



# Committee on Critical Infrastructure

NARUC  Summer  
Policy Summit

# Committee on Critical Infrastructure

## Innovations in Infrastructure Security: UAS



Edison Electric  
INSTITUTE

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NARUC Summer Policy Summit  
Committee on Critical Infrastructure

July 16, 2017

San Diego, CA

Chris Hickling



@chriswhickling

# What do you call this?

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# SCREAMING EAGLES OF RELIABILITY



# Key Applications for UAS

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Generation Facilities Inspection

Transmission and Distribution Inspections

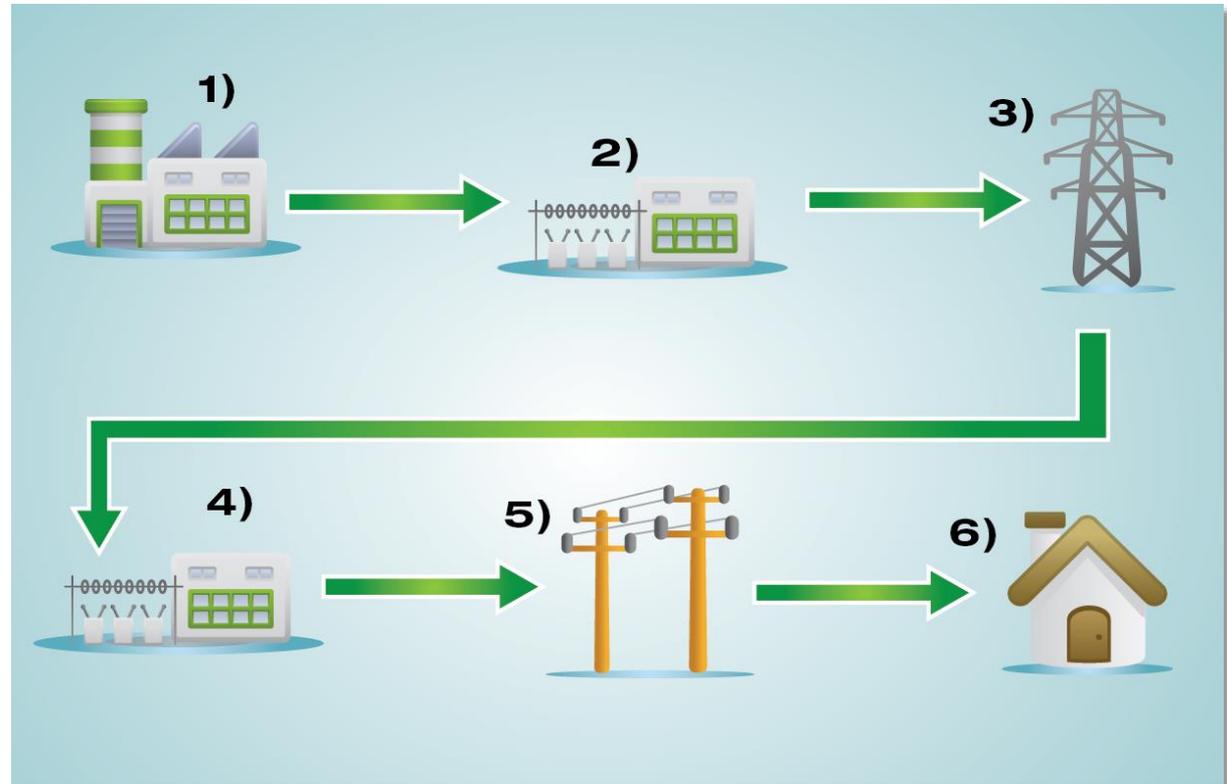
Environmental Assessment

Emergency Response / Disaster Recovery

Physical Security

# Key Application - TD&G

- 5,393 generating units at 2,122 plants
- ~45,000 substations
- 382,296 miles of transmission line
- 3,467,216 miles of distribution line



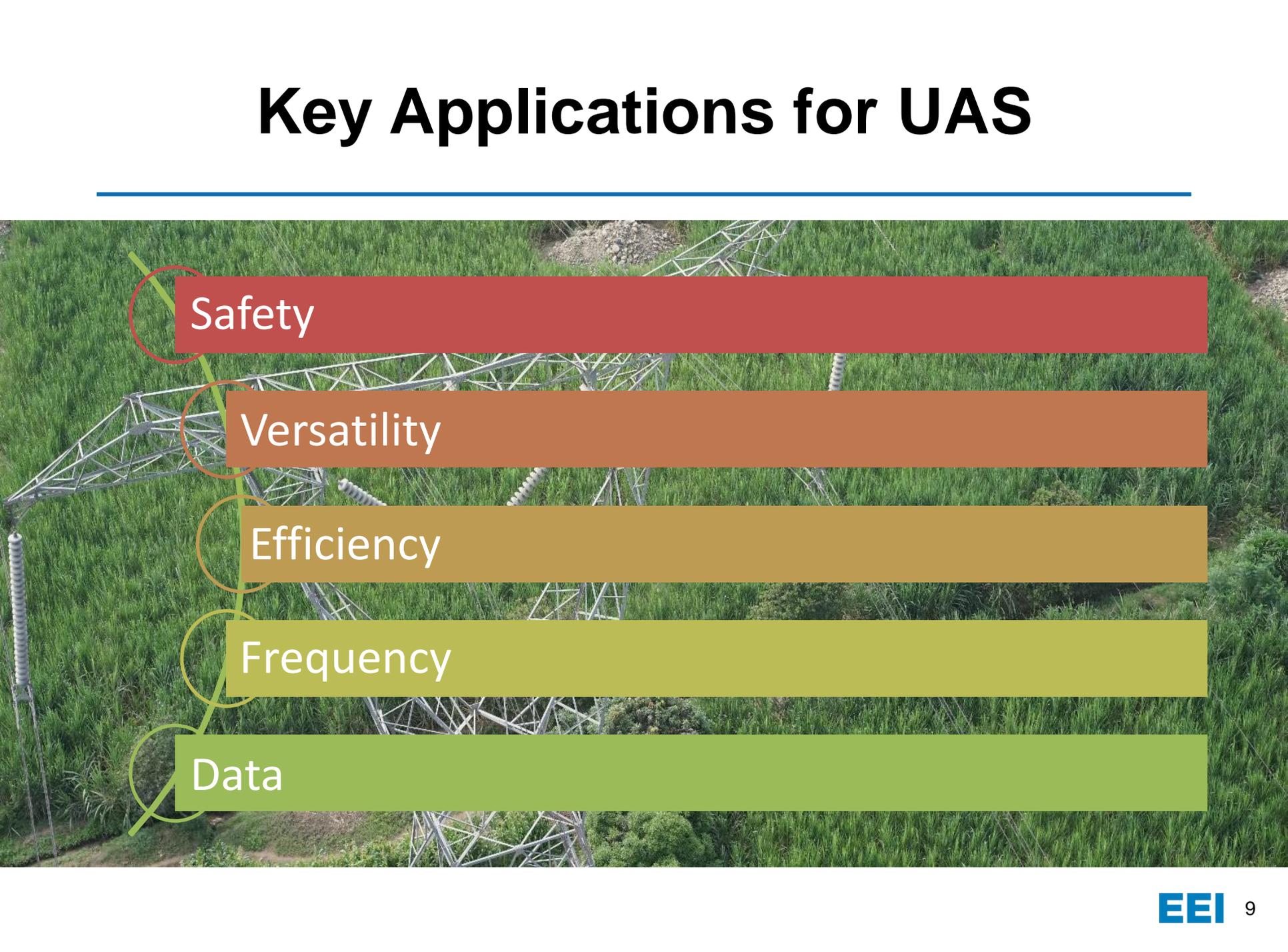
# Key Applications

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- A drone “can get right up next to the [wind turbine] blade,” taking 3-D pictures that show if there are dents or holes.
- “...when you focus on safety like this you can also improve the uptime of your assets. So not only are we attacking the safety hazards but we're also improving the availability of the assets.”
- “We used drones for the first time to assess damage...in January. ...drones can be deployed faster than helicopters in most scenarios. We estimate that we shaved off approximately a half day of assessment time by using drones.”
- The boilers are typically eight to 10 stories tall and have thousands of components that must be inspected. Normally, the company's workers spend a week building scaffolding and using ladders and suspension devices to inspect boiler equipment. Doing the same job by drone took a day...

# Key Applications for UAS

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An aerial photograph of a power line tower in a grassy field. Five colored callout boxes are overlaid on the left side of the image, each containing a key application for UAS. The boxes are: Safety (red), Versatility (orange), Efficiency (yellow), Frequency (light green), and Data (green).

Safety

Versatility

Efficiency

Frequency

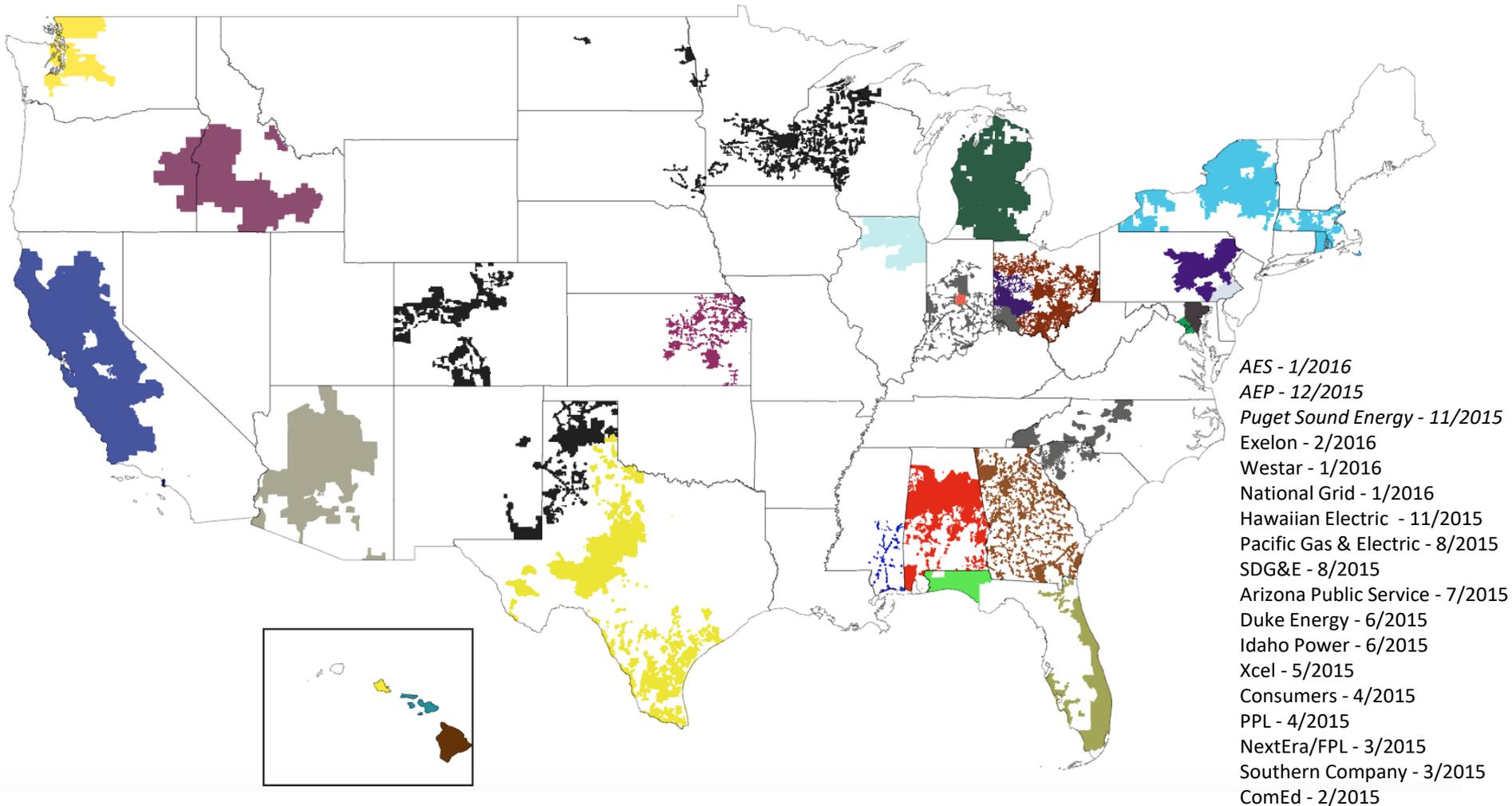
Data

# Where We Were

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- **February 2012:** FAA Modernization and Reform Act enacted.
- **September 2014:** First Section 333 exemption granted.
- **March 2015:** ComEd receives first 333 exemption for routine utility operations.
- **June 2016:** Final Rule – Part 107
- **July 2016:** FAA Extension, Safety, and Security Act signed into law. **Current authorization expires 9/30/17.**

# EEI Member Company FAA 333 Exemptions



# Where We Are

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- **February 2015:** Proposed Rule - Part 107
  - **June 2016:** Final Rule – Part 107
    - Less than 55 lbs. including payload.
    - Within visual line of sight.
    - May not operate over persons not directly participating in operation.
    - Daylight only; <100 mph (87 knots), <400 ft. above ground level or within 400 ft. of a structure.
- (↑ ***These restrictions can be waived.*** ↑)
- Operation in Class G airspace allowed without ATC permission (Classes B, C, D, E req. permission.)
  - Preflight inspection (but not airworthiness certificate)
  - Remote pilot airman certificate (but not pilot's license)
  - Register the drone

# 2016 FAA Reauthorization

**Section 2204** instructs the FAA to enter into agreements with DOE, FEMA and others “to facilitate the expeditious authorization of safe unmanned aircraft system operations in support of service restoration efforts of utilities.”

**Section 2207** requires FAA to publish guidance for emergency certificates of authorization or waivers for the use of UAS in response to a catastrophe, disaster, or other emergency to facilitate emergency response operations, such as firefighting, search and rescue and utility and infrastructure restoration efforts.”



# 2016 FAA Reauthorization

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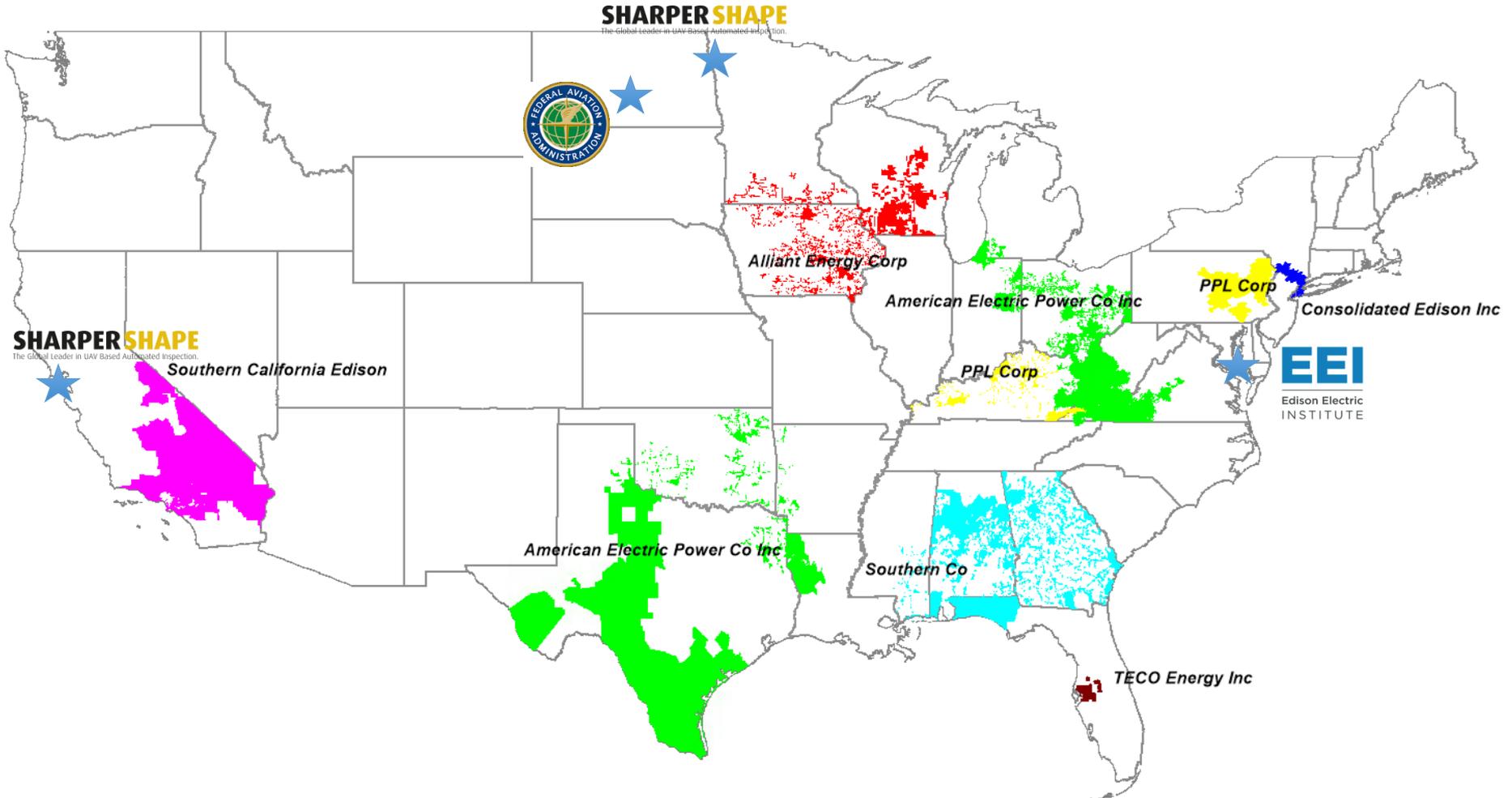
- **Section 2210** allows for a person to apply to the FAA *“to operate an unmanned aircraft...beyond the visual line of sight ... and during the day or at night.”*
- Flights are allowed for *“activities to inspect, repair, construct, maintain, or protect covered facilities...”*
- “Covered facilities” include pipelines, electric GT&D, or *“any other critical infrastructure facility”* using a broad definition found in 18 U.S.C. 2339D (*“systems and assets vital to national defense, national security, economic security, public health or safety.”*)

# Where We're Going

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- **June 2016:** Final Rule – Part 107 (Eff. Date 8/29/16)
- **August 2016:** Sharper Shape files two separate waiver requests to enable beyond visual line of sight (BVLOS) operations of unmanned aircraft.
  - **“Blanket” request to fly BVLOS only in sparsely populated areas. “Site Specific” waiver for six specific locations located in suburban, non-congested areas.**
  - Safety mitigations include limitations of altitude (300 ft. AGL), location (within 300 ft. laterally of a power line), speed (not to exceed 40 knots; ~45 mph), time of day (sunrise-sunset).
  - HD video, redundant radio link, cellular network, failsafe flight computer

# Sharper Utility Consortium

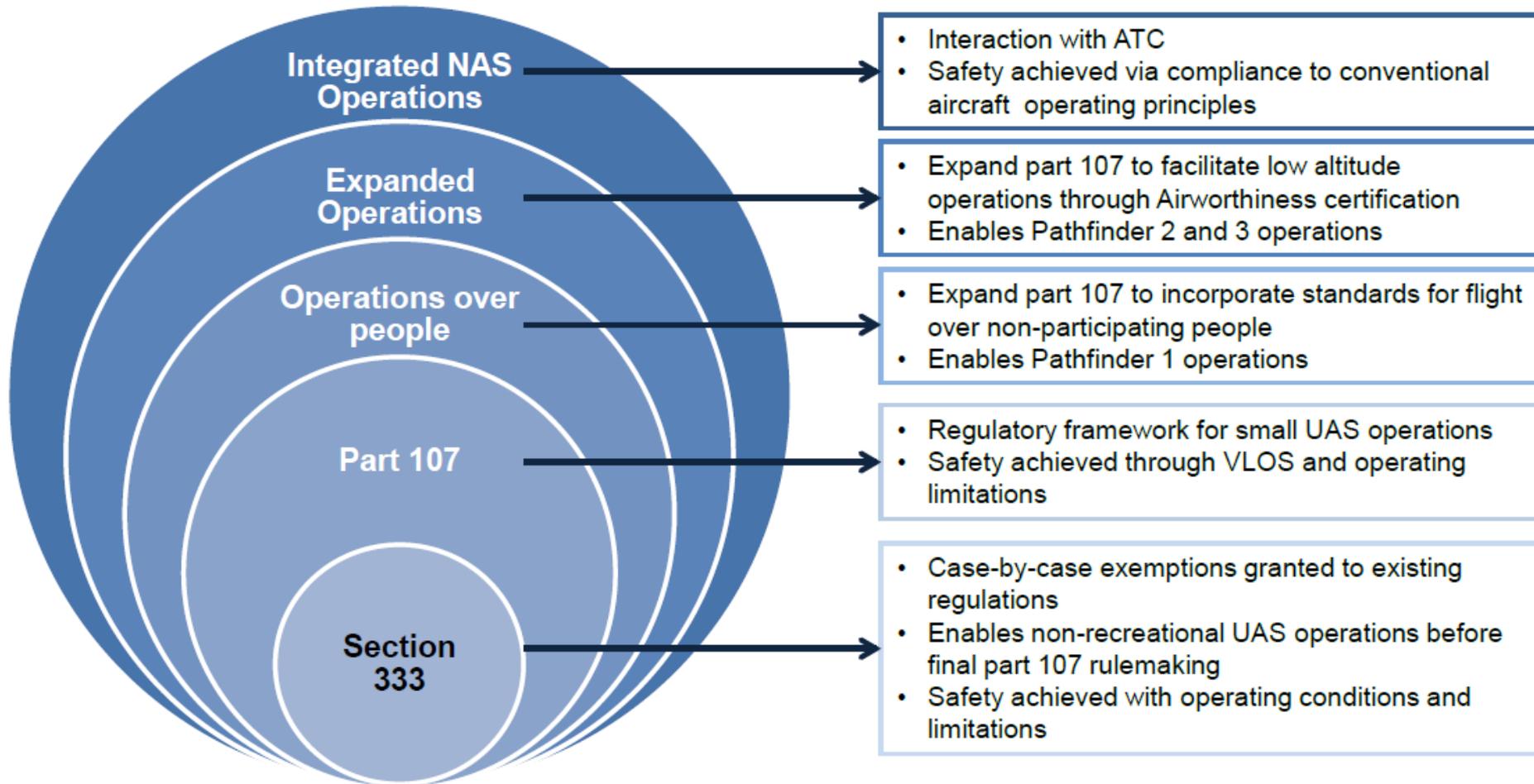


# 2017 FAA Reauthorization

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- In June, both chambers passed FAA bills out of committee; House on largely party-line vote, Senate unanimously.
  - Part 107 process improvements
- Larger issues will drive this bill – especially Air Traffic Control privatization, top priority of House T&I Chair Shuster.
- It's a “must-pass” bill but...
  - 2012 FAA bill passed after 20+ short term extensions, FAA shutdown for several weeks in July-August 2011.

# Building the Regulatory Framework



# State Jurisdiction

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- December 2015 FAA memo regarding state and local regulation of UAS, noting that *“States and local jurisdictions are increasingly exploring regulation of UAS...”*
  - *“Congress has vested the FAA with authority to regulate the areas of airspace use, management and efficiency, air traffic control, safety, navigational facilities...”*
  - *“Substantial air safety issues are raised when state or local governments attempt to regulate the operation or flight of aircraft. ...fractionalized control of the navigable airspace could result...”*

[https://www.faa.gov/uas/regulations\\_policies/media/UAS\\_Fact\\_Sheet\\_Final.pdf](https://www.faa.gov/uas/regulations_policies/media/UAS_Fact_Sheet_Final.pdf)



**EEI**

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*Power by Association<sup>SM</sup>*

# SCE UAS Update

San Diego, CA

July 2017

Dave Guerrero Principal Manager  
SCE Aircraft Operations

NARUC Summer Policy Summit

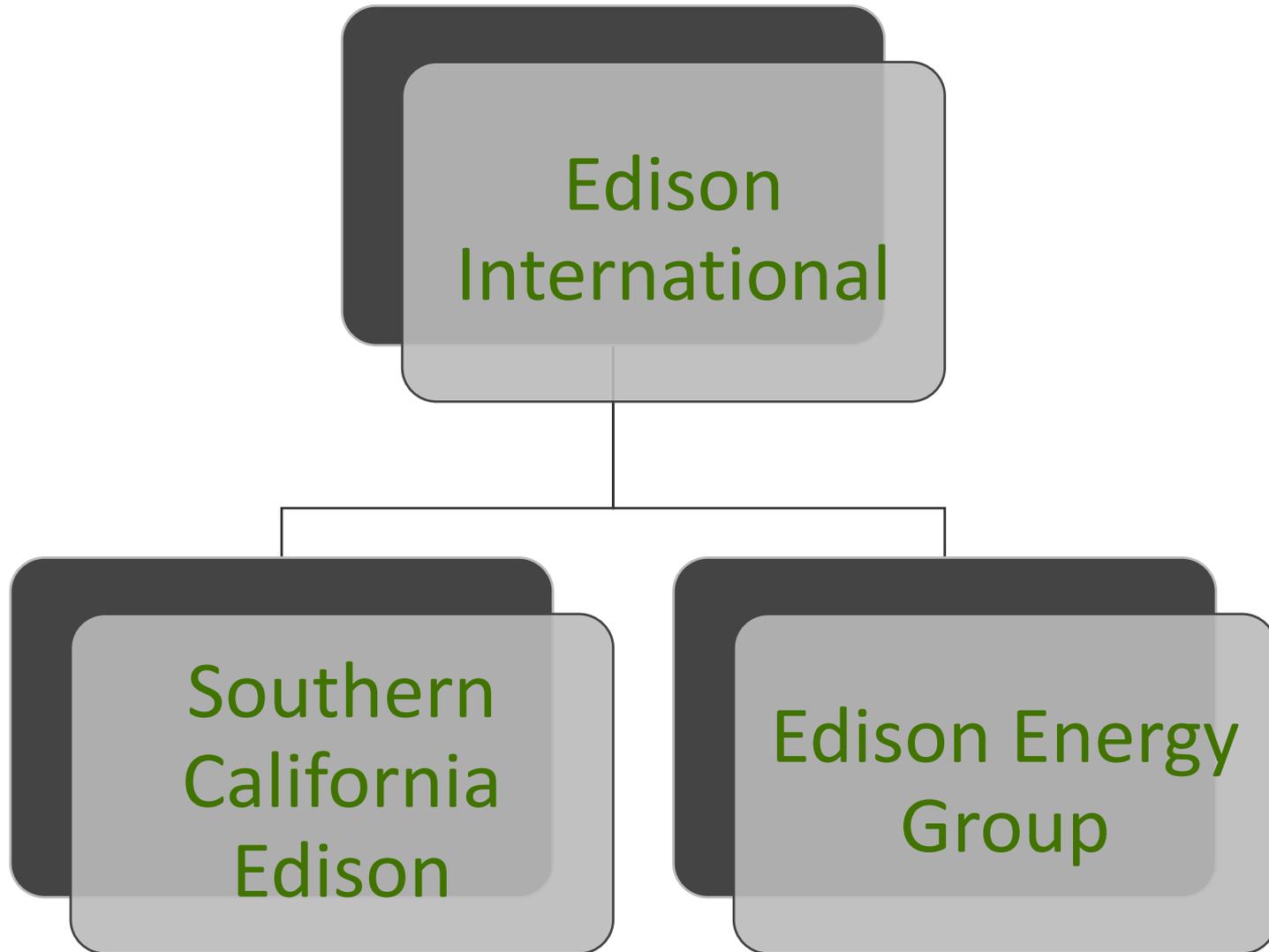
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# Background / History

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# Background – Edison International

- **1886 - Company begin operation in the city of Visalia**
- **1909 - Company reincorporates as Southern California Edison (SCE)**
- **1922 - Turns over its distribution system to the City of Los Angeles Bureau of Power and Light**
- **1959 – Begins aircraft operations with helicopters**
- **1964 – SCE acquires the California Electric Company known as Calelectric**
- **1996 –SCE changes its name to Edison International**
- **2016 – 130 Years of Service**



# About Us - SCE



- ❑ ~ 50,000-square mile territory
- ❑ ~ 4.9 million customer accounts
- ❑ Serving ~ 15 million people
- ❑ Over 100,000 miles of transmission and distribution lines
- ❑ Also Operate in Arizona and Nevada
- ❑ ~ 1.4 M poles
- ❑ Highest, lowest, & hottest places in the U.S.
- ❑ ~ 35 miles between highest & lowest places

# The Technology

- UAS
  - VTOL
  - Fixed Wing
- Sensors
  - Optical (HD, 3D)
  - Infrared
  - Multispectral/ Hyperspectral
  - Corona Cameras
  - LiDar
- Software
  - High definition photos
  - Ortho-mosaics
  - 3d Photogrammetry
  - LiDar/High density point clouds
  - Vegetation danger tree models
  - Relative vegetation health

# Use Cases for SCE

- Emergency Response
  - Real time damage assessment
    - Earthquakes, storms, wind, fire, etc
- Inspections
  - Transmission and right of way roads
  - Dams, penstock, structures, and attached assets
  - Substations
  - Distribution inspections
  - Generation facilities
  - Geological inspection
- Monitoring
  - Rights-of-ways / access roads
  - Vegetation Management
  - Environmental Surveys
  - Construction activities
- Security
  - Critical infrastructure
  - Civil disturbances
  - Threats
- Construction Planning
  - Survey grade 3D elevation models (line catenary)
  - Survey grade 3D terrain models (line siting)
  - Volumetric (land disturbance)

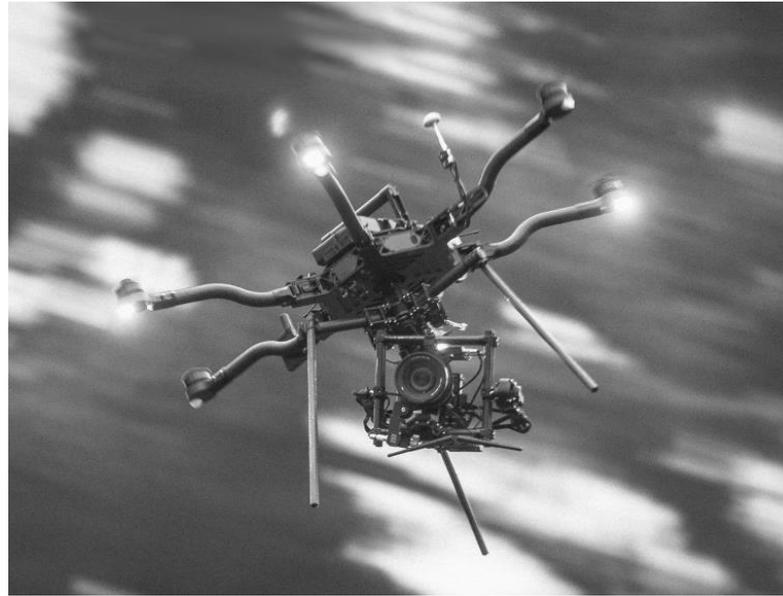
# Potential Benefits

- Safety
  - Risk exposure to personnel is reduced (the toolbox drone)
- Reliability
  - Greater detail is captured
  - More detailed storm / damage assessments will reduce outage time
  - Leverage advances in sensor technology
  - Early identification of danger trees and vegetation health
  - Detection of contamination and connector failure
- Documentation
  - High quality data is captured and maintained
  - Regulatory compliance is better supported
  - Detailed change detection is enabled by software
- Planning / Budget
  - Detailed construction / maintenance planning can be improved
  - Condition-based maintenance can occur
  - More frequent inspections can occur as regulations allow for BVLOS, UAS costs come down, and technology improves

# UAS Background / History at SCE

- 2015:
  - Information sharing discussion between various SCE organizations
    - T&D, Air Ops, Legal, Environmental Services, Generation (Hydro)
- 2016:
  - Outlined user cases and interested departments
  - Contracted w/3<sup>rd</sup> party provider for UAS services
  - Joined EEI Task Force
  - Filed section 333 exemption with FAA
  - Began operation under Part 107
  - Procured 2 UAS:
    - ALTA 6 from Freefly Systems Inc.
    - DJI Phantom III
  - Qualified 2 operators to fly
  - Flew 1<sup>st</sup> mission(s)
- 2017:
  - Building roadmap / aligning internal efforts
  - Looking at broader sensing framework, of which UAS is a component

# SCE's Initial Purchase – ALTA 6



- Sensor Independent
  - Sensor / camera development without acquiring and registering another aircraft
  - Field-exchangeable sensors as mission evolves
  - Future-proof
- High Payload Capacity
- 20 to 25 min flight duration
- Versatile Configuration Options
- Fast Setup / Takedown

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# Questions?

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# Verizon's Use of Unmanned Aerial Systems (UAS)

## NARUC Briefing



July 16, 2017

Tom Camp

- 
- **Airborne LTE Operations (ALO)** - UAS demonstrate how Verizon's 4G LTE network can help first responders and emergency management personnel enhance disaster recovery efforts
  - **Emergency Response**
    - Flying Cell Site
    - Payload Back-haul



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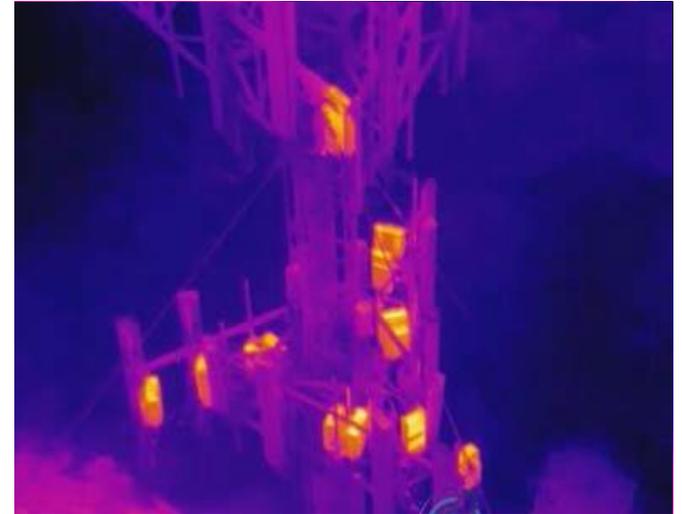
# Testing of Flying Cell Site

## **Highlights of Cape May UAS Demonstration on 6/20/2017:**

- Flight ops in Cape May, NJ, drone at 2000' ft. MSL (Mean Sea Level) 2000' ft. radius.
- Connections from ground based UEs (User Equipment) flawless.
- Applications accessed: Voice, text, streaming video, social media.
- 39 users connected.
- 9 targeted handsets presented to first responder participants.

# Utilizing UAS to Evaluate Network Facilities

- Damage evaluation
  - Infrared imagery (non VZ Tower shown)
  - Site Surveys



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# Damage Evaluation



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## Drone Activities by State and Federal Entities

NJ Dept. of Transportation Aviation Dept. is taking a leadership role in defining standards for drone use by state agencies. Participated in our Cape May Tabletop Exercise, September 2016.

NJ State Police & Office of Homeland Security and Preparedness (OHSP) are interested in drones for disaster response.

All active large area Certificates of Authorization (COA) active in the state are in Cape May County.

- One is managed by the Virginia Tech Test Site: 250 square miles
- One is managed by the New Jersey Institute of Technology: ~175 square miles
- One is managed by the New Jersey Innovation Institute: ~150 square miles

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## Drone Activities by State and Federal Entities – cont.

**Cape May County has acquired it's own COA from the FAA. It's 800 square miles in extent with a 7,000' ceiling. They used this COA for a hurricane response UAS exercise during the week of June 19.**

### **Participating Universities & Agencies:**

New Jersey Innovation Institute (NJII),

Rutgers has a "bottoms up" organic program underway, led by the Center for Advanced Infrastructure and Transportation: <https://cait.rutgers.edu/>

Rowan University and Atlantic Cape May College both have programs underway.

Princeton also has activity underway.

FEMA has expressed interest in our flying cell site capability.

# • Press



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10.31.2016 | Network

## Verizon uses different types of drones for network performance

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10.14.2016 | Emergency Management

## Verizon uses drones for cell site inspections in the Carolinas in wake of Hurricane Matthew, another tool for reliability

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[@my3screens](#)



First aerial survey speeds cell site recovery to just hours compared to potentially days based on severity of flooding



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- Press

### Media Coverage to Date

- Philadelphia Business Journal, [Verizon tests out 'cutting-edge' disaster relief technology in Cape May County](#) [subscription required, see here for [full text](#)]
- SNJ Today (New Jersey), [Drone Technology Could Help Emergency Responders After Serious Storms](#)
- Reporter Ted Greenberg's story aired on WNBC-TV NYC ([TV eyes link](#), and WCAU-TV Philadelphia June 19, 2017 [http://www.nbcphiladelphia.com/news/local/Drone-Emergency-Response\\_Philadelphia-429770253.html](http://www.nbcphiladelphia.com/news/local/Drone-Emergency-Response_Philadelphia-429770253.html))

# Skyward Acquisition

- Skyward, a Verizon company, enables businesses of all sizes to manage and scale all aspects of a drone operation, from automating workflows to equipment maintenance, and from collaborative flight planning to crew management.
- What Is It
- Skyward's drone operations software is the most efficient way to power a commercial drone program.
- What Can It Do
- Know where it's safe to fly with interactive airspace map.
- Collaborate with team members in the field and keep track of flight hours, flight jobs, records, and maintenance.
- Automate workflows for maximum safety and efficiency.
- Keep all records in one centralized location that your team and other stakeholders can access, from anywhere.
- Quickly log operations with multiple flights. Meet regulatory and insurance requirements.

# The most efficient way to power your drone program:



PLAN



PROVISION



FLY



PROCESS  
PROCESS



DELIVER



ANALYZE & IMPROVE



# Skyward, A Verizon Company

- Who Will Be Interested?
- Construction/Engineering
- Media
- Insurance
- Agriculture
- Oil and Gas
- Energy
- Telecom
- Local, State and National agencies

Thank you.

# Committee on Critical Infrastructure