ARTICLE

706 ENERGY STORAGE SYSTEMS

Introduction to Article 706—Energy Storage Systems

The addition of Article 706 to the *Code* during the 2017 revision cycle recognized the important role that energy storage would play to manage the massive amounts of grid-connected energy production from alternative sources such as wind and solar. Because of the need to store this energy, the *NEC* Correlating Committee formed a 79-member task group (along with input from many other sources) to develop the requirements contained within this article.

It is important to understand what Article 706 does and does not apply to. The scope says it applies to all permanently installed energy storage systems (ESS) "having a capacity greater than 1 kWh." They may be stand-alone or interactive with other electric power production sources. Although much of the original language used to create Article 706 came from deleted sections of Article 690 Solar Photovoltaic (PV) Systems, an ESS can store energy from any power source; there are no restrictions.

An energy storage system consists of one or more components that (when assembled together) is capable of storing electrical energy for future use. An energy storage system (ESS) might include (but is not limited to) batteries, capacitors, and kinetic energy devices (such as flywheels and compressed air). Some of these systems will have either ac or dc output available. They may also include inverters and converters to change stored energy into electrical energy. An ESS might directly power loads such as in a stand-alone system, or it might provide another energy management function like buffering energy produced by an intermittent source such as a wind or PV system.

Energy storage systems can be (and usually are) connected to other energy sources, such as the local utility distribution system. There can be more than one source of power connected to these systems and their connection to other energy sources must comply with the requirements of Article 705 which provides the rules for installations of one or more electric power production source operating in parallel with a primary source of electricity, such as a utility.

It is important to note that Article 480 (Storage Batteries) has not been removed. While this may create confusion for some struggling to understand the difference between an ESS and a battery system, the easiest way to identify the two at this point is to look for the system listing. Updates to the 2020 *NEC* now require that any ESS be listed as a system and will most often be based on the requirements of UL 9540, Standard for Energy Storage Systems and Equipment. There is no system listing requirement for battery systems in 480, and all lead-acid batteries are exempt from any listing. Unlike battery systems, an ESS often also includes other equipment such as inverters or other electronic power converters.

Part I. General

706.1 Scope

Scan this QR code for a video of Mike explaining this topic; it's a sample from the videos that accompany this textbook.
www.MikeHolt.com/20PVvideos

This article applies to all energy storage systems having a capacity greater than 1 kWh that may be stand-alone or interactive with the electric utility supply. Energy storage systems are primarily intended to store and provide energy during normal operating conditions. ▶Figure 706–1

Note 1: For batteries rated in ampere hours, kWh is equal to the battery nominal rated voltage times the battery ampere-hour rating, divided by 1,000.

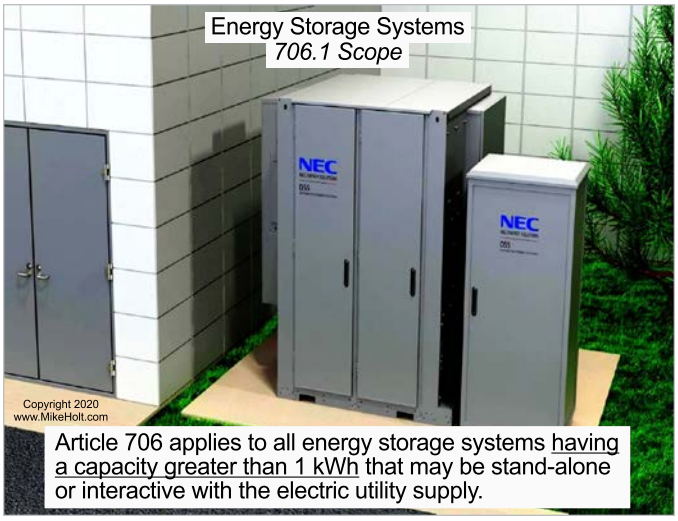

Figure 706–1

Author's Comment:

- To better understand ampere hours relative to kilo-watt hours think of your cellphone. Many cellphone batteries are rated at 3,000 mAh (milli-amp hours) which, when divided by 1,000, equal be 3 ampere hours. Lithium-ion batteries, prominent in cell phones, have a voltage of 3.70V so when multiplied by 3 ampere hours result in 11.10 watt-hours. As you probably now realize, calculating the amount of power available in a battery is simply an exercise in Ohm's Law but on a larger scale.