Infrastructure Codes and Standards—the National Electrical Code®—Electric Vehicles and DC Power

Mark W. Earley, P.E.
Chief Electrical Engineer
National Fire Protection Association
What is the National Electrical Code?

- Also known as the NEC ® or ANSI/NFPA 70
- There are two electrical codes that govern electrical installation
  - The National Electrical Safety Code®—governs electrical and communications utility installations
  - The National Electrical Code®—governs electrical installations in the built environment
First edition issued in 1897
There have been 52 editions
Since 1953, the NEC has been issued every three years
Adopted into law
National Electrical Code® Articles on Alternative Energy

- Alternative Energy Sources
  - Article 480–Batteries
  - Article 625–Electric Vehicle Charging Systems
  - Article 690–PV Systems
  - Article 692–Fuel Cells
  - Article 694–Small Wind Systems
  - Article 625–Electric Vehicles
  - Article 705–Interconnected Electrical Power Production Sources
Section 625.26 recognizes interactive electric vehicle charging infrastructure.
- Listed for the purpose
- Used in optional standby systems (Article 702)
- When used as a production source Article 705 also applies
Microgrids

- Who owns it?
  - Utility–National Electrical Safety Code®
    - 29 States do not allow other entities to sell power
  - Non Utility–National Electrical Code®

- Whose side of the line of demarcation is the equipment on?
  - National Electrical Code®
  - National Electrical Safety Code®
Article 705

- The pivotal article for alternative energy requirements
- Necessary for combining sources
  - Protects the premises
  - Protects the grid
  - Protects workers
Most general requirements apply to all electrical systems, regardless of power source.
The Three Legged Stool

- Electrical installation requirements—\textit{NEC®}
- Product standards—UL, NEMA, etc
  - Product testing to standards
- Electrical inspection (ensures compliance with the installation rules of the \textit{NEC}, along with any product installation requirements)
DC Requirements

- Have been in every edition since the 1897 edition.
- There are specific AC and DC requirements.
- Where not specified, requirements apply to AC and DC.
Thoughts to Ponder

Are the Common Requirements a Good Idea?

◦ Based on current applications, yes!
  • Based on current technology, the requirements of the NEC have worked well.

◦ Higher power DC may present new challenges
  • Overcurrent protection
  • GFCI protection
  • AFCI protection
  • Switching
  • Circuit protection
  • Arc flash evaluation
  • Circuit separation
NEC TCC Task Group on DC

- Chaired by John Kovacik, UL
- Members from various parts of the NEC community and from parts of the electronics industry
- May be soliciting additional members with DC expertise
Conclusions

- Major changes to our Electrical infrastructure are on the way.
- The NEC has been very responsive to change
- The NEC has requirements for interactive electrical systems
- Safety must not be compromised in our quest to become energy independent and green!
Thank you!