Energy Storage Systems

Course Outline

Course Description: This **5-module course**, is based on UL 9540, UL 9540A, the *2018* and *2021 International Fire Code (IFC)*, the *2018* and *2021 International Residential Code (IRC)*, and the *2020 National Electrical Code (NEC)*. The course explains some of the key items and requirements of UL 9540 and 9540A. It also explains how the *2018 IFC* references the UL 9540 and 9540A standards and explains other important battery requirements of the *IFC*. Important items of Article 706 of the *2020 NEC* are also covered. The last portion of the class covers a variety of line diagrams and manufacturer specification sheets for some common battery backup systems that the industry is currently seeing installed. Each module consists of an integrated video presentation, including presentation slides, explanation, and examples. Modules are designed to be roughly 25-40 min. in length.

Course Objectives:

- Understand the importance of UL 9540 and 9540A in relation to energy storage systems (ESS).
- Understand the basics of UL 9540A for large-scale fire testing.
- Know the differences between "threshold quantities" versus "maximum allowable quantities" per the *IFC*.
- Determine ESS quantities allowed inside and outside of a building.
- Understand the separation of battery arrays and battery units.
- Understand the proper locations and capacity limits of ESS for residential use.
- Understand the required disconnects and overcurrent protection for ESS.

Texts and Readings: UL 9540, UL 9540A, the *2018* and *2021 International Fire Code (IFC)*, the *2018* and *2021 International Residential Code (IRC)*, and the *2020 National Electrical Code (NEC)* are the references used for this course. It is highly recommended that you purchase a paper-back copy of these codes, which are available online at www.iccsafe.org or NFPA.org.

Course Outline of Topics:

Module:	Topics:	Readings:	Quiz:	Duration:
1	UL 9540 and 9540A	UL 9540 and 9540A	N	33 min.
2	The IFC and ESS Systems	2018 IFC or 2021 IFC Chapters 5, 7, 12	N	32 min.
3	The IRC and ESS Systems	2018 IRC and 2021 IRC Chapter 3	N	26 min.
4	The NEC and ESS	2020 NEC 706	N	33 min.
5 Part 1	Example ESS Plans		N	39 min.
5 Part 2	Example ESS Plans		N	31 min.
5 Part 3	Example ESS Plans		N	27 min.
	29 Quiz Questions, 2 min. each			*58 min.*
	Total Course Hours			**4.5 hours**

Quizzes: This course will be followed by an assessment quiz. A passing score of 75% is required in order to advance to receive a certificate of completion. Topics in the quizzes may or may not have been covered in the video modules. A thorough reading of the code may be necessary in order to progress through this course.

Expectation of Participants: You can progress through this course at your own pace; however, you only have access for 365 days.

Continuing Education Credits: Completion of this course results in **.45 CEU's** being provided by ICC, as West Coast Code Consultants is a Preferred Provider.

Instructor:

Doug Smith, MCP, CBO currently serves as Energy Division Lead for West Coast Code Consultants (WC3) and has been an inspector/plan reviewer for over 15 years. He has obtained 19 ICC certifications, including Master Code Professional and Certified Building Official. Mr. Smith has performed well over 10,000 plan reviews for renewable energy projects, including solar PV and energy storage systems. Mr. Smith currently serves as a Standards Technical Panel (STP) Member for the following UL Standards: UL 9540 (Energy Storage Systems and Equip.), UL 9540A (Test Method for Evaluating Thermal Runaway…in Battery Energy Storage Systems), UL 1741 (Inverters, Converters, Controllers…), and UL 1703/61730 (PV Modules/Panels). Mr. Smith was also recently appointed by IAEI to be on Code Making Panel #10 for the National Electrical Code (NEC). He is considered an expert regarding energy storage and solar PV systems and has taught many courses on the subjects.