

Manufacturer Challenges to ESS Deployment

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Topics

- General Deployment Hurdles
- Broad Spectrum of Standards
- Power System Interconnections
- Application Performance
 - Emergency Systems
 - Healthcare EPS
 - Optional Standby



Why Deploy Energy Storage?

Customer Main Value Propositions

First question to answer: What value or performance concern needs to be solved?

- Energy savings (e.g. Demand Charge Reduction)
- Revenue generation (e.g. Frequency Regulation Market participation)
- Maximize renewable consumption
- Take advantage of incentives (e.g. ITC)
- Provide resiliency

- ✓ Client vision
- ✓ Benefits
- ✓ Challenges
- ✓ Funding

ESS Deployment

General Hurdles

- Rate of change in the fire codes
- Interconnection application grants are taking 9-12 months in some areas
- Battery availability today is causing long lead times & missed opportunities. For example, in the Global Adjustment (GA) market in Ontario, there is a need to shave electrical peaks in the summer months. If you miss the deployment window, you might as well wait a whole year for the CapEx investment.



ESS Deployment

General Hurdles

- Confidence that tariff rates, market participation program structure and incentives won't change
- Comfort in the payback period being longer than energy efficiency programs
- Safety and rush to deployment – Outside the US there are incidents where high demand may have resulted in system integrators to rush deploy poorly designed systems



ESS Deployment

Integration Challenges

Broad Spectrum of Standards

- DER Integration
- Microgrid Standards
- Smart Building Interface
 - ASHRAE Guide Proposal



ESS Deployment

Integration Challenges

Power System Interconnections

- NEC Article 705
- Line or Supply Side
- Load Side & Size Limitations
 - Calculations
 - Engineering Supervision
 - Power Control System (PCS) Standards Gap

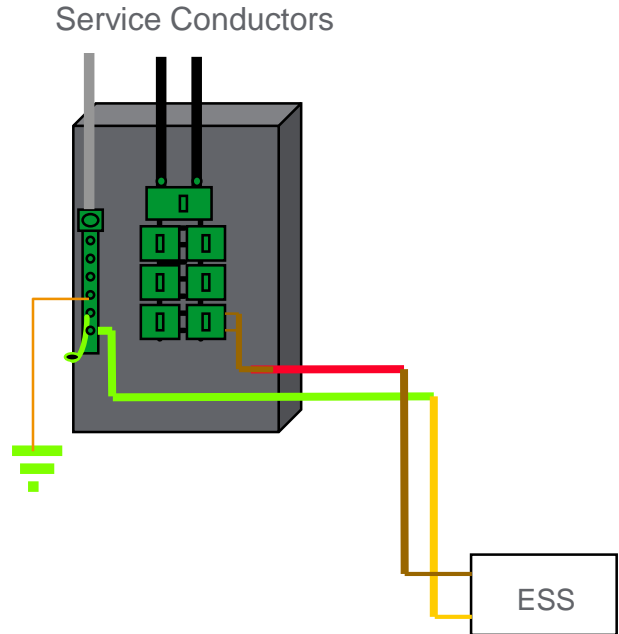


ESS Deployment

Integration Challenges

Power System Interconnections

- Load Side Connections – Limited by the rules in 705.12(B)(2)
- Requires Engineering Supervision to exceed limits
- Focus in on conductor/bus overload
- Doesn't recognize load control systems



ESS Deployment

Integration Challenges

2020 NEC Second Draft (Post Ballot)

705.13 Power Control Systems.

A power control system (PCS) shall be listed and evaluated to control the output of one or more power production sources, energy storage systems (ESS), and other equipment. The PCS shall limit current and loading on the busbars and conductors supplied by the PCS.

For the circuits connected to a PCS, the PCS shall limit the current to the ampacity of the conductors or the ratings of the busbars to which it is connected in accordance with 705.13(A) through (E).



ESS Deployment

Integration Challenges

2020 NEC Second Draft (Post Ballot)

705.13 Power Control Systems.

(A) Monitoring.

The PCS controller shall monitor all currents within the PCS. Any busbar or conductor on the load side of the service disconnecting means that is not monitored by the PCS shall comply with 705.12. Where the PCS is connected in accordance with 705.11, the PCS shall monitor the service conductors and prevent overload of these conductors.

ESS Deployment

Integration Challenges

2020 NEC Second Draft (Post Ballot)

705.13 Power Control Systems.

(B) Settings.

The sum of all PCS controlled currents plus all monitored currents from other sources of supply shall not exceed the ampacity of any busbar or conductor supplied by the power production sources. Where the PCS is connected to an overcurrent device protecting any busbar or conductor not monitored by the PCS, the setting of the PCS controller shall be set within the ratings of the overcurrent device.

ESS Deployment

Integration Challenges

2020 NEC Second Draft (Post Ballot)

705.13 Power Control Systems.

(C) Overcurrent Protection.

The PCS shall provide overcurrent protection either by overcurrent devices or by the PCS including the functionality as an overcurrent device in the product listing.

(D) Single Power Source Rating.

The rating of the overcurrent device for any single power source controlled by the PCS shall not exceed the rating of the busbar or ampacity of the conductors to which it is connected.

ESS Deployment

Integration Challenges

2020 NEC Second Draft (Post Ballot)

705.13 Power Control Systems.

(E) Access to Settings.

The access to settings of the PCS shall be restricted to qualified personnel in accordance with the requirements of 240.6(C).

ESS Deployment

Integration Challenges

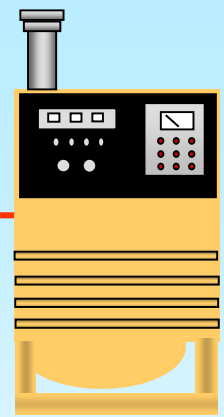
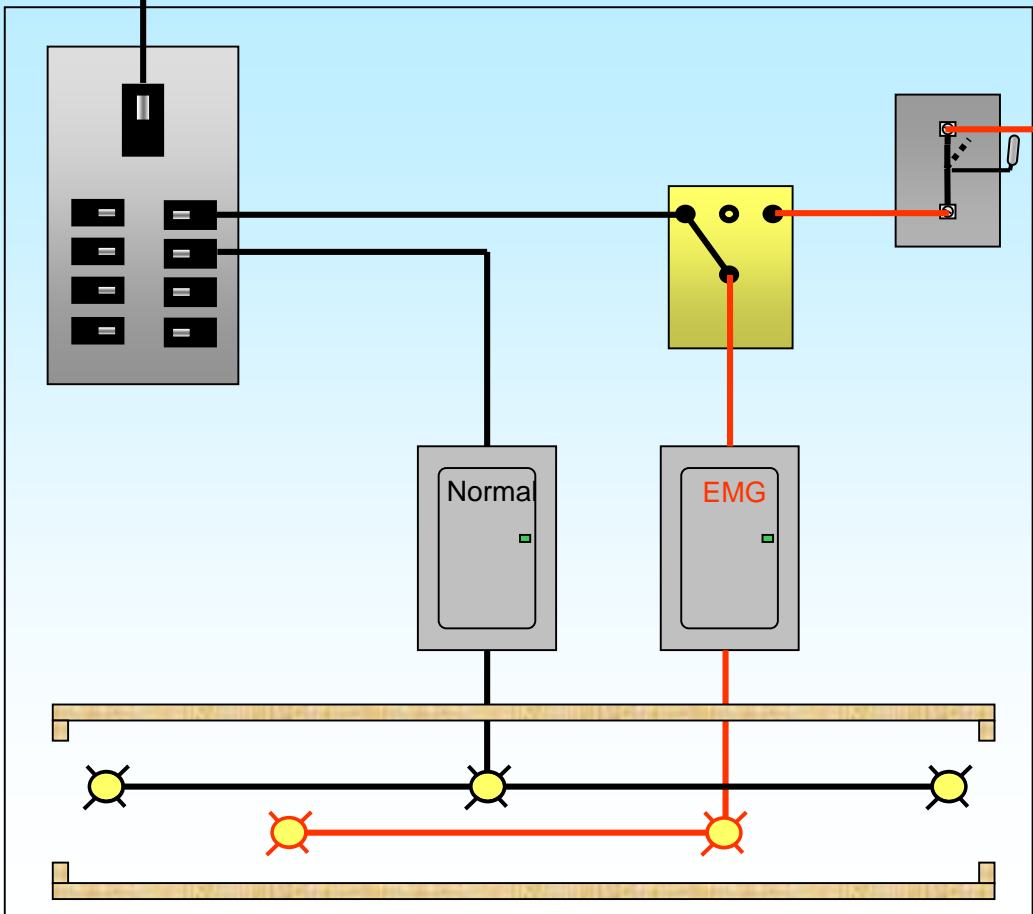
Application Performance – Lack of Clear Requirements

- Emergency Power
- Healthcare EPS
- Optional Standby Systems
 - Duration of supply / ESS sizing
 - Installation Safety
 - Reliability, Redundancy, Location Protection



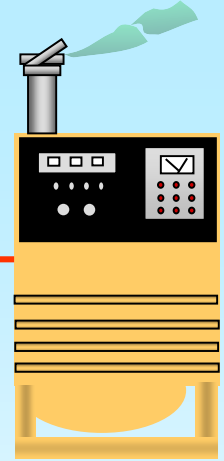
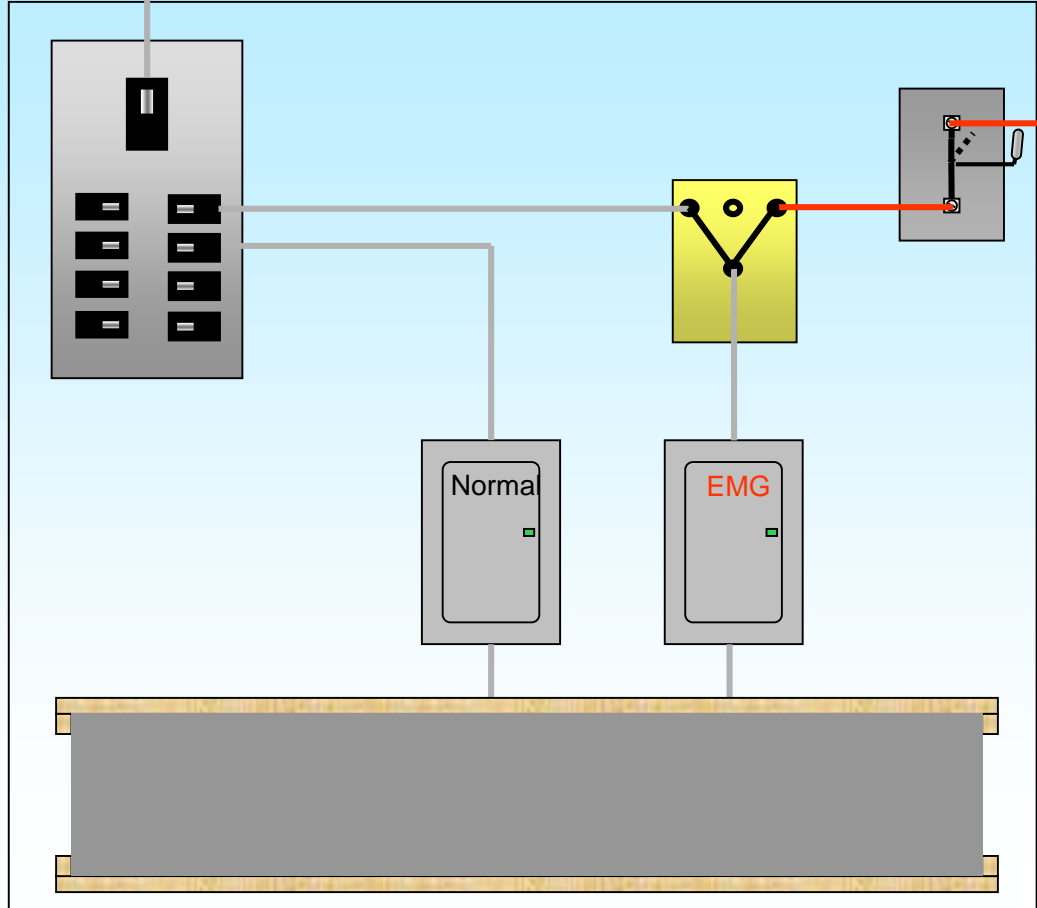
Emergency Standby System

Utility
Supply



Emergency Standby System

Utility
Supply



ESS Deployment

Integration Challenges

Emergency/Healthcare EPS (NFPA 110)

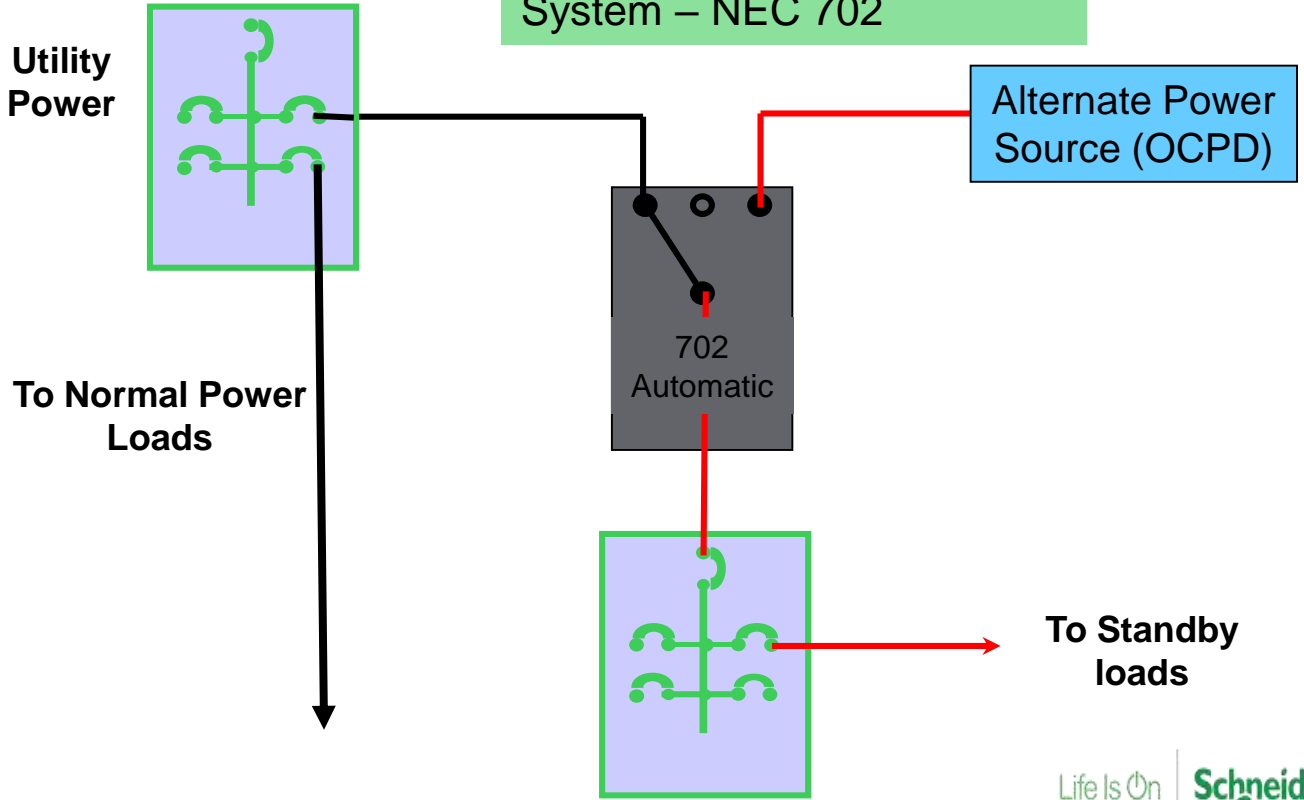
- Class or minimum time (5 min to over 48 hrs)
- Type or power restoration time
- Level – installation, performance, and maintenance rules
 - Level 1 – failure to perform could result in loss of human life or serious injuries
 - Level 2 – failure is less critical to human life and safety
 - Source available at all times (including maintenance activities)
 - Reliability, Redundancy, Location Protection



ESS Deployment

Integration Challenges

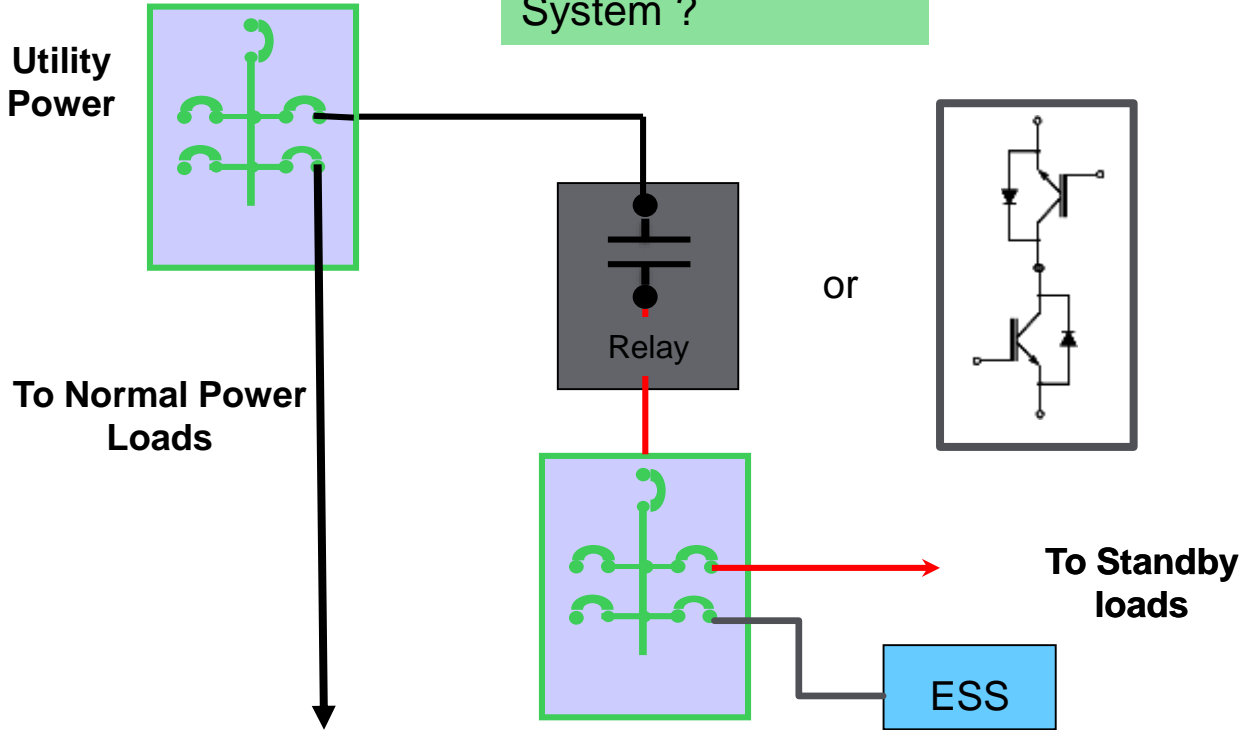
Traditional Optional Standby System – NEC 702



ESS Deployment

Integration Challenges

Optional Standby System ?



ESS Deployment

2017 NEC Arc Flash Hazard Marking

706.7 Notification (Field Marking)

- Applies to system disconnect
- Nominal ESS Voltage
- Maximum available short circuit current from ESS
- Clearing time or arc duration based on the available short-circuit current from the ESS and associated overcurrent protective devices
- Date of calculation
- **Exception** permits use of NFPA 70E arc flash hazard marking



ESS Deployment

Integration Challenges

Moving Forward

- Completion of Fire Safety Requirements
- Development of application standards that detail the testing, performance, maintenance and product certifications required for ESS use in Emergency Power, Healthcare EPS, Optional Standby Systems, and others
- Integration guidelines or common protocols for ESS control within smart building, DER generation, and microgrid systems
- Development of a Power Control System (PCS) standard that permits certification as an overcurrent protection device for ESS connections on the customer side



Information



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Life Is On

Schneider
Electric