Building Automation Adapts to the Smart Grid

- Renewable Energy
- Smart Cities Streetlighting
- Commercial & Residential Buildings
- Internet of Things
Agenda

- Understanding the change
- Review of some standards and what to expect
- Regulations already out there
Think about it
Think about it

Electricity generation, transmission, and distribution

- Power plant generates electricity.
- Transmission lines carry electricity long distances.
- Transformers step up voltage for transmission.
- Neighborhood transformers step down electricity before it enters houses.
- Distribution lines carry electricity to houses.

Source: Adapted from National Energy Education Development Project (public domain)
Why do we care? And the customers?

Telecom vs Electricity Grid

Southern California Edison

- Support EV TOU customers
- Deployed 80 L2 EVSEs with payment modules at 9 SCE facilities
- Standards based: OpenADR
  - Varied Pricing: Tiers, Rate of Charge, Penalty
  - Varied Curtailment Events
- OCPP
  - Session Reports
  - EVSE Status
  - Credit Card

https://www.sce.com/evbusiness/chargerready
Southern California Edison

- BYOT model
- 4,800 customers select own devices
- 8 events with an average 750 watts of load reduction per hour per customer
- Energy savings:
  - 3.6MW of average energy reduction per event (peak ~7MW)
  - 115.2MWh of energy saved annually
Some standards

- **IEC TS 62872-1:2019**
  - Industrial-process measurement, control and automation - Part 1: System interface between industrial facilities and the smart grid

  - How can a facility make use of grid signals
  - Considerations for the building

[https://webstore.iec.ch/publication/62884](https://webstore.iec.ch/publication/62884)
OpenADR 2.0 Standard

OpenADR provides a non-proprietary, open standardized Demand Response (DR) & Distributed Energy Resources (DER) interface that allows DR service providers to communicate DR, DER, and TE (Transactive Energy) signals directly to existing customers using a common language and existing communications such as the Internet.

https://www.openadr.org
Some standards

- **CTA-2045 (EcoPort)**

  Modular Communications Interface for Energy Management.

  “USB Port” for appliances

  Regulations in place for Heat Pump Water Heaters in Washington State, coming in OR and CA

https://www.openadr.org/ecoport
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Some standards

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[Diagram showing the interaction between Any Communication System, Universal Communication Module (UCM), Smart Grid Device (SGD), and various protocols and interfaces.]

https://www.openadr.org/ecoport
California Code of Regulations, Title 24 (Building Standards) Part 6 (Energy Code)

Slides courtesy of Gabe Taylor, CEC
Nonresidential Building

**NONRESIDENTIAL BUILDING** is any building which is identified in the California Building Code Table; Description of Occupancy as Group A, B, E, F, H, I, M, or S; and is a U; as defined by Part 2 of Title 24 of the California Code or Regulation.

**NOTE:** Requirements for high-rise residential buildings and hotels/motels are included in the nonresidential sections of Part 6.

- “Nonresidential” includes:
  - High-rise residential
  - Hotels/motels
2019 Energy Code DR

- **Nonresidential**
  1. Thermostats
  2. Lighting
  3. EMC
  4. General

- **Multifamily**
  5. Solar Ready

- **Residential**
  6. Solar Ready
  7. Water Heaters
  8. HVAC
Nonresidential

- Single Zone
  - A/C & Heat Pumps
- Single Zone w/ DDC
  - Additional Shed Requirements
- Alterations
  - §120.2(b), 120.2(h) → 110.12(b), & 141(b)2E
Nonresidential

- Lighting Controls
- Buildings >10,000 ft²
- LPD > 0.5 W/ft²
- §130.1(e) → 110.12(c)

REQUIRED
Nonresidential

- Electronic Message Centers (EMC)
- > 15 kW
- >30% Reduction
- §130.3(a)3 → 110.12(d)

REQUIRED
Nonresidential

- Demand Responsive Controls
- For Compliance or Credit
- §130.5(e) → 110.12

REQUIRED
Multifamily

- DR Thermostats +
  - Either:
    - Additional EE, or
    - EV Chargers
- 0 ft\(^2\) of Solar Ready
  - Down from 250 ft\(^2\)
- §110.10(b)1B

REQUIRED
Residential

- DR Thermostats
  \[= 150 \text{ ft}^2 \text{ of Solar Ready}\]
  - Down from 250 ft\(^2\)
  - DR Thermostats + Additional EE
  \[= 0 \text{ ft}^2 \text{ of Solar Ready}\]
- §110.10(b)1A

REQUIRED
Residential

- Heat Pump Only
- Alterations Only
- Optional:
  - §110.12, or
  - NEEA Tier 3
  - §150.2(b)1Hiii b & c

**REQUIRED**
Residential

- Alterations Only
- Optional Testing Allowance
- Rare Cases
  - EXCEPTION to §150.2(b)1Fiia
  - EXCEPTION to §150.2(b)1Fiib

REQUIRED
Rolf Bienert
rolf@lonmark.org