Addressing compliance challenges with data centers



Presenter



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The evolving data center landscape

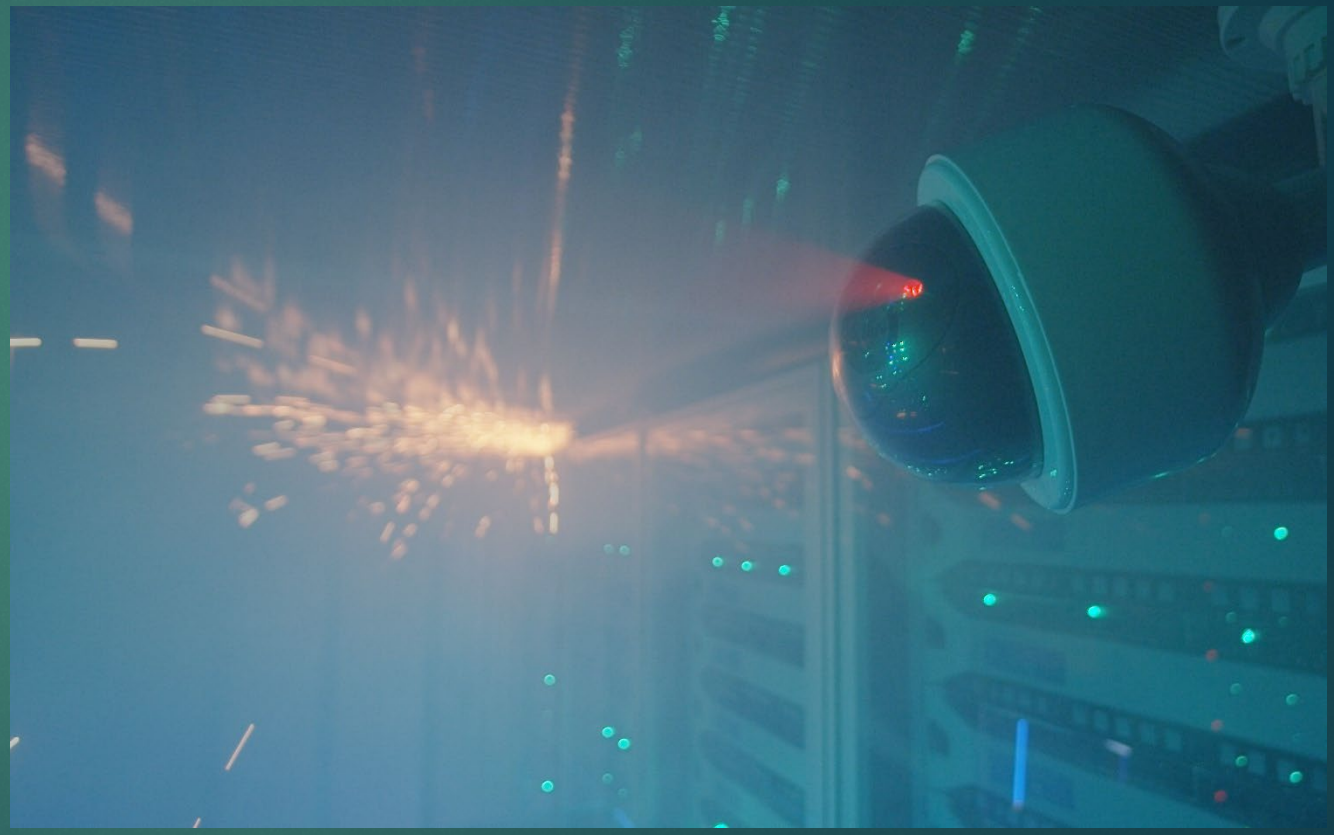






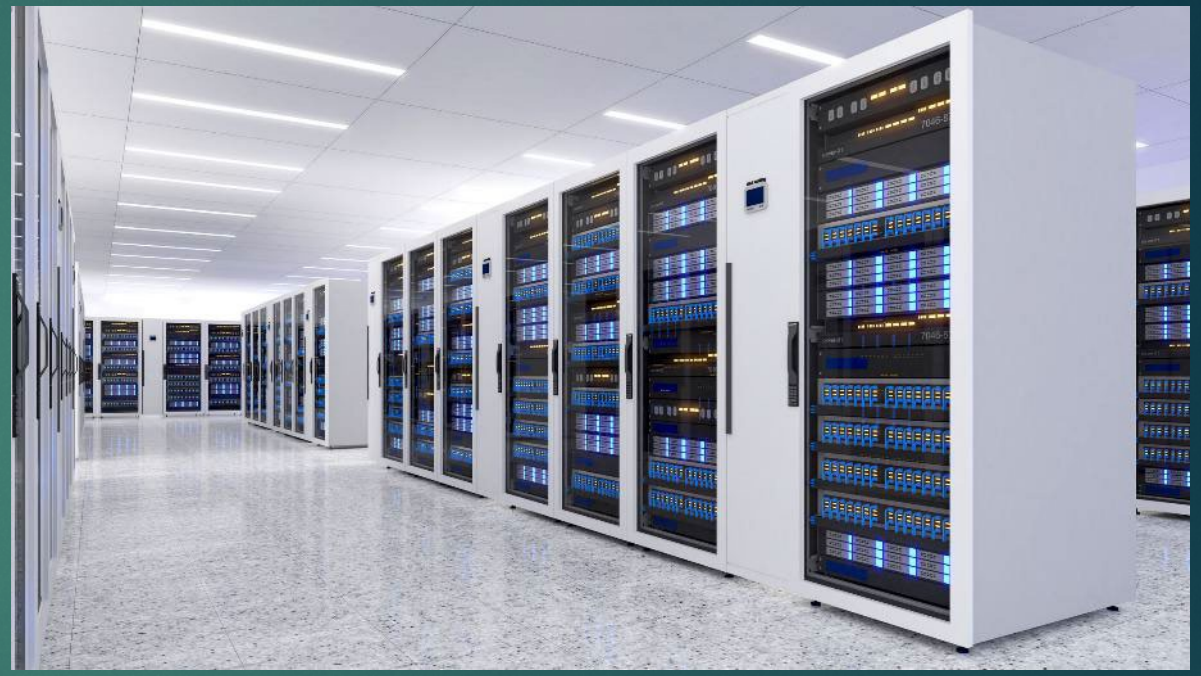
Data center industry considerations

- Rapid chip evolution drives the future – Challenges for codes, standards and equipment to keep pace
- Minimizing downtime is an important consideration.
  - Huge financial and reputation implications
  - Compliance with safety requirements critical
  - Minimizing fires a key



Types of data centers

- Enterprise
- Colocation (co-lo)
- Cloud
- Managed service
- Hyperscale
- Edge
- Micro



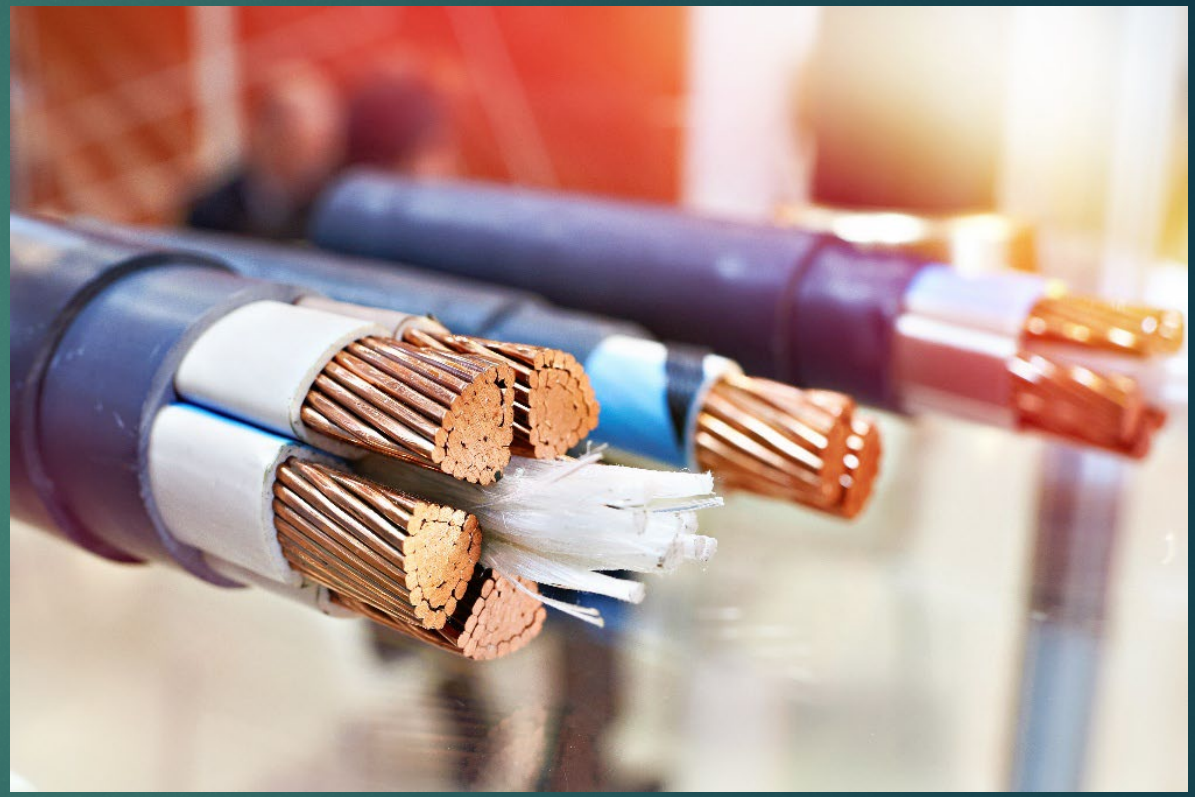
New power distribution solutions are needed

- 480 VAC is reaching its limits.
- Delivering in DC avoids losses, reduces cable size
- 800 VDC is here now; 1,500 VDC is on the horizon.
- Energy storage systems (ESS) are a natural fit for data centers
- Superconductors under development
- Inherent challenges with DC voltages



New and innovative wiring methods

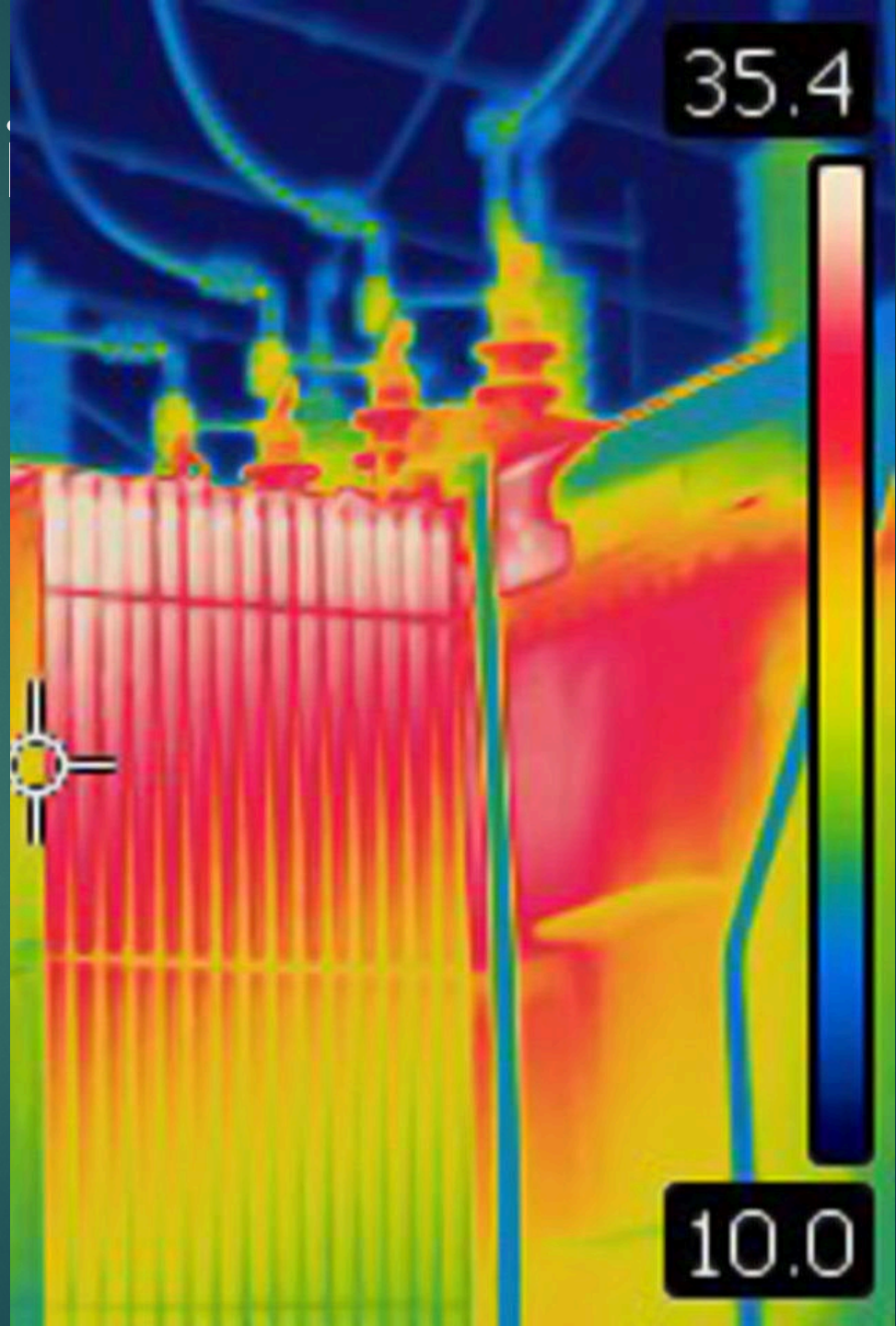
- Superconductors
- More flexible cables (UL 2137)
- AC/DC power whips (UL 817A, the Outline of Investigation for Data Center Power Cord Sets and Power-Supply Cords)
- Liquid-cooled cables and assemblies
- Research on:
  - EMI field degradation
  - Fluid compatibility



800 VDC safety considerati

Concerns compared to 480 VAC

- Breaking circuits more challenging
- Arc flash and personal protective equipment (PPE) considerations
- Staff training, including emergency responders



What is an arc flash?

- Sudden release of electrical energy in form of a plasma
- Causes include inadvertent short circuit by tools, failed or poor contacts, etc.
- Energy levels can cause permanent injury or death.
- Injuries include burns, temporary or permanent blindness, hearing damage or physical injuries (falls, blunt trauma, etc.).



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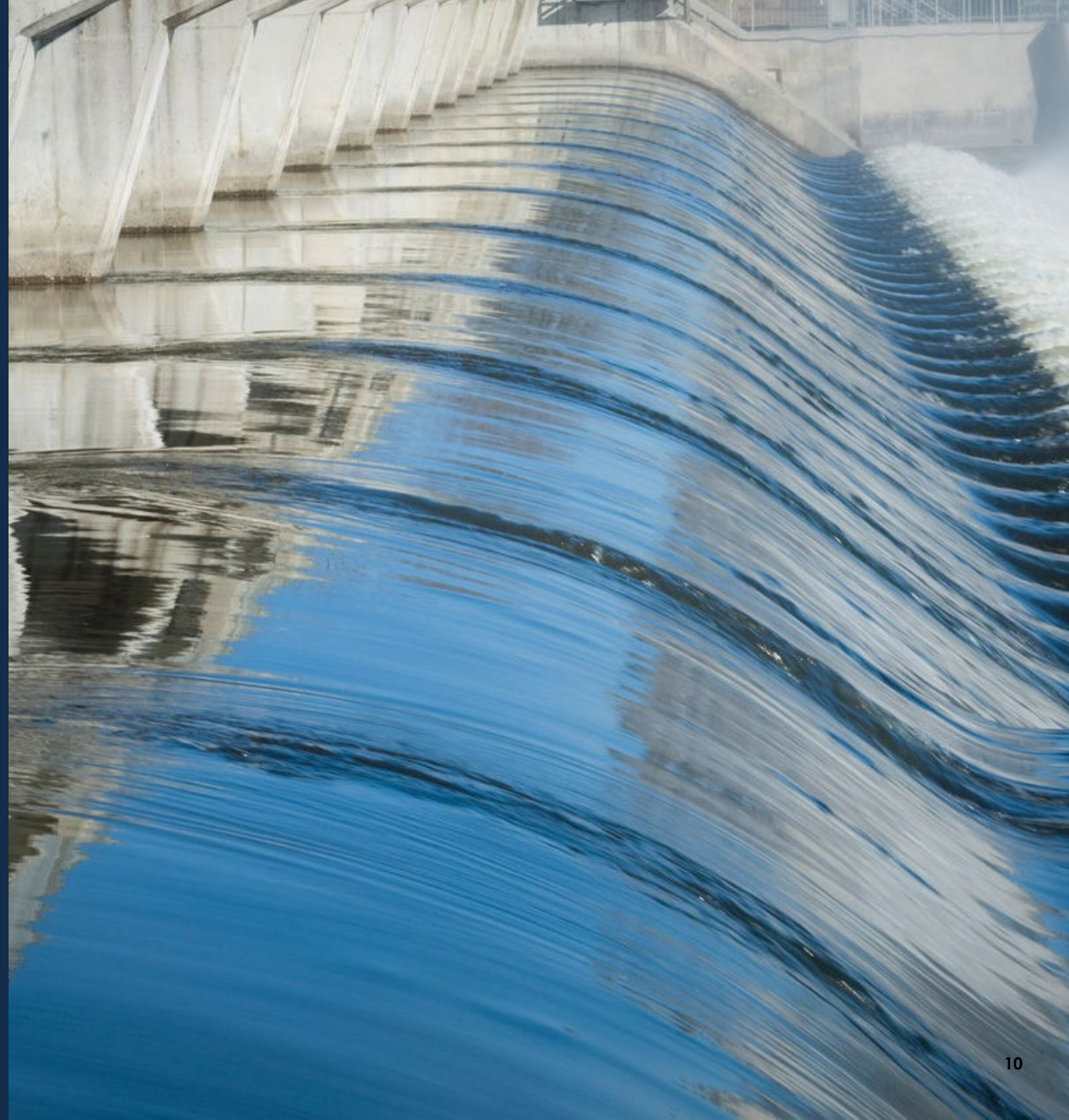
Cooling challenges



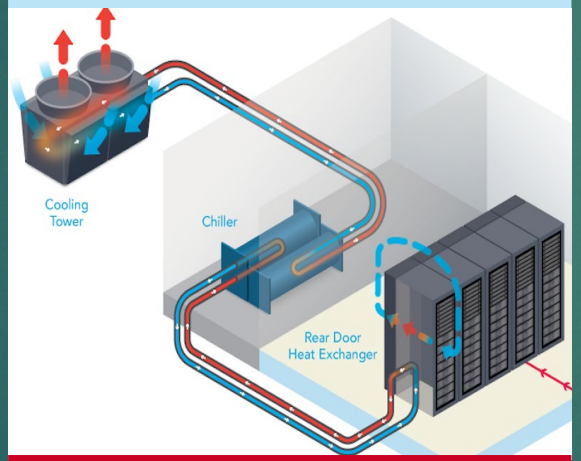
Increased power requires novel cooling techniques

Technological advancements in cooling are enabling hyperscale data centers to be deployed in dense environments.

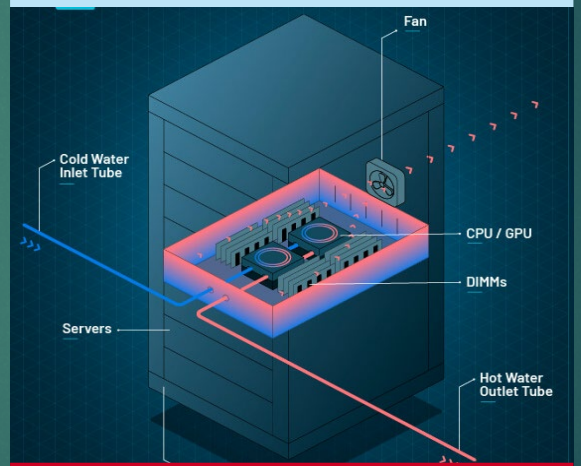
Air-to-air cooling



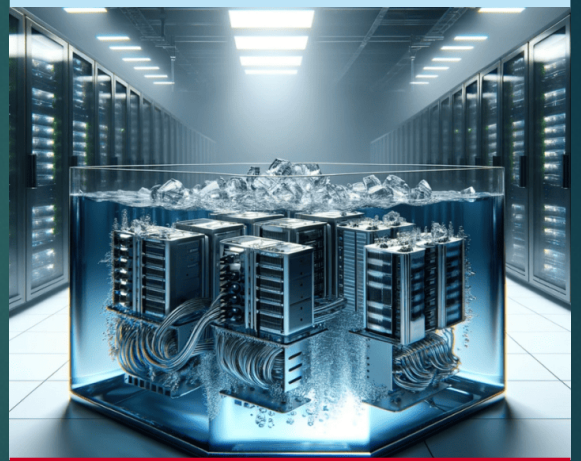
Liquid-to-air cooling



Liquid-to-liquid cooling



Immersion cooling



End-to-end solutions to support safety, performance and sustainability for cooling distribution units (CDUs) and other cooling solutions for data center thermal management

Data center configurations



Fixed facility/hybrid



Modular

Benefits of prefabricated modular units

- Rapid deployment
- Scalability and flexibility
- Cost savings

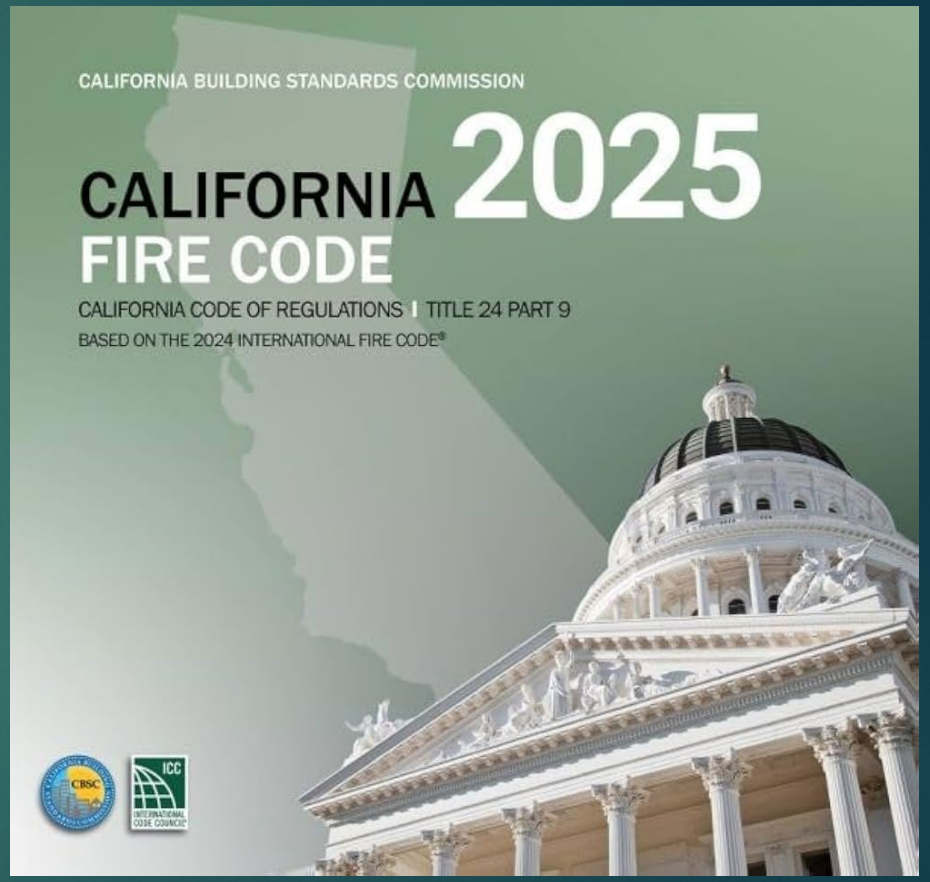


Data center code development activities



Code developments

- **NEC® (National Electrical Code®)**
  - New Chapter 23 for data centers and IT equipment; new Article 1608 for modular assemblies
  - DC Task Group: 20 public inputs, including DC grounding and nominal voltage
- **NFPA 75**
  - Potential scope expansion; public inputs covered nontraditional areas
  - Similar concerns with NFPA 76?
- **ICC / IBC**
  - G12 Data Center Guideline open for public comment; new occupancy class proposed
  - Fire protection, security and FCAC/BCAC working groups – get involved!



Resources (learn more)

- www.ul.com/datacenters
- www.opencompute.org
- https://currentos.org

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