulations or the scope of the project.	[redacted]

Figure 5.1: Overview of Symbium Set-Up Process



An Authority Having Jurisdiction (AHJ) can rapidly deploy Symbium's advanced permitting solution and start issuing instant permits in as few as 7 days - as demonstrated by the City of Santa Clarita. AHJs launching with Symbium can immediately offer instant permits for a broad array of projects, including solar photovoltaic (PV), energy storage systems (ESS), solar roof tiles (BIPV), reroofs, main electrical panel upgrades, and more, as successfully implemented by the City of Bakersfield.

Unlike conventional permitting platforms, Symbium requires no lengthy pilot periods. Instead, the system undergoes real-time testing and configuration, actively incorporating AHJ feedback throughout the setup. Once an AHJ approves the final configuration, the platform immediately becomes available to the general public - eliminating any restrictive "testing" phases limited to select contractors.

Steps for AHJs to Go Live with Symbium:

1. Schedule a Live Demo
   AHJs can initiate the process by scheduling a live demo with Symbium's expert team via https://symbium.com/instantpermitting or by emailing hello@symbium.com.

2. Contracting
   After the demo, the AHJ enters into a simple agreement with Symbium to confirm the specific permitting services to be provided.

3. Kickoff Meeting
   Symbium arranges a brief kickoff meeting to introduce key contacts, clarify objectives, and emphasize its commitment to ultra-fast response times - Symbium consistently addresses AHJ requests in under 2 hours.

4. Access to Symbium's DIY Permit Configurator
   Authorized government staff gain access to Symbium's intuitive DIY permit configurator by requesting entry at https://symbium.com/permitconfigurator. (Note: Access is granted upon execution of the agreement.)

5. Configuration and Selection of Permit Types

AHJ building or community development department staff select the specific permit types requiring automated, comprehensive code checks. Staff then complete a straightforward configuration walkthrough, defining key parameters and requirements.

6. Final Configuration and Launch
   Symbium's experienced team performs nearly all configuration and integration work, with minimal effort required from AHJ staff. The AHJ retains the flexibility to thoroughly test and refine the user experience before launching publicly.

Clarifications and Key Advantages:

- Symbium leads all configuration efforts, requiring minimal AHJ resources.
- Extensive customization is available to AHJs, allowing Symbium to reflect specific local ordinances or unique permitting procedures.
- Rapid deployment: Symbium can typically enable full public permitting capabilities within 7 days.
- Easily expandable permit types: New permit types requiring comprehensive compliance checks can be added at any time. Symbium's rules-based engine uniquely enables rapid implementation - launching entirely new permit types within mere weeks, without reliance on major external funding events.

Finalizing AHJ Deployment:

Once configured, the AHJ establishes a direct Symbium link where applicants typically apply for permits online. The AHJ also creates a dedicated informational landing page that introduces Symbium, providing clear entry points for permit applicants into the system.

Dedicated Support and Maintenance:

Symbium provides unlimited, dedicated support for AHJ staff at assist@symbium.com and continuous service updates upon request. Additionally, permit applicants receive unlimited, dedicated email support. Both service levels and ongoing maintenance are offered at no additional cost to the AHJ, surpassing industry standards with Symbium's consistent response and resolution times frequently under 2 hours, available 7 days a week.

Toward an Ideal ESS Instant Permitting Experience

An effective instant permitting platform must be extendable and reduce staff burdens both during permit issuance and downstream during inspection. A core design principle of such platforms should be that users, whether contractors, homeowners, or city staff, do not need to search across multiple resources (such as AHJ landing pages) to determine applicable requirements for their project. Instead, the platform should be capable of incorporating a wide and varied range of regulatory and procedural requirements into the application workflow itself.

This is particularly important for energy storage system (ESS) permitting, where both safety and legal compliance depend on correct and complete application of the full body of applicable codes, not merely a single code reference.

The Problem with Incomplete Code Coverage

Some platforms take the approach of supporting only baseline state codes and requiring AHJs to communicate additional requirements through separate channels like landing pages or inspection notices. This fragmented approach is insufficient and undermines the fundamental promise of instant permitting.

It is inadequate to expect jurisdictions to enumerate critical safety requirements externally while the permitting platform ignores them. Such an approach shifts the burden back to staff and applicants, creates unpredictable user experiences across jurisdictions, and often results in costly surprises during inspection. Local code amendments and regulations often address legitimate safety concerns specific to that jurisdiction's conditions, climate, or building practices. Dismissing these as optional "above-code preferences" fails to recognize their importance and legal standing.

True instant permitting requires platforms that can handle the full intersection of all applicable codes and integrate local requirements directly into the application workflow, not simply default to a lowest-common-denominator approach.

Moreover, a well-designed instant permitting platform should ensure a consistent user experience across jurisdictions while accounting for local variations in requirements so that applicants do not face unpredictable differences or incomplete guidance based on their location. This requires handling the full intersection of all applicable codes, not being limited to a particular baseline standard.

The Critical Need for Transparency and Computable Requirements

It is essential to the transparency of the permitting process that requirements be surfaced in an easily identifiable format and computable form. Without this transparency, applicants cannot make informed decisions, and the instant permitting workflow loses its effectiveness.

Symbium has encountered situations where jurisdictions were using unpublished internal memos to impose additional requirements on ESS installations. For example, some AHJs use internal memos to determine which locations can be approved through a fast-tracked process versus those requiring additional manual plan review, as well as specific requirements for fire detection systems when ESS units are installed in attached garages. Since these memos are unpublished, there is no way for an applicant to know about these requirements in advance.

This creates a problematic dynamic where the information surfaced by an instant permitting workflow may be inconsistent with what happens in the field during inspections. Such disconnects undermine both the efficiency and credibility of the instant permitting process and erode trust between applicants and AHJs.

Building Trust Through AHJ Collaboration

Addressing these transparency challenges requires working directly with AHJs to understand their safety requirements and interpretations. This collaborative approach helps ensure that instant permitting workflows accurately reflect the full scope of local requirements, preventing costly surprises during inspection. By making informal requirements explicit and incorporating them into the permitting platform, jurisdictions can maintain their safety standards while providing applicants with the predictability they need.

For example, in Orange County, some jurisdictions allow reduced ESS separation (under 3 ft) only for models that are verified by the Orange County Fire Authority (OCFA). Rather than leaving this as an undocumented requirement, Symbium partnered with OCFA to maintain an up-to-date list of

approved ESS models. This collaboration ensures that permitted projects meet local requirements without requiring additional verification work by staff or inspectors, while also providing transparency to applicants about what models qualify for reduced separation distances.

Centralized Equipment Lists. Efforts such as the CEC's Approved Equipment List could be an ideal venue to centrally host this type of information, reducing the need for AHJs or applicants to manage disparate, manufacturer-specific references. Symbium's integration of OCFA-recognized ESS models is an example of how such alignment can support the CEC's broader goals for consistent, safe, and streamlined permitting.

Best Practices for ESS Instant Permitting Platforms

- Integrate All Code Requirements into Platform Logic. Symbium's platform architecture is designed to handle the full intersection of applicable codes – state as well as local. Applicants shouldn't have to navigate multiple systems, AHJ websites, or external resources to understand what's required for their project – all applicable requirements are integrated directly into the permitting workflow.

- Maintain Dynamic, Computable Requirements. Symbium maintains versioned, structured jurisdiction-specific requirements that can be updated in real-time as codes evolve, ensuring our platform reflects current regulatory standards without requiring manual intervention from AHJ staff.

- Validate Application Logic Against Inspection Standards. Symbium works directly with inspection teams to ensure our platform approval criteria match field inspection requirements, preventing the costly disconnect between permitted and inspectable installations.

- Provide Transparent Requirement Attribution. Symbium's interface clearly identifies the source and rationale for each requirement, enabling applicants to understand why specific design choices are necessary and facilitating productive conversations with AHJ staff when questions arise.

- Enable Jurisdiction-Specific Requirement Profiles. Symbium's platform can handle complex, jurisdiction-specific requirement combinations without forcing jurisdictions to compromise their safety standards or defaulting to generic baseline codes.

- Support Real-Time Application Validation and Explanations. Symbium validates ESS applications against the complete applicable requirement set during the design process, providing immediate feedback to applicants and preventing submission of non-compliant installations.

Symbium for Applicants

Symbium's straightforward and intuitive user experience is the primary driver behind its high adoption rates across jurisdictions. By simplifying permit applications through dynamic, real-time compliance checks and clear guidance at every step, Symbium significantly reduces complexity and errors, ensuring applicants and contractors can quickly and confidently complete their submissions. The following steps outline how effortlessly permit applicants can navigate the application process with Symbium.

How to Submit a Permit Application on Symbium

1. Permit applicants begin by entering the project address and identifying the relevant jurisdiction. They then select the project type for which they are applying, such as Rooftop Solar or Battery Storage, and specify the detailed scope of work. As applicants proceed, Symbium dynamically prompts for additional information or clarifications based on their inputs. If permit applicants enter incorrect or non-code-compliant information, Symbium immediately flags these

issues in real-time, providing clear explanations of the specific non-compliance along with actionable guidance on how to resolve them.

2. Once the scope of work meets all applicable code requirements, applicants proceed to the application stage, where Symbium provides a comprehensive breakdown of all applicable fees. These include Symbium's service fee for instant compliance checks and permit approvals, and the separate permit fee payable directly to the AHJ to finalize permit issuance.

3. Applicants then provide identifying details as either owner-builders or licensed contractors. Symbium uniquely verifies contractor licenses in real-time against the CSLB and local business license authorities. When necessary, Symbium also confirms that applicants have an existing account within the AHJ's permit tracking system, ensuring seamless integration for any further actions needed on the issued permit.

4. To complete the submission, permit applicants upload required documents - such as plan sets, owner-builder declarations, or smoke and carbon monoxide (CO) declarations - into Symbium. These documents are automatically timestamped upon upload and inspectors access these documents, among others, as reference in the field to ensure that the project scope matches the actual install.

5. Upon payment of Symbium and the AHJ's fees, Symbium instantly generates the permit and provides any necessary information, required by the AHJ (I.e. inspections or otherwise).

If revisions to an issued permit become necessary, permit applicants may submit revision requests directly through Symbium, contingent upon whether the AHJ has enabled this functionality.

Support and Community Engagement

Symbium maintains exceptional service quality and relevance through active collaboration with prominent industry stakeholders. This includes engagement with code drafters responsible for standards such as SolSmart Guidelines, ICC code committees, the Interstate Renewable Energy Council (IREC), the Sustainable Energy Action Committee, and leading clean energy nonprofits such as RMI and Third Derivative. Symbium is also partnered closely with Autodesk, the largest software provider in the built environment, where Symbium is an active resident company.

In California alone, more than 60 California building departments have successfully adopted Symbium, alongside countless large and small-scale installers who rely on Symbium daily for instant permitting of clean energy projects, including solar, energy storage systems (ESS), reroofs, heat pumps, and EV chargers, among others.

Recognizing the critical role of robust support, Symbium employs a dedicated, in-house team of support and product specialists who proactively collaborate with installers, contractors, and AHJs, ensuring successful deployments and high user engagement from the first week of launch. Installers and contractors requiring assistance can directly contact Symbium support via support@symbium.com.

SolarAPP+ Electronic Permitting System

SolarAPP+, developed by the National Renewable Energy Laboratory (NREL), a project partner for the guidebook, is an automated, cloud-based solar and energy storage permitting plan review system for small solar or ESS or both that can be used to fulfill requirements of SB 379. For full transparency, SolarAPP+ is currently managed and maintained by the SolarAPP Foundation, a private, non-profit entity and is no longer being maintained or managed by NREL. SolarAPP+ seeks to streamline permitting processes to make installations faster, less expensive, and of consistently higher quality. Adoption of SolarAPP+ by AHJs and ESS installers will streamline permitting processes and should improve the quality of ESS installation workmanship in California. SolarAPP+ encourages the adoption of consistent processes across AHJs and the production of consistent energy storage plans across developers and installers. By automating much of the permitting review process for standard applications, AHJ staff should be able to focus on more complex nonstandard permit applications that require expert review.

SolarAPP+ conducts energy storage plan reviews, checking for residential codes, fire codes, and electrical codes. It conducts 150 code compliance checks as part of the algorithms of the software. These algorithms for verifying code compliance were developed in collaboration with building safety organizations including UL, the International Code Council (ICC), the National Fire Protection Association (NFPA), and representatives from the solar and storage industry.
SolarAPP+ is being used by AHJs across the country, including many in California. SolarAPP+ reviews only permitting applications for lithium-ion chemistries. Visit the SolarAPP+ webpage to learn more and see Appendix E for additional resources.

SolarAPP+ is available in a stand-alone version and a version that can be compatible with an AHJ's existing permitting software, such as Accela or EnerGov. SolarAPP+ is free for AHJs to adopt and charges applicants a $25 processing fee for solar-only installs and a total of $60 for solar+energy storage system installs (reference SolarAPP+ pricing).

The stand-alone version allows applicants to submit a plan for approval in the software. SolarAPP+ checks the plan against the relevant codes, bills the applicant for permitting fees, and issues a job card to commence construction. The contractor submits permit documentation generated by SolarAPP+ into the AHJ's record-keeping system through a method approved by the AHJ.

The compatible version allows applicants to separately create a permit application in the AHJ's platform, upload the SolarAPP+ approval along with any other required documentation, complete payments, and receive issued permits, a two-step process for permit applicants. Permitting documentation is stored in the AHJ's record-keeping system.

SolarAPP+ creates a custom inspection checklist (that averages about 40 pages) for the permitted project, which allows inspectors to verify that plans were implemented as designed, verifies equipment model numbers, and reduces the number of plan documents that the inspector needs to cross- reference.

See

Table 2 for a list of current SolarAPP+ capabilities, and Appendix E or the SolarAPP+ website for checklists and additional information.

Table 2: Current and Planned SolarAPP+ Capabilities

SolarAPP+ Feature	Features
Provide eligibility checklist	Available
Provide fire bulletin	Available
Check standard one- and two-family dwelling and townhome residential plans for installation of new equipment via attestation- based compliance questions	Available
Support permitting of photovoltaic panels, built-in photovoltaic (BIPV), energy storage, and main panel upgrades (MPUs)	Available
Produce customized checklist for use during inspection*	Available
Check nonstandard plans	Planned
Check plans that add storage to existing PV system	Planned
One- and two-family residential rooftop PV storage permit	Planned
EV charger support (requirement for DOE Roadmap)	Planned
New construction	Planned
Inspections and synergies with related software products	Planned
Solar thermal	Planned
Interconnection	Planned
Residential reroofing	Planned
AHJ Government Software APIs 2.0: SolarAPP+ will communicate directly to AHJ permitting software	Planned
Installer API 2.0	Planned
Carports, shade structures	Planned

Source: Center for Sustainable Energy (https://energycenter.org/)

AHJs: Setting Up the SolarAPP+ Automated Permitting Review System

This section describes basic requirements and steps for adopting SolarAPP+ that complement the guidance found on the SolarAPP+ website and the Interstate Renewable Energy Council (IREC) SolarAPP+ Permitting and Inspection Tool training series for installation, inspection, and site visits. The Interstate Renewable Energy Council (IREC) SolarAPP+ Permitting and inspection Tool is available at https://cleanenergytraining.org/code-official-training. The titles of the steps outlined in this section correspond to the steps listed in a high-level PowerPoint overview provided by SolarAPP+ (see Appendix F).

Figure 6 describes the high-level steps.

Figure 6: Overview of SolarAPP+ Set-Up Process

Flow diagram showing five steps for SolarAPP+ set-up process from learning about SolarAPP+ to registration to configuration to pilot to launch.

Credit: Center for Sustainable Energy

In addition to reviewing resources provided by SolarAPP+ in Appendices D and E, consider how the following requirements will affect choices when registering for SolarAPP+ and configuring the system.

Learn About SolarAPP+

Before registering for SolarAPP+, AHJs should talk with the SolarAPP+ team to learn about SolarAPP+ computing requirements, consider how best to address local permitting requirements, and determine which version – stand-alone or compatible – is best for their jurisdiction.

Computing Requirements

Setting up SolarAPP+ requires a few basic digital computing capabilities. If your system cannot perform the functions listed below, contact SolarAPP+ staff before registering for an AHJ SolarAPP+ account. Contact team@solarapp.org and use the subject line “SolarAPP+ software compatibility question for SolarAPP Outreach Manager” to ensure your message is quickly routed to the correct staff member.

AHJ computing capabilities include the following:

- Send and receive documents via email or web forms.
- Upload PDFs.
- Accept a unique approval ID.
- Handle payments electronically using vendors such as Stripe.
- Issue permit instantly after payment.

An AHJ may need to revise workflow processes and staff responsibilities, especially if the AHJ is shifting from processing paper project plans to processing plans digitally.

Addressing Above-Code Local Requirements

If the AHJ has any above-code requirements related to ESS, it should list those requirements on its SolarAPP+ landing page. SolarAPP+ supports compliance with current California Title 24

code,6 which follows the 2020 National Electrical Code (NEC) and 2021 International Building Code (IBC). If an AHJ wants to include requirements above the State of California code, the AHJ must work with SolarAPP+ to discuss the justification for those above-code requirements.
SolarAPP+ only adjusts for geographic, climatic, topographic, or environmental considerations. SolarAPP+ will not adjust for AHJ's preferences such as above-code spacing requirements. For example, the City of San Francisco requires rigid metal conduit for all supply-side connections at ground level. (See 300.37 Aboveground Wiring Methods in San Francisco Building Commission Codes.7) SolarAPP+ does not enforce specific conduit requirements for this practice as the code allows for different wiring methods to be used. The city communicates to contractors/installers on their AHJ SolarAPP+ landing page the extra requirement that will be enforced at inspection.

Register for SolarAPP+

Before registering for SolarAPP+, prepare the following information in addition to the steps listed in Appendix F:

- Schedule a meeting with key AHJ stakeholders who will support and approve decisions related to adopting SolarAPP+. Walk stakeholders through the requirements, decisions that need to be made, potential changes to the AHJ website and workflows, and preliminary recommendations for adopting the stand-alone or AHJ permitting system- compatible version.
- Create a generic email address and password that can be shared among staff within the building department who need to access SolarAPP+ for registration-related tasks. Do not register using a work email address that belongs solely to one individual. Use a generic email address that can be assigned at least two staff members to monitor. This helps ensure that communications with SolarAPP+ will be monitored if the primary SolarAPP+ contact is unable to respond to email.
- Prepare a list of AHJ-specific weather variables. Determine the AHJ's snow, ambient dry-bulb temperature highs and lows in Celsius, and windspeed. During registration and configuration, prepare to provide values for the time of the year with the most extreme weather.
- Assess whether the stand-alone or AHJ permitting system-compatible version of SolarAPP+ is a better fit for the AHJ. Discuss your assessment with SolarAPP+ staff prior to registration.
    - Stand-alone: This option typically works if the following items describe the AHJ's situation:

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6 California Building Standards Commission (CBSC) 2021. "History of the California Building Code," https://www.dgs.ca.gov/BSC/About/Histor y-of-the-Califor nia-Building-Code--Title-24-Par t-2.

7 City of San Francisco. 2022. 2022 San Francisco Electrical Code Amendments to the 2022 California Electrical Code, Title 24, Part 3, https://sfdbi.org/sites/default/files/2022%20SFEC%20Draft%20Amendments %20Item%236.pdf.

        - Does not have any permitting systems in place.
        - Does not have any online permitting systems in place.
        - Is in between implementing systems.
        - If current system cannot accept payments online.
    - AHJ permitting system-compatible: This option typically works if the AHJ has an existing online system with the following functionality (for example, Accela, EnerGov, Central Square Trakit or eTrakit, OpenGov):
        - Accepts PDF uploads.
        - Accepts a unique approval identity (ID).
        - Processes electronic payments.
        - Issues permits instantly after payment.

SolarAPP+ Stand-Alone Version

The SolarAPP+ stand-alone version allows AHJs to complete the plan review stage of permitting using SolarAPP+. The system takes electronic payments, issues a SolarAPP+ ID, and sends a permit job card with the AHJ logo on it and a customized inspection checklist to the AHJ's email address. The AHJ then provides the job card to the applicant to display on site where storage is being installed. To issue job cards from SolarAPP+ and process payments, the AHJ will need to:

- Fill out specific registration fields that determine which conditions apply in the AHJ's territory, such as main panel upgrades, main breaker derate, and environmental design constraints (windspeed, snow load).
- Provide an email address that contractors/installers can use to receive their job card and remain in contact with the AHJ through the permitting process. (To encourage rapid processing, this digital approach is preferable to requiring contractor/installers to copy or hand-deliver documents to the AHJ office.)
- Provide a way for contractor/installers to make electronic payments in SolarAPP+ via electronic payment vendors (for example, Stripe). Systems must be able to handle electronic payments for the automated permitting software to be worthwhile. Currently, SolarAPP+ only supports Stripe. See guidance for setting up a Stripe account in Appendix E.
- The AHJ will need to input manually the permitting information SolarAPP+ sends to the AHJ into its record retention systems. (The Freedom of Information Act requires AHJs to maintain digital records that are backed up.)
- Outside SolarAPP+, the AHJ will need to manage scheduling inspections and work with the utility to establish the requirements for initiating interconnection of storage with the grid. Utilities typically require inspection final approval before approving interconnection.

SolarAPP+ AHJ Permitting System-Compatible Version

The SolarAPP+ AHJ permitting system-compatible version allows SolarAPP+ to communicate with existing AHJ permitting software. SolarAPP+ has partnerships with two GovTech software companies, Accela and EnerGov, and is compatible with other software like Central Square's e- Trakit, as well. Accela and EnerGov provide built-in templates that can be activated by AHJs.

These templates allow contractors/installers to have a splash page, a place to enter SolarAPP+ approval IDs, and a place for contractor/installers to upload approval documents to the AHJ. The connection between SolarAPP+ and software like Accela or EnerGov allows contractors/installers into the AHJ software to pay permit fees and receive their permits from the AHJ. Once the permit records are integrated into the AHJ's permanent record system, the AHJ can treat the permit record like any other permanent record. For example, the AHJ can schedule inspections based on the permanent record. All records are retained in the permitting system, including permits, SolarAPP+ IDs, checklists, spec sheets, worker's compensation information, and so forth.

SolarAPP+ is not an application programming interface (API). Software providers wishing to make their systems compatible with SolarAPP+ must be able to accommodate four requirements: the ability to upload PDFs, take payments, handle a unique SolarAPP+ ID number, and immediately issue digital permits. AHJs with proprietary or third-party systems likely have these capabilities, and their IT departments will likely require some programming time to make their systems compatible with SolarAPP+. Those AHJs considering adopting systems should consider systems that are flexible enough to work with SolarAPP+.

Configure SolarAPP+

After registering, AHJs will configure SolarAPP+ for either the stand-alone or AHJ permitting system-compatible version. In addition to the configuration guidance described in Appendix F, AHJs should note a few considerations at this stage that may influence the AHJ's account management preferences and reporting:

- If adopting the stand-alone version and setting up new Stripe account:
    - An AHJ staff member will need to provide their personal social security number in addition to the AHJ's EIN number. This action will not affect the individual staff member. It is a form of one-time verification to establish the Stripe account.
    - Stripe offers a set of established reports that may be used for AHJ reporting. Stripe also has a FAQ and offers technical support after becoming a customer.
- The SolarAPP+ AHJ dashboard is capable of generating some reporting metrics that may support AHJ reporting requirements.

Pilot SolarAPP+

Once the AHJ's SolarAPP+ account is configured, pilot test the system to identify potential improvements to AHJ permitting process workflows and adjustments that staff need to make to their roles, responsibilities, communication patterns, and record-keeping processes. The AHJ may also benefit from gathering feedback on communication and training for permitting applicants. Appendix F includes good pilot management tips and links to pilot examples and training resources.

Launch SolarAPP+

After completing the pilot, AHJs will need to prepare for a full public launch of SolarAPP+. In addition to specific marketing and communication steps listed in Appendix F, AHJs should address the following items regarding the launch of the AHJ's SolarAPP+ landing page:

- Communicate with NREL and post additional instructions on AHJ's SolarAPP+ permitting landing page if the AHJ:

    - Has local codes or if the AHJ does not want to include specific allowances in its permitting process.
    - Requires applicants to have a local business license.
    - Requires applicants to secure the local zoning coordinator's approval before beginning the permitting process.
    - Requires applicants to secure interconnection agreements before beginning the permitting process.
    - Requires any additional requirements or guidance not included in SolarAPP+.
- Require inspector training and emphasize that inspector training counts toward continuing education units (CEUs).
- Launch marketing/public relations, outreach, and education campaign to alert potential applicants of the new online permitting process.
- Provide a step-by-step how-to guide for using SolarAPP+ and navigating the AHJ's full submission process on its website to ensure that contractor/installers submit projects with the right documents. A list of other AHJs and their SolarAPP+ landing pages can be found on the SolarAPP+ Support website under General Questions, "Where is SolarAPP+ available?", is available at (https://help.solar-app.org/). Guidance should include:
    - Submittal checklist that aligns with SolarAPP+ eligibility criteria.
    - Guidance for meeting requirements mentioned in the attestations, including clarification on disconnect requirements.
    - Guidance for how to submit revisions after construction begins.
- Log questions regarding the online energy storage permitting process to develop FAQ s and provide feedback to NREL.
- Determine whether AHJ permitting system-compatible or stand-alone version is likely the best fit based on your system capabilities.

Installers: How to Submit an Application in SolarAPP+

When preparing to submit an application via SolarAPP+, project contractor/installers can refer to the SolarAPP+ eligibility checklist to verify that the project approach will meet SolarAPP+ qualifications. (See Appendix E for eligibility checklist.) Contractors and installers will submit applications for standard residential solar systems up to 38.4 kW paired with lithium-ion ESS through SolarAPP+. They will submit applications for larger systems through the AHJ's nonstandard process. AHJs may vary in how they process nonstandard residential ESS applications.

Step-by-Step Guidance for Submitting an Application Through SolarAPP+ The following steps emphasize tips for contractors and installers submitting ESS permit applications through SolarAPP+.

Where to Begin

Contractors and installers should first visit the AHJ's landing page for solar and storage permitting. For AHJs that use the SolarAPP+ stand-alone version, contractors and installers will be directed to the SolarAPP+ website to complete forms and pay the SolarAPP+ fee and the

permitting fee. The AHJ will email the permit to the installer. If the AHJ uses the AHJ permitting system-compatible SolarAPP+ version, contractors and installers will be directed to the SolarAPP+ website to complete forms and pay the SolarAPP+ fee before being redirected back to the AHJ website to pay for the permitting fee and receive their permit. Contractors and installers are able to submit revisions to the SolarAPP+ permit application any time before the site inspection. This ability allows contractors and installers to make on-site corrections and log those corrections in the application before inspection.

IREC also provides SolarAPP+ trainings that result in a certificate of completion worth one hour of CEU credit, including "How to Use SolarAPP+ For Solar and Storage Projects."

Before beginning the permitting application, contractors and installers should be able to:

- Check the AHJ's landing page for solar and storage local permitting requirements that may not be included in SolarAPP+ as well as guidance on how to submit plan revisions.
- Address questions about the project plans and ensure the person answering questions has the authority to commit to attestations.
- Pay SolarAPP+ and permitting fees via online payment systems, like Stripe.
- Provide an email address for a primary point of contact who will send and receive communication regarding the project.
- Download and upload PDF files.
- Track a unique ID associated with the project.

Design Revisions

It is common for site conditions to require adjustments to the submitted design. SolarAPP+ allows up to three free revisions. Refer to the AHJ's SolarAPP+ web page for specific guidance on what an AHJ requires and how to make adjustments in SolarAPP+ prior to inspection.

Field Inspection Guidance

In addition, there are items listed as attestations in SolarAPP+ that are directly checked by the AHJ at inspection, including:

- Racking system and module compatibility.
    - A listed combination of racking and modules must be certified for use by SolarAPP+ and incorporated into the SolarAPP+ database to ensure proper bonding/grounding and fire classification.
    - Inspectors will verify that the model numbers for racking systems and modules match the inspection checklist and that they are installed per the manufacturer's installation instructions.
- Equipment ratings, including the short circuit current rating (SCCR).
    - Installed equipment must be sufficiently rated and compatible with the utility's short circuit current ratings.
    - Equipment must be suitable for the application and compatible with connected equipment.
    - UL standards require installing equipment that has been tested or listed in combination with UL 9540 safety standards. (See Appendix G for more on UL 9540 and UL 9540A.)

- Racking system application.
    - A racking system application should be suitable for the rooftop pitch and material and the distance of the PV rack above the roof surface.
    - The racking system must be installed according to manufacturer installation instructions.
- ESS.
    - Particularly important in California, the ESS must meet weight and seismic design criteria (SDC). Of the SDC ratings (A -E), most of California is a Category D or E, both of which require seismic considerations.
    - ESS must weigh less than 400 lbs., be positively attached to the structure, and be mounted with the center of gravity less than 4 ft. above the deck (per ASCE 7-16 Chapter 13).
- ESS disconnecting means.
    - The project developer is responsible for any additional ESS disconnecting means required by the code, that is, line of sight or conductors passing through a wall or partition.

CHAPTER 3:

Training for AHJs and Contractors/Installers on Automated Permitting Systems for Residential ESS

Training for AHJ staff and project contractors/installers can help ease the transition to using automated permitting systems and ensure that permitting documentation is submitted correctly the first time to reduce time and frequency of resubmissions. Trainings should cover ESS installation-specific rules in the 2022 California Title 24 Building Standards Code as well as the use of Symbium, SolarAPP+ or other automated permitting systems. AHJs can align their operations teams with Symbium or SolarAPP+ requirements and workflows and be prepared to meet California Title 24 Building Standards by following the eligibility checklist and making sure staff understand how to apply it. IREC has a specially designed training series for contractors that provides CEU credits. IREC also offers a SolarAPP+ fact sheet for contractors that includes best practices for installation and is designed to ensure that systems pass final inspection. The eligibility checklist represents the minimum design criteria that SolarAPP+ uses for code compliance, including wire sizing and overcurrent protection devices. Symbium is designed to go beyond minimum eligibility checklists by providing full transparency into detailed, jurisdiction-specific requirements in real-time. Contractors and installers gain immediate clarity on procedural and substantive criteria - no matter how complex or varied - ensuring their projects not only pass final inspections but seamlessly comply with local regulations at every stage of design and permitting. Contractors/installers should also consider establishing a central contact at the Office of the State Fire Marshal to provide UL 9540A review and guidance. In addition, AHJs and installers may find the resources in Table 3 useful for training staff and developing ESS permitting approaches.

Table 3: Training Resources on ESS Automated Permitting – Guidebook Trainings and Webinars

Organization	Training Resource *Continuing Education Units (CEUS) available	Helpful for AHJ	Helpful for Contractor/ Installer	Online Location
How to Use the Guidebook for AHJs	Energy Storage Permitting Guidebook Training	[redacted]		Coming Soon
How to Use the Guidebook for Installers	Energy Storage Permitting Guidebook Training		[redacted]	Coming Soon
Benefits of Guidebook Implementation	Energy Storage Permitting Guidebook Training	[redacted]		Coming Soon

Source: Center for Sustainable Energy (https://energycenter.org/)

Table 4: Training Resources on ESS Automated Permitting – Code Compliance

Organization	Training Resource *Continuing Education Units (CEUS) available	Helpful for AHJ	Helpful for Contractor/ Installer	Online Location
California Department of General Services (DGS)	2022 California Title 24 Building Standards Codes	■		https://www.dgs.ca.gov/BSC/Codes
EnergyCodeAce	California code compliance tools, training, and resources		■	https://energycodeace.com/
International Association of Electrical Inspectors (IAEI)	* Digital Education On-Demand Training includes training on national electrical code changes	■	■	https://www.iaei.org/page/digital-education
IAEI/ICC	* ICC/IAEI Electrical Inspector Joint Certification program		■	https://www.iccsafe.org/building-safety-journal/bsj-dives/elevate-your-career-new-icc-iaei-electrical-inspector-joint-certification-program/

Organization	Training Resource *Continuing Education Units (CEUS) available	Helpful for AHJ	Helpful for Contractor/ Installer	Online Location
IREC	* Individual courses and groups of courses relevant to plan review and solar+storage permitting including the following topics: SolarAPP+ permitting and inspection tool courses on the inspection checklist and a how to use Solar APP+ course for contractors Field inspection courses with videos dedicated to PV and energy storage Solar PV system courses that cover topics relevant to installing solar+storage such as fire safety, structural attachment, weather sealing, grounding, inverters, panelboards, and disconnecting means	[redacted]	[redacted]	https://cleanenergytraining.org/code-official-training#solarap p

Organization	Training Resource *Continuing Education Units (CEUS) available	Helpful for AHJ	Helpful for Contractor/ Installer	Online Location
Sustainable Energy Action Committee (SEAC)	Compilation of resources to address code and technical challenges to ESS deployment		[redacted]	https://sustainableenergyaction.org/resources/?_resources_categories=energy-storage-systems https://sustainableenergyaction.org/our-work/energy-storage- systems/
Symbium and the CEC	Training webinar with the CEC	[redacted]	[redacted]	https://www.youtube.com/watch?v=aRippQIwQRg&t=310s

Source: Center for Sustainable Energy (https://energycenter.org/)

Table 5: Training Resources on ESS Automated Permitting – ESS Equipment List

Organization	Training Resource *Continuing Education Units (CEUS) available	Helpful for AHJ	Helpful for Contractor/ Installer	Online Location
CEC	Solar Equipment Lists Program provides a database of equipment, including ESS under 250 kWh and over 250 kWh, that meets established safety and performance standards	■	■	https://www.energy.ca.gov/programs-and-topics/programs/solar-equipment-lists

Source: Center for Sustainable Energy (https://energycenter.org/)

Table 6: Training Resources on ESS Automated Permitting – ESS Plan Review and Inspection

Organization	Training Resource *Continuing Education Units (CEUS) available	Helpful for AHJ	Helpful for Contractor/ Installer	Online Location
California Public Utilities Commission (CPUC)	Safety Best Practices for the Installation of Energy Storage includes links to inspection checklists	■		https://www.cpuc.ca.gov/regulatory-services/safety/storage-best-practices

Organization	Training Resource *Continuing Education Units (CEUS) available	Helpful for AHJ	Helpful for Contractor/ Installer	Online Location
IREC	Example field inspection checklist	■	■	https://cleanenergytraining.org/products/inspecting-a-solarapp-system-pv- energy-storage
Pacific Northwest National Lab (PNNL)	Plan Review & Inspection Checklist	■		https://energystorage.pnnl.gov/pdf/PNNL-SA-124486.pdf
Symbium	Comprehensive walk-through video (~7min)	■	■	https://symbium.com/instantpermitting
SolarAPP+	FAQ includes example field inspection checklist	■	■	https://help.solar-app.org/article/ 89-whats-on- the-solarapp-inspection-checklist

Solsmart	National Simplified Residential PV and Energy Storage Permit Guidelines	[redacted]	[redacted]	https://solsmart .org/resources/n ational- simplified- residential-pv- and- energy- storage- permit- guidelines/

Source: Center for Sustainable Energy (https://energycenter.org/)

Table 7: Training Resources on ESS Automated Permitting – Fire Safety

Organization	Training Resource *Continuing Education Units (CEUS) available	Helpful for AHJ	Helpful for Contractor/ Installer	Online Location
CAL FIRE/Office of the State Fire Marshal	Information Bulletin 21-004	■	■	https://osfm.fire.ca.gov/media/kklgizii/ib_ess_heat_detector_residential_code_final.pdf
IREC	Webinar recording: Energy Storage System Basics and Beyond	■	■	https://cleanenergytraining.org/products/energy-storage- system-basics- and-beyond- webinar-recording#tab-product_tab_overview
NFPA	NFPA 855 Standard for the Installation of Stationary Energy Storage Systems	■	■	https://link.nfpa.org/free-access/publications/855/2023
NFPA	Energy Storage & Solar Systems, Safety Training Program		■	https://www.nfpa.org/ess
NFPA	Fact sheet: Energy Storage Systems Fact Sheet		■	https://www.nfpa.org/~/media/Files/Code%20or%20topic%20fact%20sheets/ESSFactSheet.pdf

Organization	Training Resource *Continuing Education Units (CEUS) available	Helpful for AHJ	Helpful for Contractor/ Installer	Online Location
UL	UL 9540A Test Method: Page includes webinars and fact sheets on interpreting UL 9540A test results			https://www.ul.com/services/ul-9540a-test-method

Source: Center for Sustainable Energy (https://energycenter.org/)

ESS Installation-Specific Rules in the 2022 California Title 24 Building Standards Codes

The following ESS installation-specific 2022 California Title 24 Building Standards code topics are important for AHJ staff and contractors/installers to know. Code references that begin with "R" are specific to the Residential Code, part 2.5 of CA Title 24:

- Roles and accountability
    - The project contractor/installer is responsible for compliance with the code.
    - The AHJ is responsible for enforcing the code at the time of inspection.
- Building code (this is described in the fire bulletin and included in Solar APP+)
    - ESS shall not be installed in sleeping rooms or closets or spaces opening directly into sleeping rooms (IRC R328.4).
    - Aggregate energy ratings shall not exceed:
        - 40 kWh within utility closets, basements, and storage or utility spaces.
        - 80 kWh in attached or detached garages and detached accessory structures.
        - 80 kWh on exterior walls.
        - 80 kWh outdoors on the ground (IRC R328.4, R328.5).
    - The max aggregate shall not exceed 280 kWh (described in California State Fire Marshal bulletin Electrical Energy Storage Systems [ESS] 21-004, is available at https://osfm.fire.ca.gov/).
        - ESS systems may include ESS in different locations on a property by spreading ESS density out and mitigating potential fire propagation from one unit to another.
    - Individual ESS unit ratings shall not exceed 20 kWh (IRC R328.5).

When an ESS is installed in a location subject to vehicle damage, it shall be protected by approved barriers. See the California Residential Building Code IRC R328.8 Diagram Demonstrating Protection by Approved Barriers, which is available at

- ESS-installed indoors that produce hydrogen or other flammable gases during charging shall be provided with either natural or mechanical ventilation in accordance with Section M1307.4.1 or M1307.4.2. (IRC R328.9; M1307.4).
    - Whereas lithium-ion batteries do not produce hydrogen or other flammable gases under normal operations, some technologies may require additional ventilation. (Refer to manufacturer's instructions). Note that Symbium and SolarAPP+ currently only review permitting applications for lithium-ion chemistries. That being said, Symbium is easily extendable to other energy storage types.
- Individual ESS shall be separated from each other by at least three feet of spacing unless smaller separation distances are documented to be adequate as approved by the code official based on large-scale fire testing (IRC R328.3.1). Note that the UL 9540A report must be approved by the AHJ prior to submission.
- ESS shall be installed only in the following locations:
    - Detached garages and detached accessory structures.
    - Attached garages separated from the dwelling unit living space in accordance with Section R302.
    - Outdoors or on the exterior side of exterior walls located not less than 3 feet (914 mm) from doors and windows directly entering the dwelling unit.
    - 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 not less than 5/8-inch Type X gypsum wallboard (IRC R328.4).
- Rooms and areas within dwelling units, basements, and attached garages in which ESS are installed shall be protected by smoke alarms in accordance with the code. 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 (2018 International Residential Code [R314, R315]).
    - Ensure devices are suitable for use and within environmental parameters of the ESS location (seek approval from the AHJ prior to submission). Examples include First Alert BRK-6135 or Resideo ProSIXheat single- station heat alarms listed to UL 539, UL 521, or another appropriate standard, interconnected to smoke alarms and/or annunciators within the dwelling unit.

- Electrical code.
    - Disconnecting means shall be provided for ESS (CEC 706.15).
    - Directory placards shall be provided for ESS (CEC 706.21).
    - ESS shall have sufficient capacity to power the largest connected utilization load (CEC 710.15[A]).

CHAPTER 4:

Next Steps for Collaboration and Policy Refinements

Policy Approaches and Next Steps

California has embarked on a historic quest to decarbonize th e economy and cut greenhouse gas emissions from buildings. The state has identified ESS as a key technology to help integrate renewable energy into the grid, reduce emissions, and ensure that the power system is reliable and resilient. BTM energy storage systems are important distributed energy resources that can help save ratepayers money while improving reliability and reducing emissions.

This guidebook focuses on improving the permitting process for BTM storage systems of less than 1 MW in capacity. At the time of publication, only battery-based systems qualify as appropriate for BTM applications of this size. These systems come in a wide range of shapes and sizes but can all store power and return it to a customer's circuits or dispatch it to the grid. The California AHJ permitting process for standard residential BTM ESS is moving toward electronic submission of plans and automated permit review systems. Passage of California SB 379 requires AHJs to adopt automated and online review systems to provide rapid decisions on permits for small solar and storage systems. Systems like Symbium and SolarAPP+ provide AHJs a route to streamline the residential permit review process. However, there is room to improve the process.

In researching the guidebook, the project team came across many barriers and best practices that are larger than the scope of this publication but may be worth discussing further. These issues, listed in Table 8: Barriers That Need to be Addressed by Policy Makers and Industry Leaders include the pace and timing of code adoption, the interpretation of codes and standards, and the training and certification of plan checkers, field inspectors, contractors, and installers. Other issues worth further exploration include how to best interconnect BTM ESS of different sizes to the electrical grid and how to optimize the interconnection process across a wide range of IOU and municipal utilities.

Questions for further discussion at the state level include the following:

- Should the CBSC consider changing the process the state uses to adopt building codes so that the pace is more rapid, better synchronized, or both with the ICC and NFPA codes?
- Can the California Office of the State Fire Marshal provide interpretation of UL 9540A fire tests and provide state-level guidance on how the results from a given test should affect code requirements for the spacing of placement of ESS?
- Should California provide training resources for the certification of plan checkers or inspectors or both so that AHJs can be sure that their staff is well-qualified to review plans and installations?
- What measures can the State take to ensure a competitive marketplace of innovation, free from constraints imposed by standards tied exclusively to one solution, and how can guidebooks or regulations be structured to promote objective, solution-agnostic criteria, enabling all innovators to develop the most effective, competitive solutions?

Table 8: Barriers That Need to be Addressed by Policy Makers and Industry Leaders

Barrier	Potential Policy Strategies	Next Steps
Rapid pace of technological changes	Convene an online or in-person educational forum or both where manufacturers of ESS and related equipment can provide ongoing trainings on new technologies	Assess existing fora and perform a gap analysis
Misalignment of update cycles of electrical codes, building codes, and California's triannual code adoption	Change CBSC code adoption cycle to better align with NFPA and ICC codes	Research the best code adoption pace to keep California synchronized with other codes
Variations in how codes are applied and in permit application requirements across the state	Create state-level guidance in how codes should be applied by AHJs and create a set of statewide plan formatting standards to reduce the need to resubmit plans for plan formatting errors	Research how AHJs vary and what the main points of variation are; Benchmark California against other U.S. states
Interpretation of fire codes and UL 9540A fire test results	Create statewide guidance on how to apply the fire code to ESS. Establish a contact at the Office of the State Fire Marshal to provide additional education and review of UL 9540A results by AHJs or other stakeholders with questions	Develop a request for the Office of the State Fire Marshal. Work with UL Solutions to provide state-level trainings for AHJs
Slow pace of interconnection to utility systems; Confusion over the appropriate contact or process or both for requesting interconnection with the utility	Ensure that all IOUs and municipal utilities have a specific process and designated contact for interconnecting BTM ESS; optimize and harmonize these processes	Review existing resources and perform a gap analysis; create a more detailed study that focuses on interconnection issues

Source: Center for Sustainable Energy (https://energycenter.org/)

GLOSSARY

AUTHORITIES HAVING JURISDICTION (AHJs)	Agencies that issue building permits. AHJs in California include cities and counties, who oversee most of the permitting in their area, and state and federal agencies, who oversee permitting for certain kinds of facilities or properties, such as K-12 schools or military bases, respectively.
BATTERY ENERGY STORAGE SYSTEM (BESS)	"A battery energy storage system (BESS) is an electrochemical device that charges or collects energy from the grid or a distributed generation (DG) system and then discharges that energy later to provide electricity or other services when needed." (National Renewable Energy Lab [NREL], 2021) Residential and commercial BTM battery technologies are typically composed of lithium-ion batteries.
BEHIND-THE-METER (BTM)	Electricity end users almost always have a meter at their site that calculates the amount of energy consumed from the grid. A behind-the-meter installation refers to any equipment that is connected to circuits on the customer side of the meter (Marsh, 2020).
CAPACITY	Energy storage system capacity is typically measured in kilowatt-hours (kWh) and is a measurement of the power stored in the device. It provides an indication of electrical power that can be supplied over a given time unit (McLaren, 2016).
ENERGY STORAGE SYSTEMS (ESS)	Energy storage technologies store electricity as another form of energy (for example, electrochemical, mechanical, thermal, and so forth) so it can be used to meet or shift power demand. "One or more devices, assembled together, capable of storing energy in order to supply electrical energy at a future time" (California Fire Code [CFC], 2019, Section 202).
GREENHOUSE GAS (GHG)	Greenhouse gases contribute to global climate change by altering the heat balance of the atmosphere.
kW/kWh	kW (small k, capital W)/kWh: kilowatt/kilowatt-hour.
MW/MWh	MW (all capitals)/MWh: megawatt/megawatt-hour.
NREL	National Renewable Energy Lab
TECHNOLOGY READINESS LEVEL (TRL)	A measurement system used to determine the maturity level of a technology (NASA, 2021).

APPENDIX A:

Automated Permitting Review Platform Requirements

Excerpt from CalAPP Solicitation Manual, Section D.6 that describes the automated permitting review platform requirements jurisdictions must meet.

6. **Verification**

The recipient shall submit the first invoice to the CEC following successful adoption of a qualifying permitting platform. The applicant will indicate on the invoice form that the platform has been fully adopted. The CEC staff will verify successful adoption of a platform prior to approving payment of an invoice. The applicant agrees to assist the CEC staff with verification, which may include:

- Verifying adoption of an SB 379-compliant solution.
- Declaration and attestation of completed grant requirements.
- Written report, including screenshots, of the solution
- An online virtual meeting that includes screen-sharing a live demonstration of the platform and answering the CEC staff questions.
- In-person site visit to demonstrate an in-house platform to the CEC staff.
- Pictures, system overviews, and other items requested by the CEC staff.

Regardless of what solution is adopted by an AHJ, for purposes of accessing the grant funds,applicants must adopt a qualifying tool that:

- Performs an automated plan review for residential solar energy systems that completes automatic code compliance checks based on user inputs (such as a contractor), thereby enabling or otherwise issuing permits instantly when the project is confirmed as code compliant, without the need for human review.
- Supports online, immediate fee payment once an application is complete, which may include auto-invoicing of permit fee costs.
- Supports immediate generation of a permit job card following payment confirmation.
- Blocks noncompliant applications from receiving a permit.
- Either:
    - Stand-alone permitting tool; or
    - Integrates with current software and inspection platform already in use

The CEC staff will review these capabilities during the verification process prior to approving payment of invoices.

Note that, as of the publication of this Guidebook, CEC staff have already verified Symbium as an acceptable solution for the purposes of SB 379 compliance and added Symbium as an option for compliance in the CalAPP grant.

APPENDIX B:
Energy Storage Technology Definitions

Summary of In-Scope Technologies

This is an exciting time in the field of energy storage. New technologies are being developed and brought to market at a rapid pace. Although this may change in the future, for this edition of the guidebook, only battery-based ESS that use lithium-ion or lead-acid chemistries are in scope, which means they are commercially available in less than 1 MW of capacity and suitable for BTM applications. The guidebook team looks forward to adding new technologies as they become available in appropriate sizes and packages. The Sustainable Energy Action Committee (SEAC) website provides a downloadable paper that includes example diagrams of ESS in its "NEC Disconnect Requirements for Energy Storage Systems" informational bulletin and is available at https://sustainableenergyaction.org/resources/nec-disconnect-requirements-energy-storage/.

Electrochemical Energy Storage

Battery-based systems are by far the most popular and widely available products for ESS; however, there are several different types of batteries, some of which are in scope and some of which are out of scope.

Lithium-Ion (Li-Ion) Battery

Batteries work by storing electricity within a cell that contains a cathode, an anode, and an electrolyte. Li-ion technology uses an electrolyte with some form of lithium. Due to the high energy density and light weight of Li-ion batteries, they have become the most popular technology and account for more than 90 percent of the global market.[8] Development of Li-ion batteries began in the 1970s, and the first commercial battery was produced in 1991 .[9] Li-ion batteries come in a wide variety of chemistries, which offer different advantages and disadvantages.

Typical applications include residential and commercial electricity storage and backup, often installed with photovoltaic (PV) solar. Grid-scale systems are also increasingly being used at substations and generating facilities to provide peak shifting, integrate intermittent sources of power, and relieve congestion on distribution lines.

Lead-Acid Battery

First invented in the mid-1800s, this technology uses lead electrodes and an acidic electrolyte to store electricity.[10] Advanced lead-acid batteries incorporate innovative battery chemistries by combining a traditional lead-acid battery with a supercapacitor to improve the cycle life and

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8 Environmental and Energy Study Institute (EESI). (2019). Fact Sheet: Energy Storage. https://www.eesi.org/papers/view/energy-storage-2019

9 Reddy, M. V., Mauger, A., Julien, C. M., Paolella, A., & Zaghib, K. (2020). Brief history of early lithium-battery development. Materials, 13(8), 1884.

10 Enos, D.G. (2014). Lead-Acid Batteries and Advanced Lead-Carbon Batteries. Sandia National Laboratories.

power output at partial state of charge. These systems are increasingly competing with Li-ion systems and there are several manufacturers and systems that are in scope for the purposes of this report.

Ubiquitous as vehicle starter batteries, larger lead-acid systems were also used to power off-grid dwellings or for equipment backup. Advanced lead-acid batteries are commercially available in similar sizes and formats as Li-ion batteries.

Flow Battery

Flow battery technology uses a liquid electrolyte pumped between storage tanks and across a membrane in a fuel cell stack to store and produce electricity. The energy of the system scales with electrolyte volume, enabling the creation of low-cost, long-duration storage systems.[11] However, for this report, flow batteries are not in scope as they are not available in appropriate sizes.

In typical applications, flow batteries are typically deployed at grid scale or at large scale. This technology is not available in sizes of less than 1 MW.

Electrochemical Molten Salt

Sodium sulfide (NaS) batteries use molten salt as the electrolyte. They have the advantage of being able to store large amounts of power for long periods.[12] The technology is still emerging, and the only available products are aimed at grid-scale sizes and are thus not in scope for this project.

Typical applications: NaS batteries are typically deployed at grid scale or in other large-scale EES applications and are not available in sizes of less than one MW.

Thermal Energy Storage

Thermal energy storage (TES) stores energy as heat energy. Energy is generated by heating or cooling materials such as salts, rocks, or water; the stored energy is then used to heat or cool spaces.[13]

Ice Thermal Energy Storage

Ice storage uses cooling equipment to create ice that can be used to reduce air-conditioning (AC) demand. The ice is made by drawing electricity during off-peak hours when electricity prices are low. Then the ice is used, typically during the day, to cool the condenser coil of an AC system. Although ice storage can reduce costs and emissions by storing energy and shifting power consumption to off-peak hours, systems under one MW do not return electricity to local circuits or the grid and thus are not in scope for the Guidebook. Typical applications: Ice storage typically helps reduce peak demand for cooling in large-scale commercial or

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[11] U.S. Department of Energy. (2021, March 17). DOE Announces $24.5 Million for Manufacturing Innovation to Build a Clean, Resilient Electric Grid. https://www.energy.gov/articles/doe-a nnounces-245-million-manufacturing-innovation-build-clea n-resilient-electric-grid

[12] Stauffer, N.W. (2016, January 12). A battery made of molten metals. MIT News. https://news.mit.edu/2016/ba ttery-molten-metals- 0112

[13] Environmental and Energy Study Institute (EESI). (2019). Fact Sheet: Energy Storage.

https://www.eesi.org/papers/view/energy-storage-2019

warehouse buildings, however Ice Energy, the only major maker of these devices, went out of business in 2020[14].

Heat Pumps

Heat pumps are a broad category of heating and cooling devices used for residential and commercial space heating and water heating tasks. Heat pumps used for space heating or cooling are not considered ESS because they do not store energy, but merely transfer it from one location to another. Heat pump hot water heaters do store energy; and there are projects evaluating their use as a demand reduction tool. However, no current commercial products that return power to the grid are available in smaller sizes. Hence, they are out of scope for this project.

Typical applications: Ground and air source heat pumps are used for heating and cooling residential and commercial spaces. Heat pump hot water heaters are also becoming increasingly common and will soon be included as an eligible technology in California's Self-Generation Incentive Program (SGIP).

Mechanical Energy Storage

Mechanical energy storage converts electricity to potential or kinetic energy where it is stored until it is converted back into electricity. For the size range of interest (less than one MW), flywheels are the predominant mechanical storage technology. Other, larger mechanical storage technologies include compressed air energy storage (CAES) and pumped storage hydropower (PSH). At the time of this Guidebook development, the authors were not able to find commercially available mechanical storage systems of an appropriate size for residential or small commercial settings, however, these systems may be of interest for future versions.

Typical applications: Flywheels are typically used for large-scale applications where power quality and uninterruptible power supply (UPS) solutions are needed to mitigate the effects of momentary or short duration outages, such as for information technology or advanced manufacturing facilities.

[14] Spector, J. (2020, February 7). Ice Energy, Thermal Storage Evangelist, Files for Bankruptcy. GTM.

https://www.greentechmedia.com/articles/read/thermal-s torage-evangelist-ice-ener gy-files-for-bankruptcy

APPENDIX C:
CALSSA Summary of the 2022 Solar Access Act

The 2022 Solar Access Act describes Senate Bill 379, signed by Gavin Newson in September 2022, and is available at (https://static1.squarespace.com/static/54c1a3f9e4b04884b35cfef6/t/63c04df96cb19339c02d7 599/1673547259137/Solar-Access-Act-SB+379-fact-sheet-2023.pdf).

APPENDIX E:

Symbium Adoption Guide: Steps for AHJs and Installers

The Symbium website includes helpful resources including a walkthrough with comprehensive examples of document uploads to Symbium by applicants and outputs from Symbium for AHJs and applicants wishing to further understand the process. Materials for getting started quickly on Symbium include:

- Comprehensive Symbium walkthrough video (~7min), available at https://symbium.com/permitconfigurator
- Steps for AHJs to fully adopt Symbium:
    - STEP 1: Send an email from your government email account to hello@symbium.com or visit Symbium's Permit Configurator page at https://symbium.com/permitconfigurator to get started.
    - STEP 2: Schedule initial conversation and a demo.
    - Step 3: Sign up with Symbium and schedule a kickoff to designate points of contact, review scope of services, and finalize configuration timelines for launch.
    - STEP 4: Access Symbium's DIY Permit Configurator and begin configuration.
    - STEP 5: Symbium to provide test and lead quality assurance testing prior to live deployment, with AHJ's final signoff.
    - STEP 6: Launch additional instant permit types with comprehensive compliance checks for an unlimited number of clean energy projects, upon request (average launch time: 5-10 days).
- Steps for permit applicants (contractors / installers) to get an instant permit from Symbium:
    - STEP 1: Go to Symbium.com
    - STEP 2: Enter an address or click on "Get Started".
    - STEP 3: Select the project type.
    - STEP 4: Complete the project scope and upload any necessary documentation, as required by the AHJ.
    - STEP 5: Pay the Symbium fee and the AHJ fee.
    - STEP 6: Receive an instant permit issuance, directly from Symbium, typically within seconds, and begin work!

APPENDIX E:
SolarAPP+ Checklists

The SolarAPP+ website includes helpful resources including checklists for applicants wishing to further understand the process. Checklists for getting started include:

- The SolarAPP+ Inspection Checklist, available at https://solarapp.nrel.gov/docs/approval-document-pv-example.pdf.
- The SolarAPP+ Eligibility Checklist, available at https://solarapp.nrel.gov/eligibility/PV.pdf.
- Example SolarAPP+ Approval Document, available at https://solarapp.nrel.gov/docs/approval-document-pv-additional-example.pdf.
- Stripe Set-Up Instructions, available at https://help.solar-app.org/article/14-setting-up-your-stripe-account.

APPENDIX F:
SolarAPP+ Introductory Slide Deck

The presentation linked below describes the 5-step process AHJs will complete to adopt SolarAPP+. The presentation provided step by step instructions for beginning the process to adopt SolarAPP+ and provided resources to support the user through the process. Welcome to SolarAPP+ is available at https://docs.google.com/presentation/d/1Uf4Wc0OojgMHxMbB6Zy155b0_gF2w5OW/edit#slide=id.p13.

APPENDIX G:

UL 9540 Certification, UL 9540A Test Method, and NFPA 855 Standard

UL Solutions provides two key standards that are frequently confused, UL 9540 and UL 9540A.

UL's 9540, the Standard for Safety of Energy Storage Systems and Equipment, was first introduced in 2016 and updated in 2020. If a product is UL 9540 listed, this means the ESS meets a specific set of standards for safe operation published by UL Solutions. Although the standard itself is voluntary, both the National Electric Code and International Residential Code require ESS to be UL 9540 listed.

UL 9540A is a method for testing ESS for fire safety. The UL 9540A test, now on its fourth edition, subjects an ESS to thermal stress and measures how the unit performs. The test typically proceeds through various stages starting at the cell level and moving to the module, unit, and, for certain kinds of equipment, the installation level.

NFPA 855 Standard for the Installation of Stationary Energy Storage Systems "applies to the design, construction, installation, commissioning, operation, maintenance, and decommissioning of stationary energy storage systems (ESS), including mobile and portable ESS installed in a stationary situation and the storage of lithium metal or lithium-ion batteries."[15] Approved as an American National Standard effective September 1, 2022, the standard establishes minimum requirements for avoiding ESS hazards. The guidance includes guidance on interconnections, commissioning and decommissioning, interconnections, operation and maintenance, and guidance for particular technologies including ESS fuel cell, superconducting magnet, flywheel, lithium metal and lithium-ion storage. Chapter 15 provides specific guidance for one- and two- family dwellings and townhouse units. (See NFPA resources in Table 3.)

15 NFPA. 2023. NFPA 855 Standard for the Installation of Stationary Energy Storage Systems.

https://www.nfpa.org/codes-and-standar ds/all-codes-and-standards/lis t-of-codes-and-s tandards/detail?code=855

APPENDIX H: References

Note: Full references are available in the associated technical reports

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