IEEE 2030.5™ and DER Interconnection: US-Africa Clean Energy Standards Program

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Introduction

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Activities:

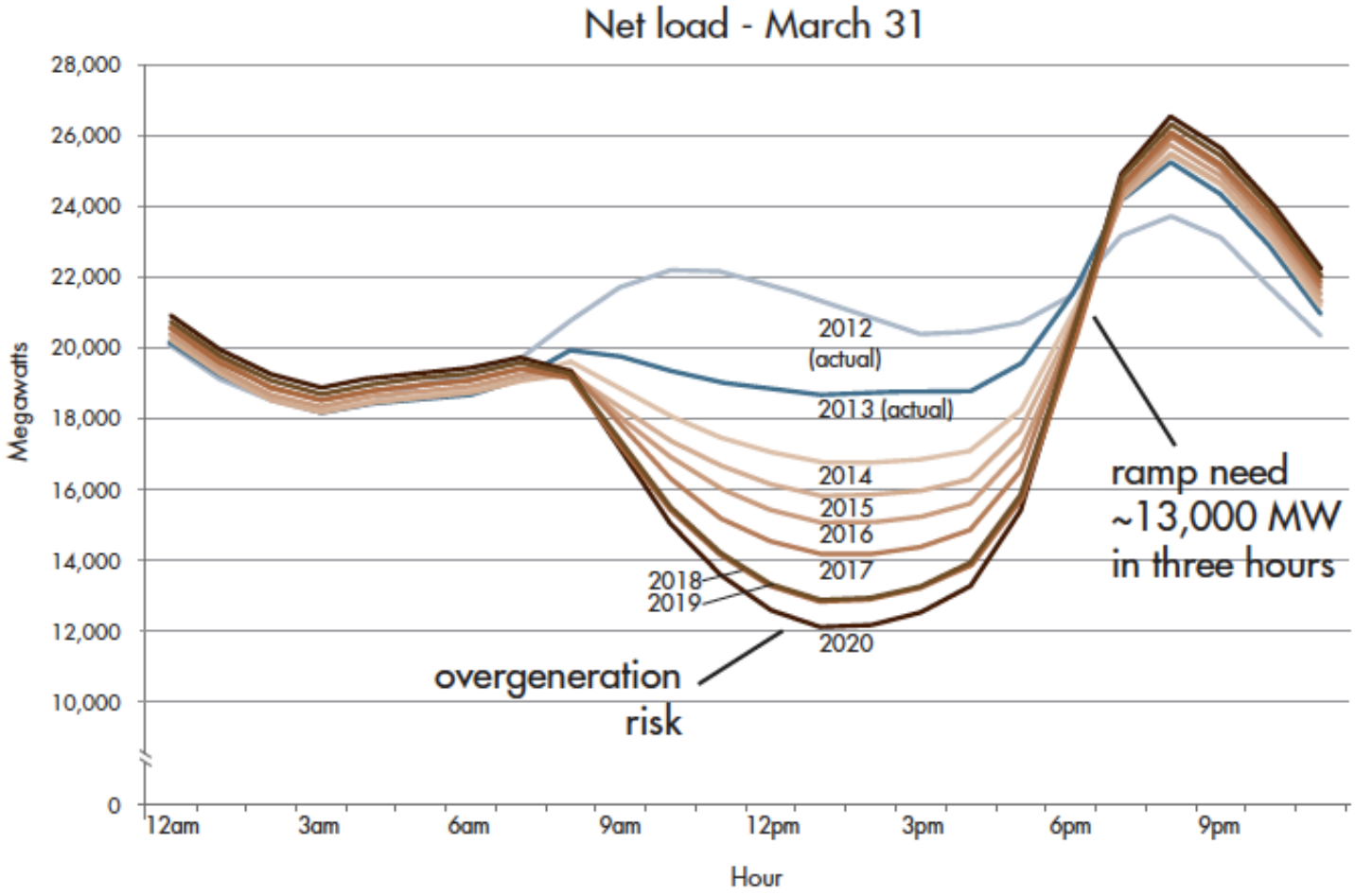
IEEE-SA

- Member, IEEE-SA Board of Governors
- Chair, IEEE-SA Corporate Advisory Group
- Vice Chair, IEEE P2030.5

Other

- ANSI, IEC, IETF, SEPA, Zigbee Alliance

The “Duck Curve”



DER Ownership

Utility-Owned

- Reliable communications (e.g., FAN)
- Equipment directly under utility control
- DNP3, IEC 61850, Modbus

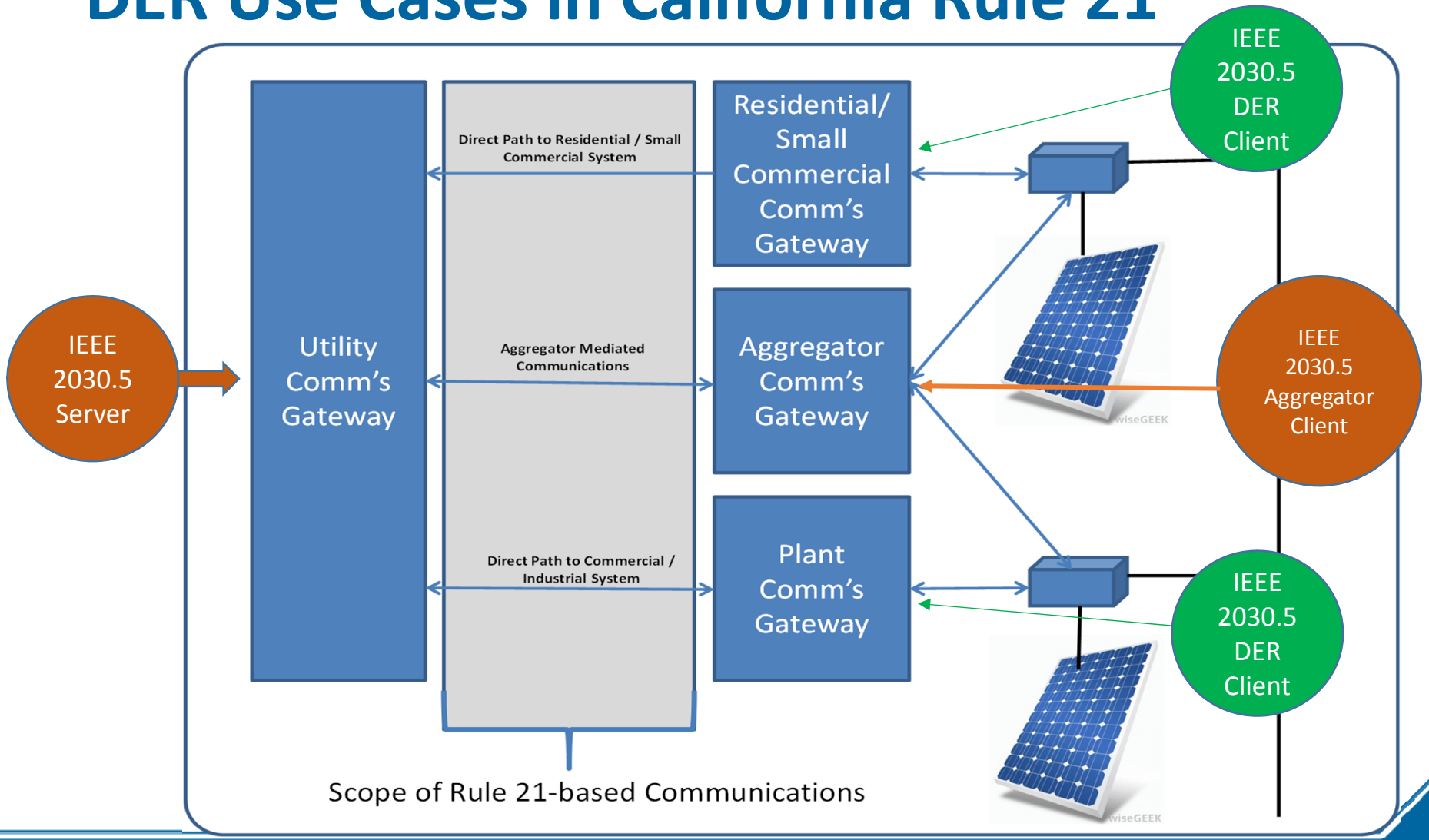
Customer-Owned

- Unreliable communications (e.g., Internet)
- Equipment ultimately under customer control
- IEEE 2030.5

Interoperability is Crucial

- Customer-owned equipment available in the retail market
- Communications over a variety of medium
- Aggregation playing an important role in markets, but need to coordinate for reliability
- Early mover locations have a lot to teach us
  - Germany
  - US/Hawaii
  - US/California

DER Use Cases in California Rule 21



IEEE 1547-2018

- New smart inverter functions:
  - Var capabilities
  - Ride-through
  - Requires DER to support at least one of IEEE 2030.5, IEEE 1815 (DNP3), or SunSpec Modbus
- IEEE 1547-2018 Clause 10 gives further requirements for communications

IEEE 2030.5

- Designed using widely-adopted technologies for communication between utilities and outside entities (consumers)
- Secure
- Adopted as “default protocol” by California’s Rule 21
- Supports communication to aggregators (grouping) as well as individual smart inverters
- One of three communications protocols in new IEEE 1547-2018
- Supports DER controls, curves, ratings, settings, metering
- Ability to target groups or individual smart inverters
- Aligned with SunSpec, IEEE 1547, IEC 61850

High-Level Design

- Divided into "**Function Sets**" – independent sets of functionality
- Any device can be a **server** and/or **client** for a function set – servers provide the data, clients use the data
- Can have multiple servers for a function set – allows for **multiple service providers**
- If desired, clients can be **assign**ed to servers
- Not restricted to energy – supports **multiple commodities** (e.g., water, natural gas, steam)

IoT Profile

- Internet Protocol (IP) – *multiple link layers*
- RESTful HTTP – *long life*
- TLS 1.2 (HTTPS) – *secure*
- XML and/or EXI – *extensible*
- IEC 61968 (CIM) – *smart grid dictionary*
- xmDNS & DNS-SD – *plug and play device and service discovery*

A Variety of Architectures

- In-home only
- Via smart meter
- Via Internet
- Combinations of the above

The use of IP eases convergence and architecture changes

Some IEEE 2030.5 Functionality

- Price Communication
- Demand Response and Load Control
- Energy Usage Information (e.g., meter data)
- Distributed Energy Resources
- Service Provider Messaging
- Prepayment Metering
- Electric Vehicle
- Billing Communication
- File Download / Update

Distributed Energy Resources

- Support for both generation and storage
- Supports DER controls, curves, ratings, settings
- Many other function sets useful:
  - Pricing
  - Energy usage (monitoring/metering)
- Supports communication to aggregators as well as individual smart inverters
- Ability to target groups or individual smart inverters
- In addition to remote monitoring and control, allows increased customer engagement and information
- Based on SunSpec Alliance Inverter Control Model, derived from IEC 61850-90-7 and EPRI work
- One of three communications protocols in new IEEE 1547-2018

Distributed Energy Resources (cont.)

- Example clients:
  - Could be as simple as a device that displays the requested event
  - Or devices that act on the event:
    - Solar inverter
    - Energy storage system
    - Electric vehicle
    - Many others
- Example servers:
  - Smart meter
  - Standalone gateway in home
  - Server in cloud

California's Rule 21 and IEEE 2030.5

- IEEE 2030.5 named as "default protocol" for smart inverter communications
- "IEEE 2030.5 Common California IOU Rule 21 Implementation Guide for Smart Inverters" developed (CSIP)
- Communications between utility and DER aggregator, as well as utility and individual smart inverters

More Resources

- Several IEEE webinars
- Several SEPA webinars
- SGIP Catalog of Standards reviews
- “IEEE 2030.5 Common California IOU Rule 21 Implementation Guide for Smart Inverters” (CSIP Guide)

Questions?