



# UAVs and Transmission Structure Inspections - Dominion VA Power Use Case

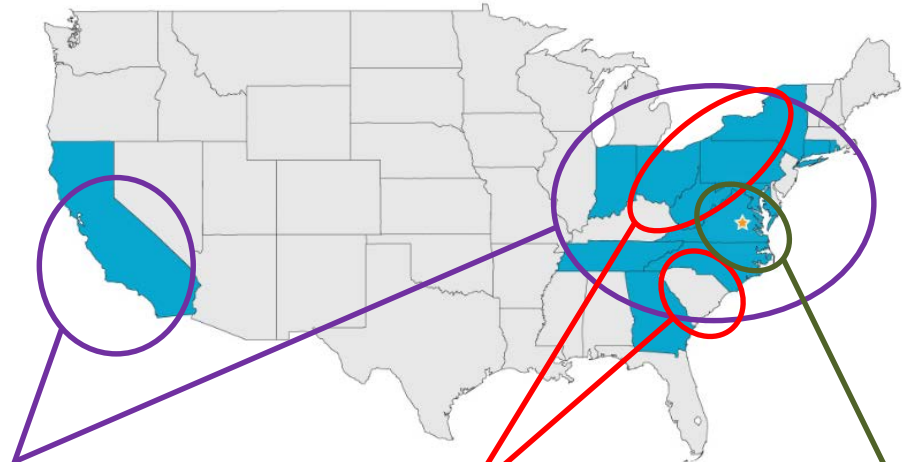
*Steve Eisenrauch*  
*Manager Transmission Forestry and Lines Services*  
*Dominion VA Power*



# Dominion

## At A Glance:

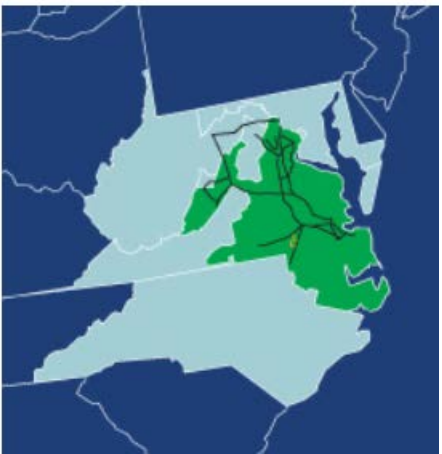
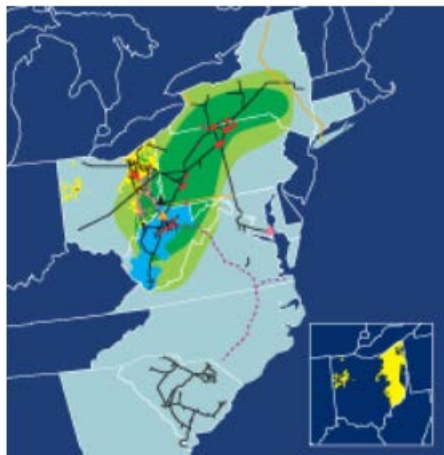
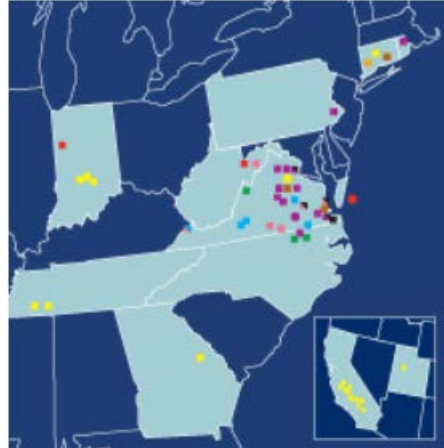
\$54.3 Billion in Assets  
5 Million Retail Customers  
14,429 Full Time Employees  
24,600Mw Electric Generation  
**6,500 Miles Electric Transmission**  
57,100 Miles Electric Dist.  
10,900 Miles Natural Gas Trans.  
18,800 Miles Natural Gas Dist.  
949 Bcf UG Natural Gas Storage



DOMINION GENERATION

DOMINION ENERGY

DOMINION VIRGINIA POWER



## Core Values:

- Safety
- Ethics
- Excellence
- One Dominion



# Safety

- UAVS have the potential to:
  - Reduce unnecessary climbing of structures by line workers
  - Reduce the need to traverse difficult access areas
  - Reduce the need to utilize helicopters



# UAS Timeline

2013

- Program Initiated

2014

- Tethered Test Flight
- Discussions with the MAAP
- Discussions with NASA
- Joined AUVSI

2015



# UAS Timeline

2014

- Non-Tethered Test Flights
- UAV Demo Day
- Legal & Risk Review
- Media Day

2015

- UAV CVI Inspections on R/W – Helicopter Comparison
- External Website and Brochure
- Safety Incident Investigation
- Line Operation Flights
- Beyond Horizons Initiative

2016



# UAS Timeline

2015

- Continued VLOS UAV Comprehensive Patrols
- Discussions with MAAP – BLOS

2016

- Test Flights
- Emergency Restoration
- Routine Patrols

2017 - 2025

- Real Time Line Operation Investigation



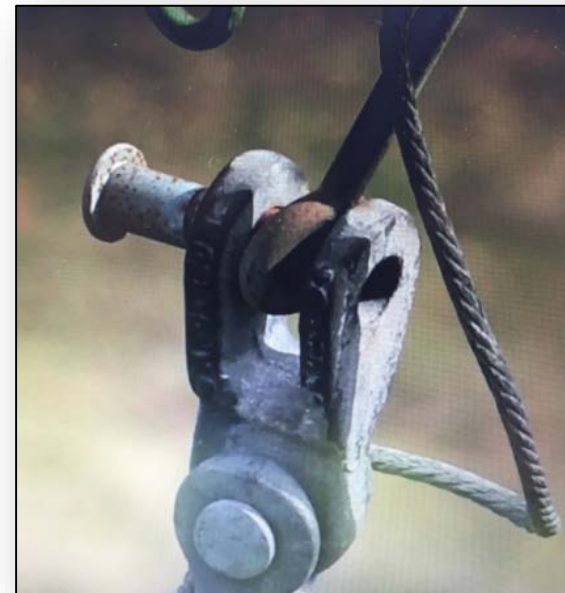
# Why Dominion Chose a Service Provider Model

- **Upstart** – Service provider is trained & has equipment.
- **UAV Model Upgrades** – The utility is not held captive to yesterday's outdated technology
- **Diversity** – Many service providers, many options
- **Linemen Investment** – Keep the linemen doing line work, no down time for training
- **Budget Swings** – Service provider can efficiently be ramped up or down
- **Utility Staffing** – Less support needed
- **Risk** – Reduced risk to the utility



# UAV vs. Helicopter Comparison

- 65 Line:
  - 115kV - 330 Structures
- Comprehensive Inspection:
  - Helicopter 3 Days // UAV 28 Days
    - 111 - Same Issues Found
    - 44 - Issues Not Found by UAV
      - Rust & Contamination
    - 305 - Additional Issues Found by UAV
      - Woodpecker Holes, Splitting, Pole Cap, Encroachments, Asset Tag, Missing Hardware, Insulator Damage & Insect Damage

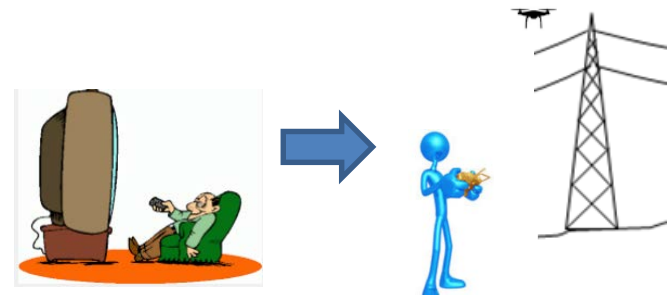


# Near Term Expected Efficiencies

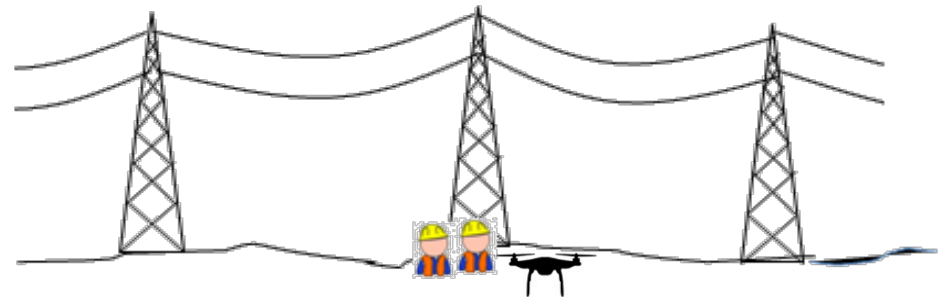
- Switch from heavy lift UAV to more nimble, quicker setup, long battery duration UAV



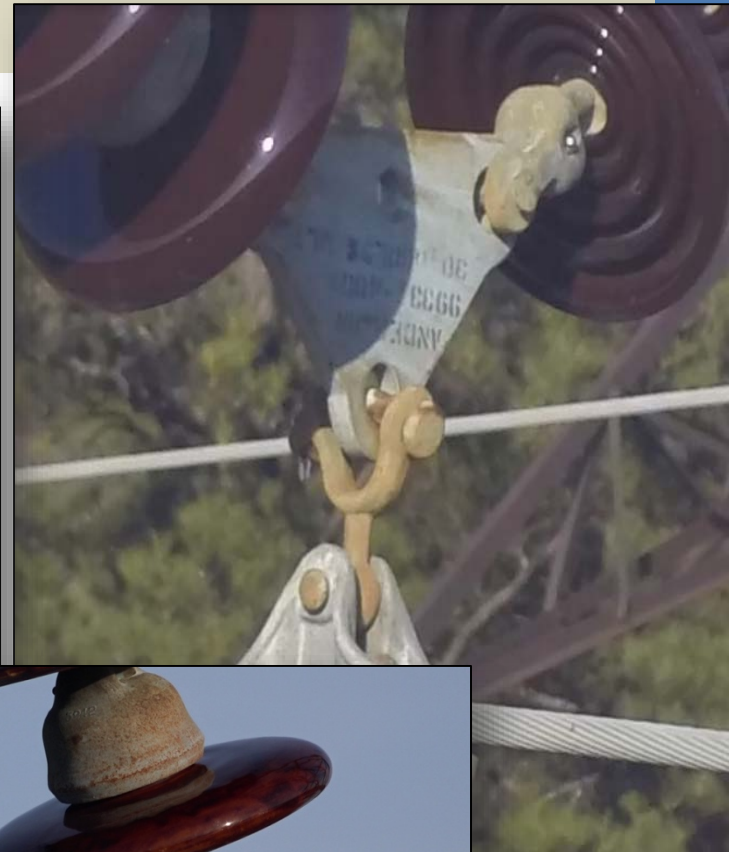
- Move from Ultra-HD video post processing to standardized inspection point HD stills and real time defect detection



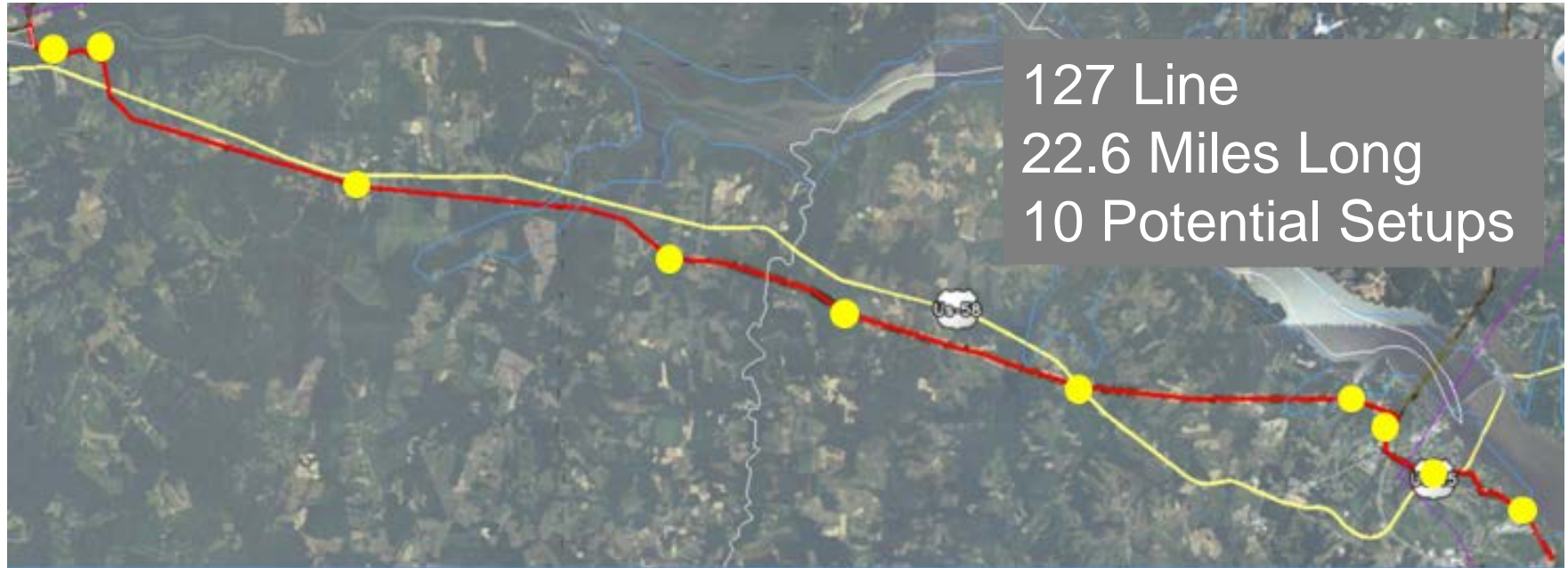
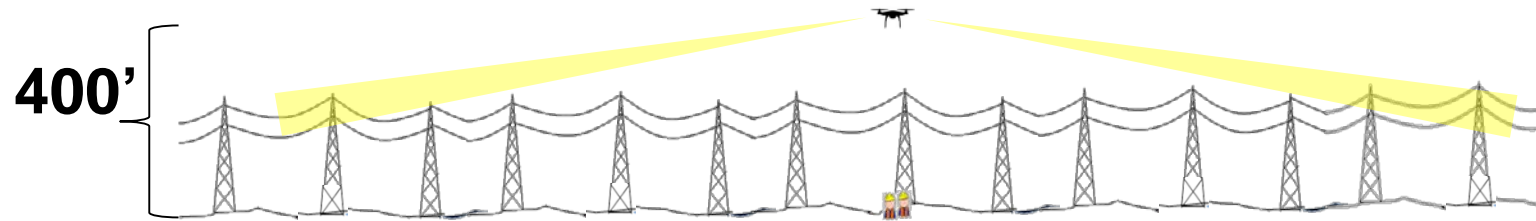
- 3 Structures in 1 setup  
VLOS



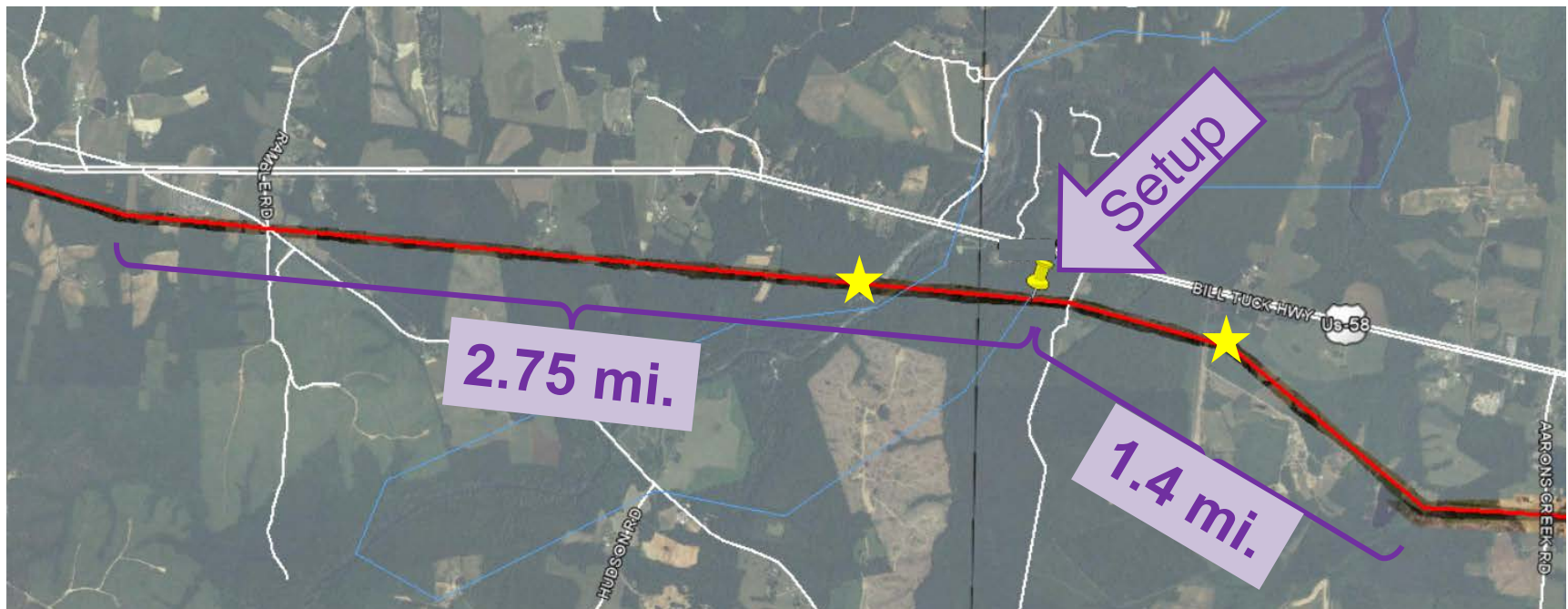
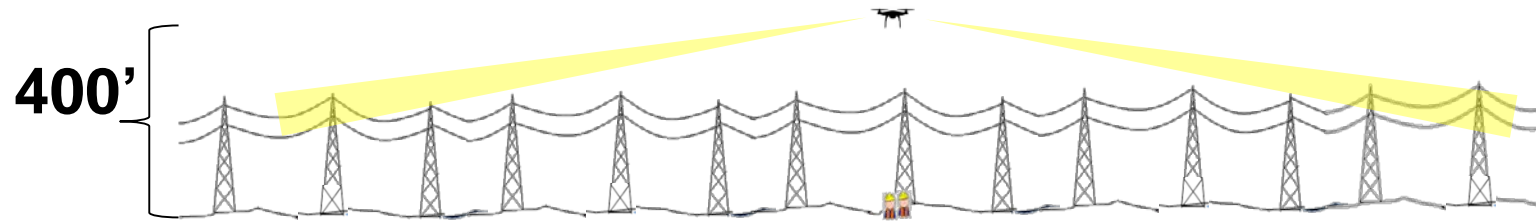
# Imagery From The UAV



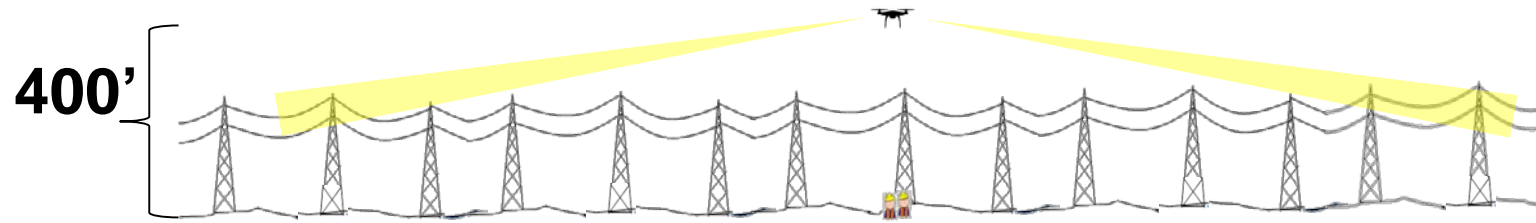
# Storm Restoration Demo



# Storm Restoration Demo



# Storm Restoration Demo



2.75 Miles from  
Setup Point →



# Other Potential Uses for UAVs at Dominion

- **Generation:** Stack Inspections, Coal Pile Volume Inventory, Dam Inspections
- **Distribution:** Storm Restoration Patrols
- **Media Relations:** Provide Video Clips to Media
- **Right-of-Way:** Identifying Encroachments
- **Project Management:** Project Progress
- **Gas:** Right-of-Way Activity
- **Security:** Many Applications
- **Facilities:** Property Layouts, Building Inspections

# UAV Concerns

- Pace of regulation
- Restriction of regulation
- Perceived privacy issues
- Structure access
- Incidents caused as a result of disreputable UAV companies or individuals that slow progress
- Ability of small UAV companies to handle work load without compromising their quality by having to quickly staff up

# Summary

- Advantages for UAVs include: safety, environmental footprint, ease of use and alternate imagery angles
- Disadvantages for UAVs include: pace and restriction of regulation, perceived privacy issues and structure access
- Costs are currently running higher than helicopters, but they are trending down and into the competitive market
- UAS will become a valuable part of a Utilities' tool bag; the only question is how soon



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