ENERGY STORAGE SYSTEMS
SAFETY TRAINING PROGRAM

PHOTOVOLTAIC & BATTERY ENERGY STORAGE SYSTEMS SAFETY TRAINING

INTRODUCTION TO PV AND BESS

Program Goal

Prepare first responders to:

- Properly identify the presence of PV and battery energy storage systems
- Understand the different types of battery chemistries used and their related hazards
- Identify and implement proper response procedures based on the type of incident

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Program Modules

BESS Safety Training for First Responders

Introduction

Basic Electrical Theory

PV (Solar)

Battery Energy Storage Systems (BESS)

Pre-Incident Planning

Emergency Response Operations

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Introduction to Photovoltaic and Battery Energy Storage Systems

OBJECTIVES

Following instruction, the student shall be able to:

- Identify two (2) common applications for energy storage systems
- Identify four (4) types of energy storage systems
- Describe the benefits of pairing photovoltaic (PV) systems and energy storage systems (ESS)

The Changing Built Environment

Introduction

The World is More Complex

- Power flow in buildings is changing
- Buildings may become “power plants”
- Securing utilities is more difficult
- More than one disconnect may need to be used to control power

Why Is This Course Important to Responders?

Introduction

Provides answers to important questions

- Where will we find PV+ESS?
- How are they identified?
- What hazards do PV systems present? ESS?
- How do we handle them at an emergency incident?

Do you know of any installations in your response area?

VIDEO

ADVANCE SLIDE TO PLAY

Introduction to Photovoltaic and Energy Storage Systems

Photovoltaic Systems (PV)

Introduction

- Increased demand for electrical power requires additional alternate sources
- Provides more economical and secure power, saving utility costs
- More environmentally friendly
- PV is a silent generator, changes where the power comes from
- PV indicators could point out the presence of ESS and vise-versa
- Firefighters are more likely to encounter PV than ESS

It is important to identify generators on scene and shut down

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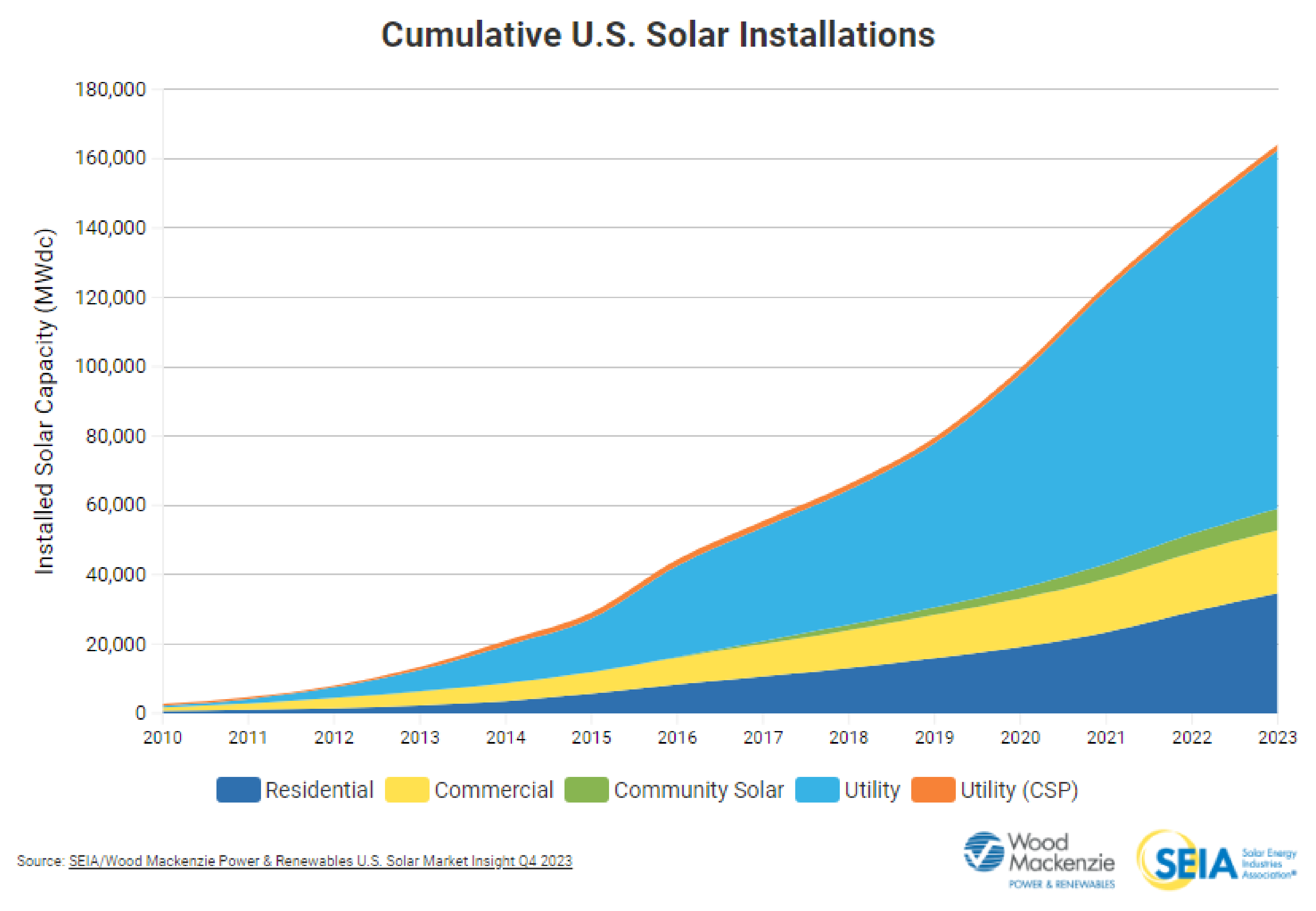
Photovoltaic Systems (PV) Statistics

Introduction



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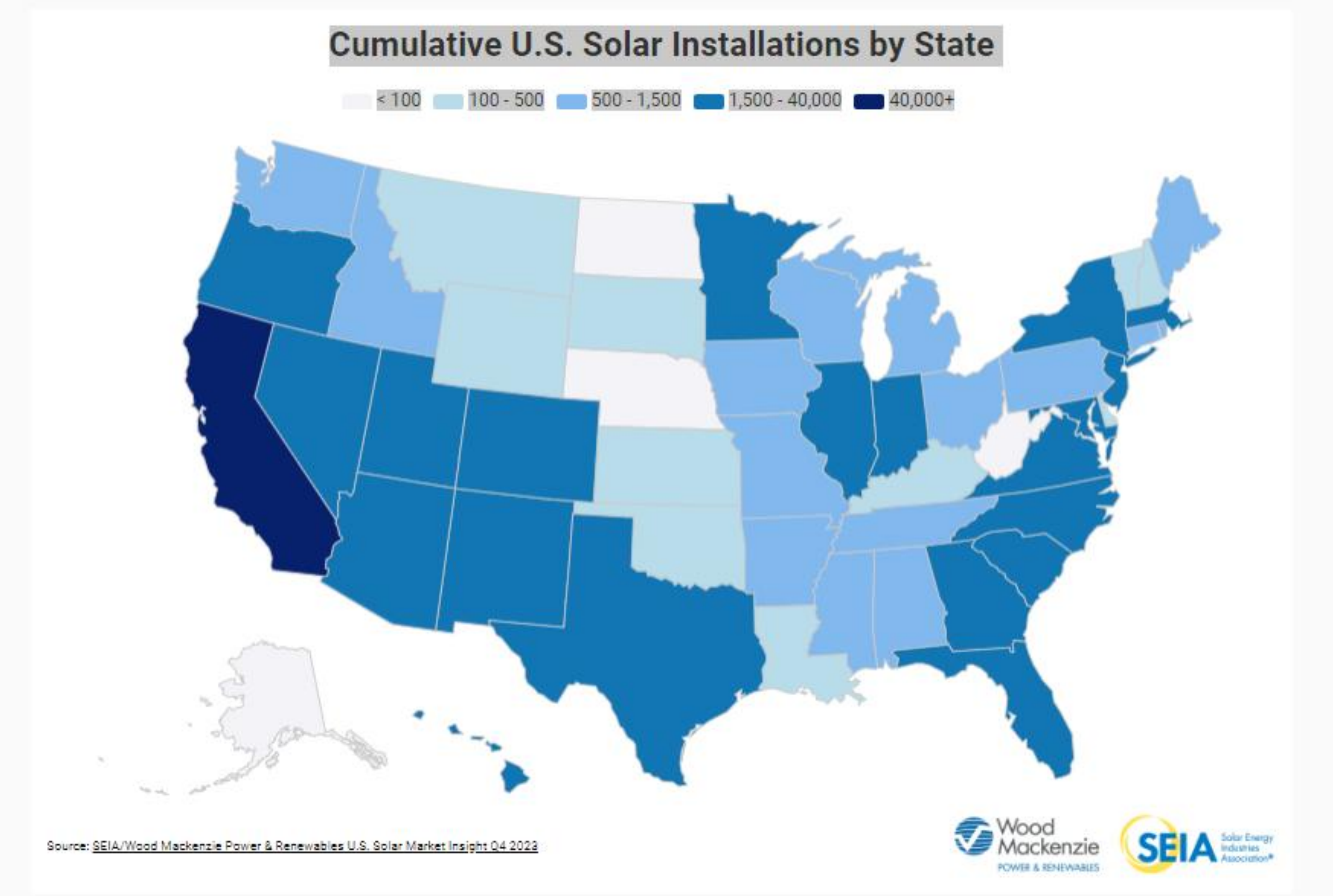
Photovoltaic Systems (PV) Statistics

Introduction



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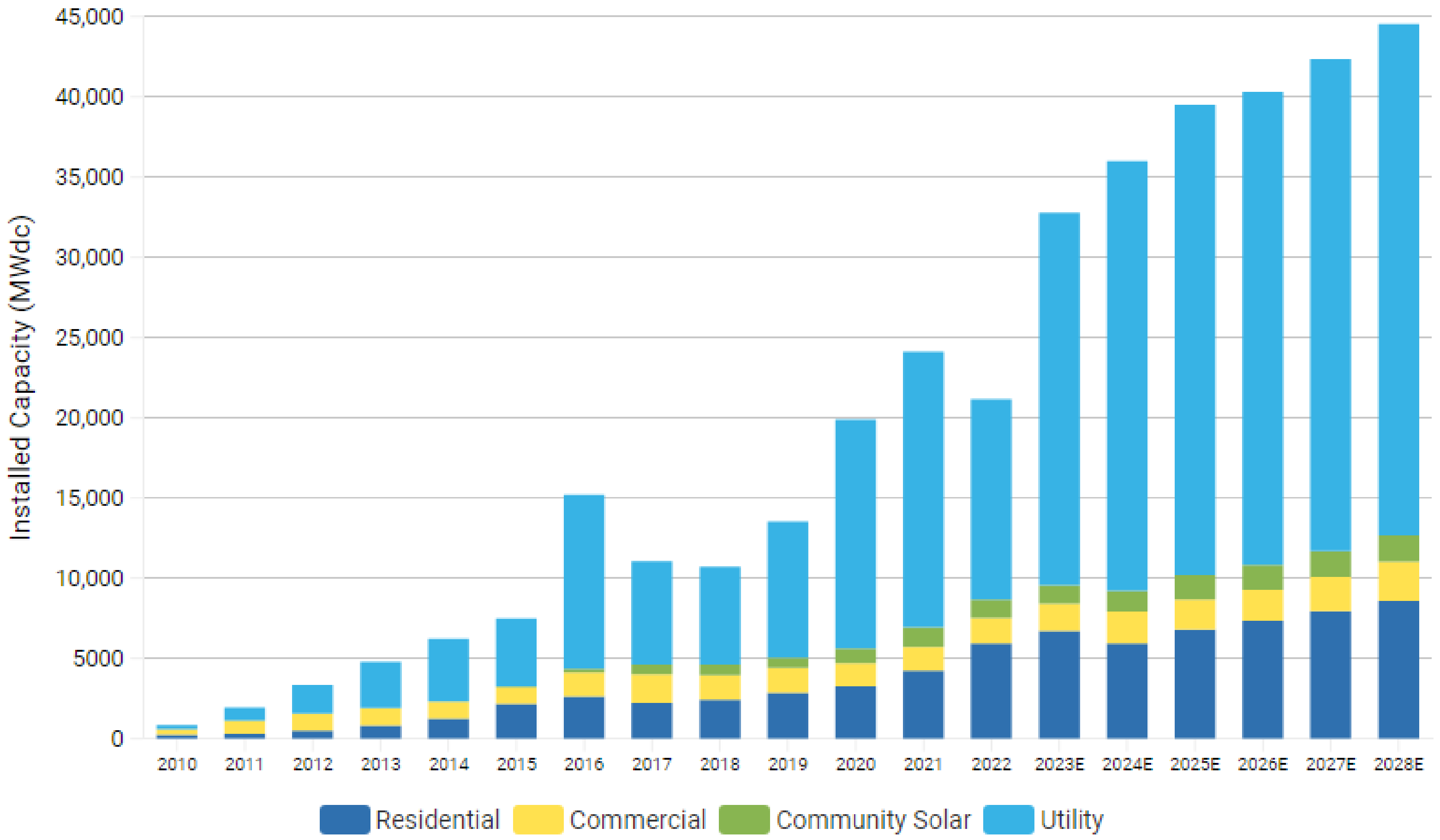
Photovoltaic Systems (PV) Statistics

Introduction

U.S. Solar PV Deployment Forecast



Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight Q4 2023

Wood Mackenzie POWER & RENEWABLES
SEIA Solar Energy Industries Association

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ESS Locations In the Electrical Grid

Utility Side of the Meter

Customer Side of the Meter

Residential

Commercial/Industrial

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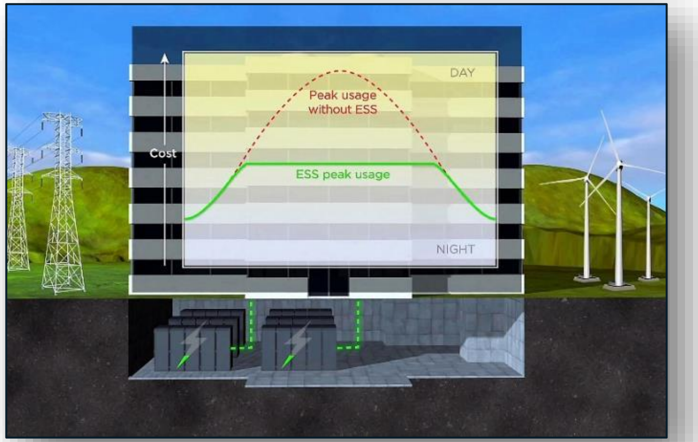
ESS Applications

Introduction

Backup Power

Off-Grid



Cost Savings (Peak Shaving)

Renewable Energy Support

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ESS Applications – Backup Power/Resiliency

Introduction

Utility

- Provides redundancy against:
  - Aging infrastructure
  - Attacks on utilities
- Smaller, decentralized electrical generation combined with ESS reduces potential for widespread outages

Customer

- Uninterruptable Power Supplies (UPS)
  - Short-term backup power
  - Shoebox to room size
- Maintains critical systems:
  - Cellular/comm. networks
  - Hospitals
  - Water/sewage pumping stations

A primary use of ESS is to provide electricity in the event of a power failure or if renewables stop generating

ESS Applications – Off-Grid

Introduction

Storage of power from gas generators or solar for homes not near utility lines

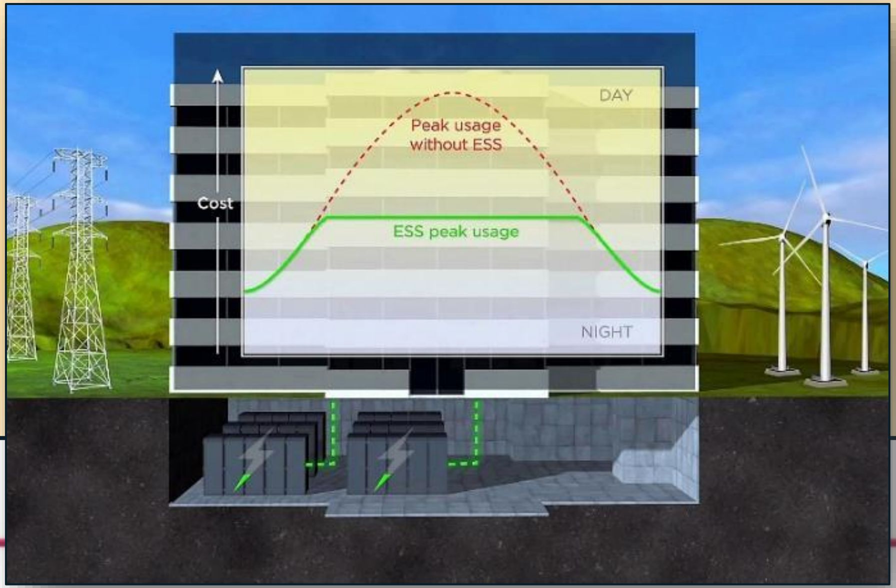
ESS Applications – Cost Savings (Peak Shaving)

Utility

- Uses stored energy to “flatten” power demand
- Feeds into grid during peak demand
- Reduces the total amount of generation a utility needs
- Can also produce savings to utilities through deferred upgrades to infrastructure

Customer

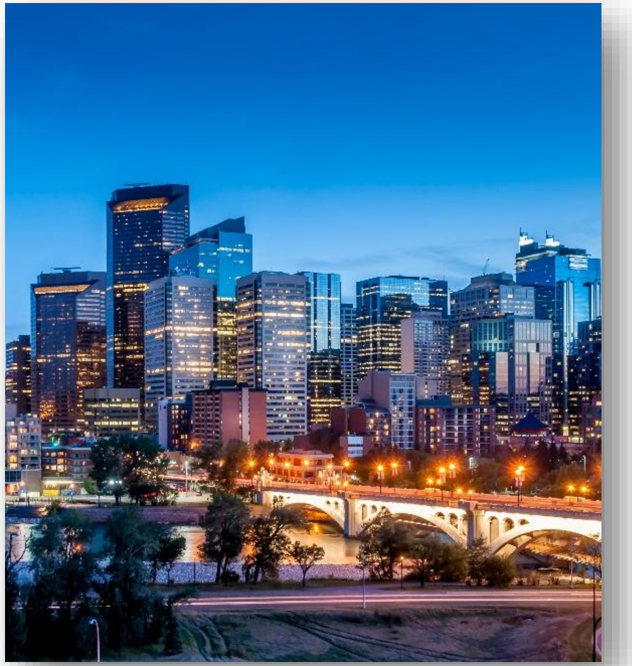
- Allows user to draw from batteries at high-cost times and charge at low cost
- Reduce demand charges



Renewable Energy Support and Energy Storage Systems

Introduction

Consumer and Utility Sides



Allows unused power to be stored for later use when there is no sun or wind

Solar Power (Photovoltaic) and Energy Storage Systems

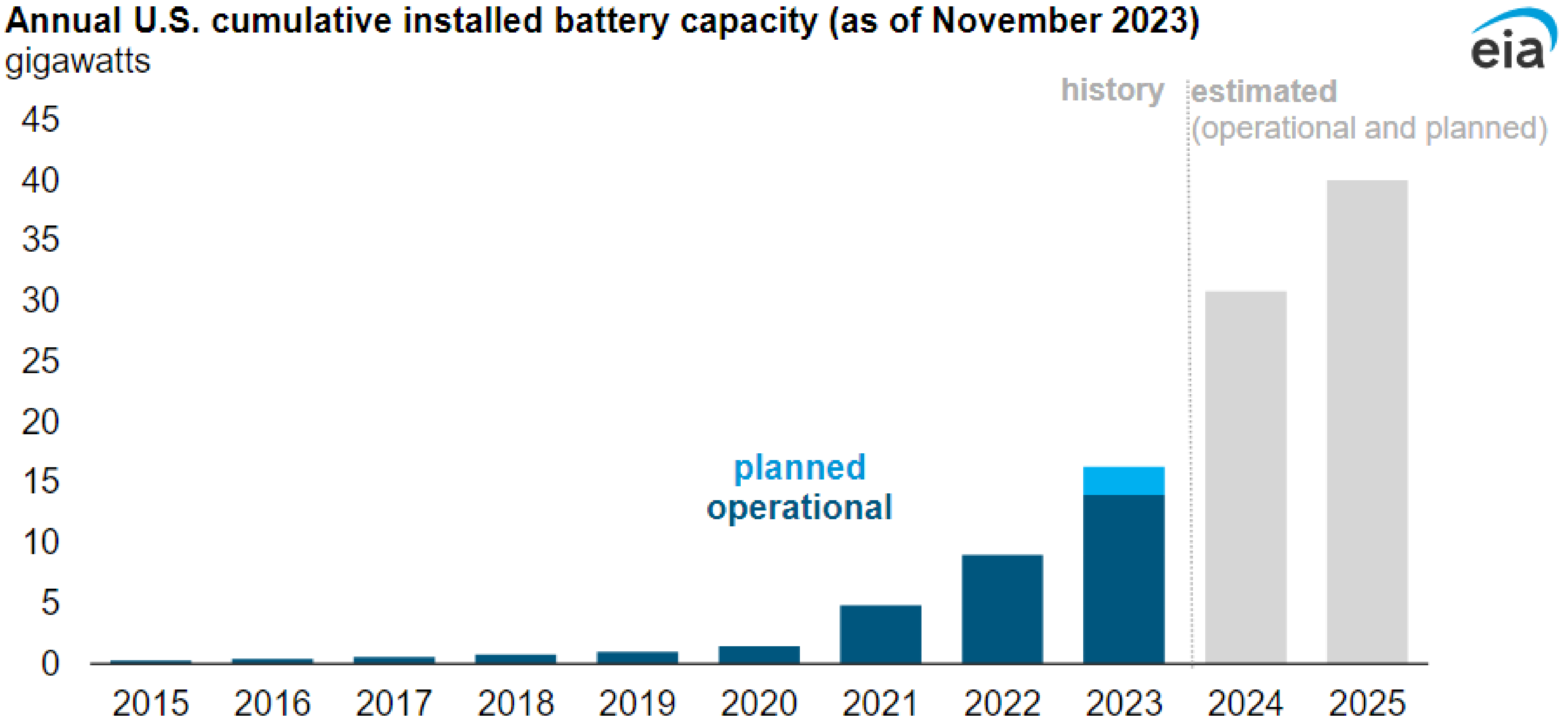
Increases operational efficiency of grid

Offset Solar Impacts on Grid

- A driving force behind the need for more storage
- Allows consumers to store all power generated on-site
- As solar installs increase, demand for utility power drops when sun rises
- Power plants have a difficult time "ramping up" – wastes fuel and increases emissions

ESS Statistics

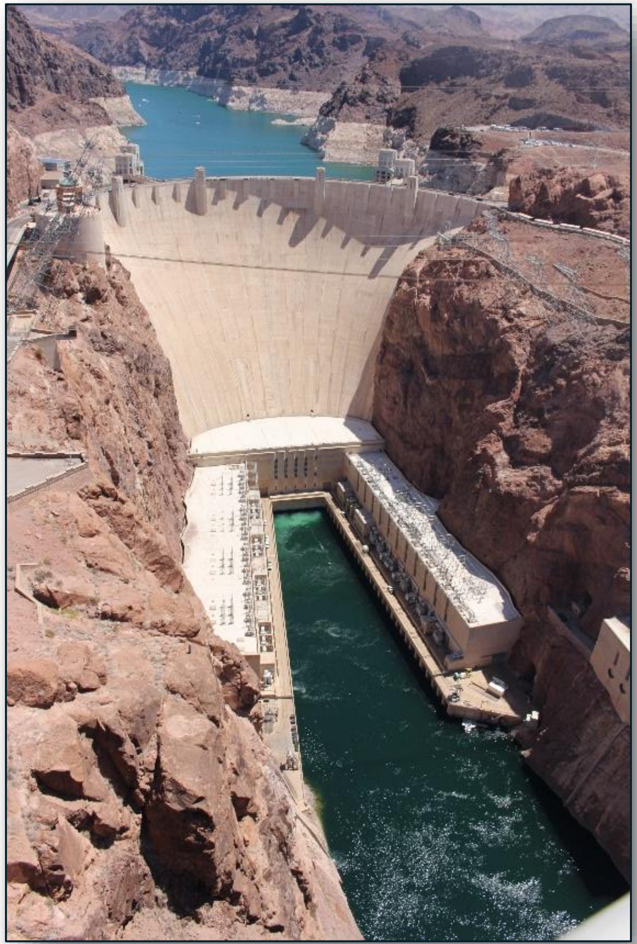
Introduction



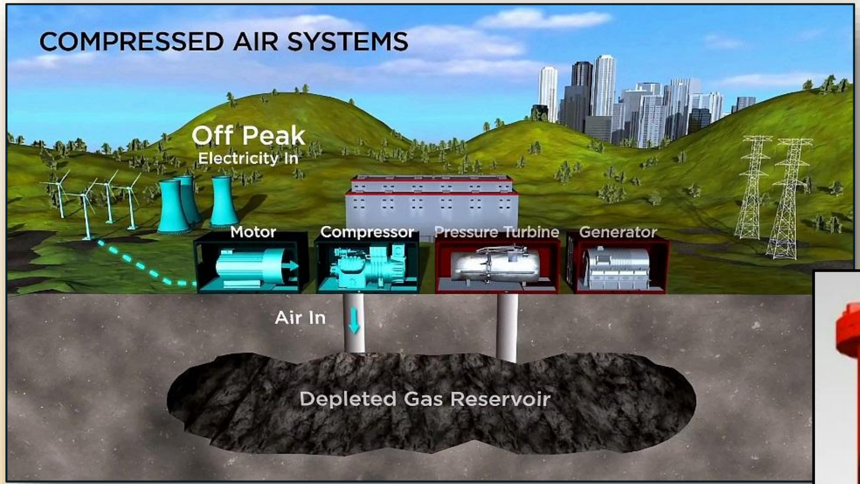
Data source: U.S. Energy Information Administration, *Preliminary Monthly Electric Generator Inventory*, based on Form EIA-860M

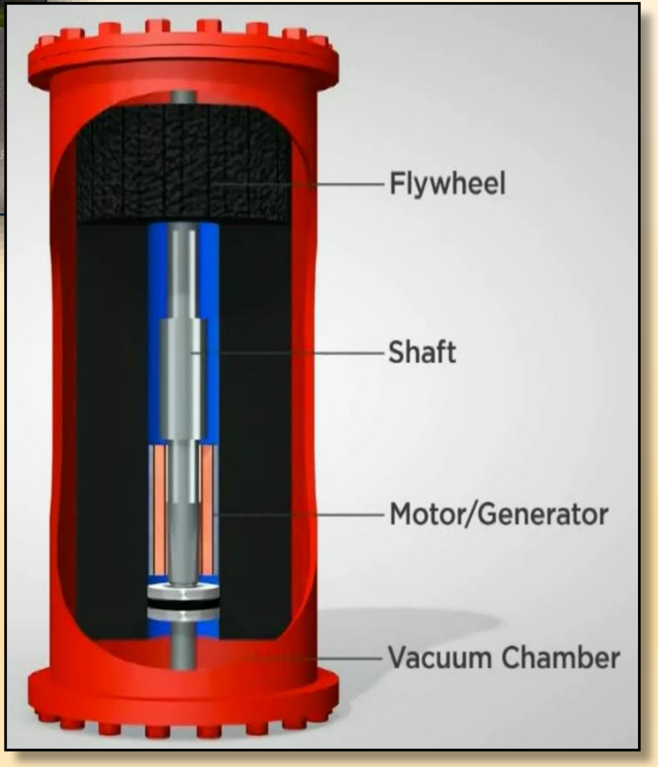
ESS Types – Hydroelectric and Mechanical

Introduction



Hydroelectric





Mechanical

ESS Types - Electrochemical

Introduction

Battery Energy Storage System (BESS)

Converts stored chemical energy into electrical energy

Size, configuration and chemistry of the system can vary greatly

Most common installation in buildings

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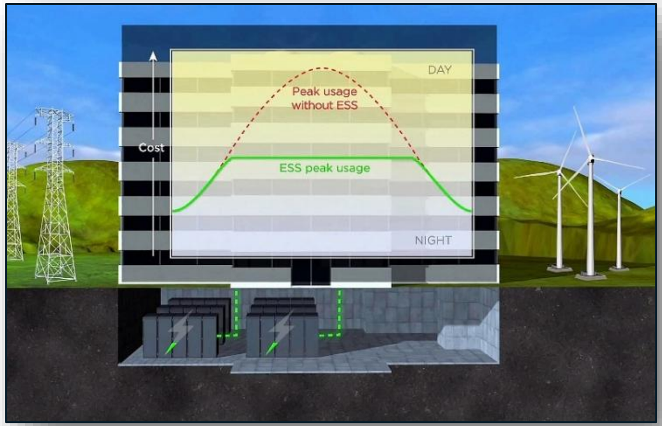
Review

Introduction

Why is this course important to responders?



What are two common applications for ESS?

What are three types of ESS?

Why is storage needed to make renewable power generation more efficient?

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