

Electricity  
Transmission

# ISO-NE PAC MEETING

05/18/2023

## Adams #21 Substation Relocation

national**grid**



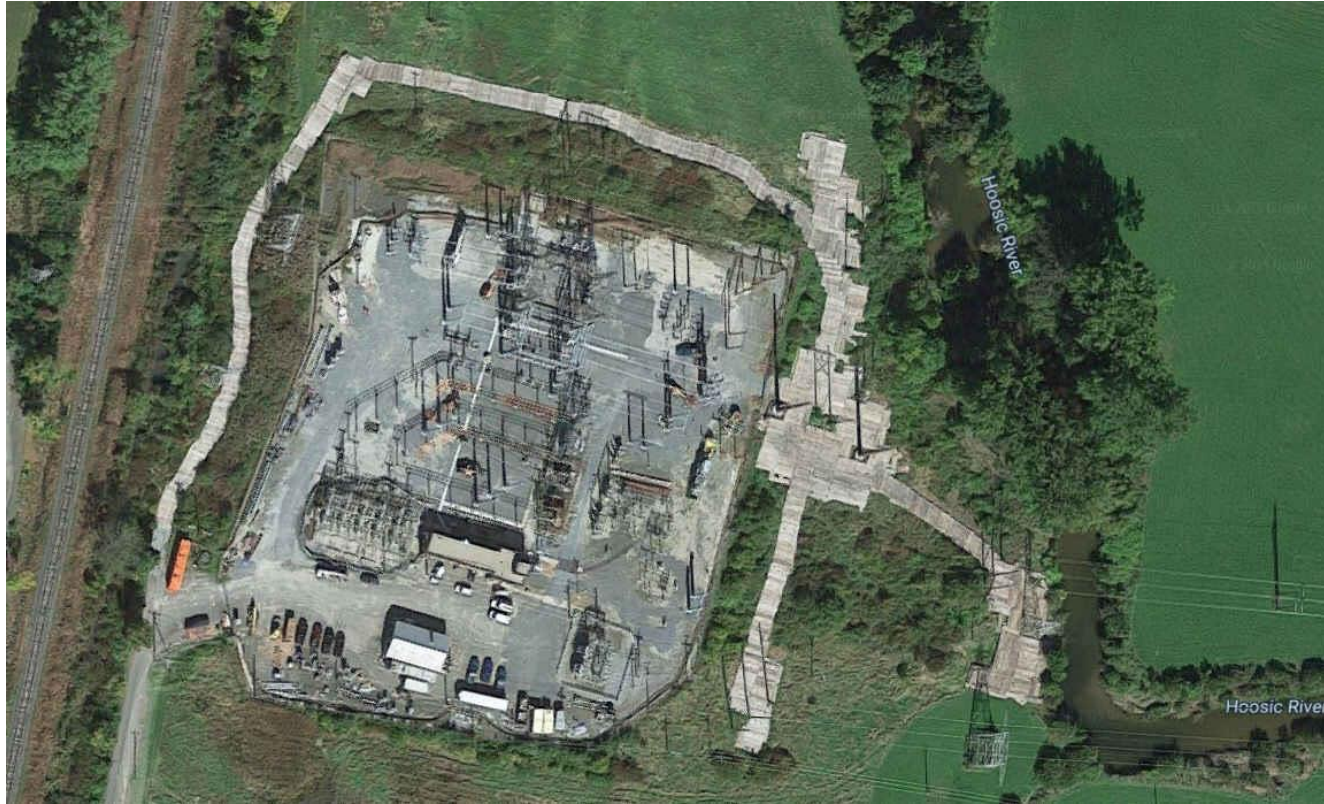
# Outline

Purpose: Discuss the proposed solution for flood mitigation at Adams #21 in Adams, MA

- Aerial View
- Existing Substation One-Line Diagram
- Substation Asset Condition
- Substation Stone Dust & Flood Concerns
- Substation & Equipment Elevation
- Environmental Constraints
- Substation Concerns' Pictures
- Options Analysis
- Proposed Solution
- Proposed Substation One-Line Diagram
- Proposed Substation Layout
- Questions

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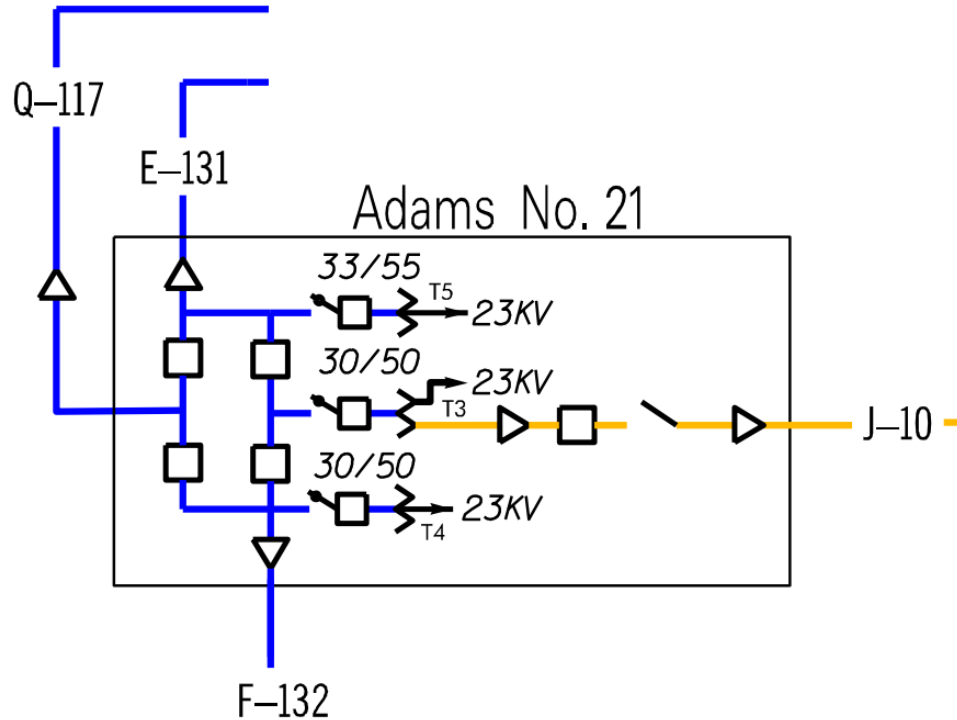
# Aerial View



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## Existing Substation One-Line Diagram



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# Substation Asset Condition

- Adams substation was built in 1917 and in 1960's 115kV sources were added. It consists of 115kV, 69kV, 23kV, 13kV assets, and serves over 18,200 customers
- T3 115kV transformer was installed in 1963 with no secondary oil containment. Recent inspection showed nitrogen leak around the flange
- T4 115kV transformer was installed in 1991, vintage surge arresters need to be replaced



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# Substation Asset Condition, Cont'd

- 69kV gas circuit breaker was manufactured in 1998 and installed in 2002, recent inspection highlighted hydraulic and SF6 issues
- 69kV Switches 3T69, 361, 911 were installed in 1973 and difficult to maintain and operate
- 23kV equipment bus, breakers, cable trays and switches have had numerous asset concerns often operating in excess humidity and stone dust contamination
- Deteriorated control cables due to site condition, high ground water table combined with cycles of freezing and thawing damage control cables in Trenwa or cable trays
- Equipment operated under environmental conditions of excess humidity and stone dust beyond their recommended specifications



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# Substation Stone Dust & Flood Concerns

- The existing substation is in wetland area and adjacent to Hoosic River, within 100-year FEMA flood zone
- In close proximity to an active lime quarry exposing equipment to excess amounts of stone dust
- New study has shown river is encroaching the site boundaries due to a new meander formation
- Access limitation and operational concerns during a flooding event (i.e., 2007, 2014, 2015, 2018 floods)



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# Substation Stone Dust & Flood Concerns, Cont'd

- Substation has flooded several times and resulted in equipment failure (circuit breakers flashover) & loss of all 18,200 customers for durations ranging from 2-7.5 hours.
- To date, only distribution equipment has failed due to flooding, and vacuum breakers seem to be the most impacted by humidity and dust

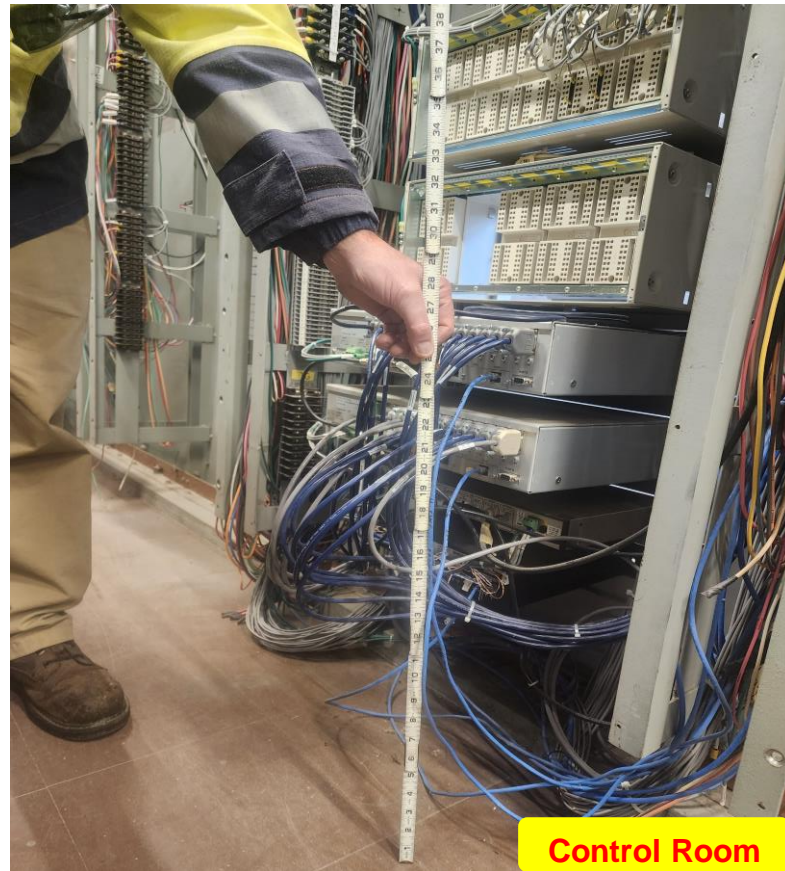


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# Substation & Equipment Elevation

- Substation elevation: 718' – 721' above sea level
- FEMA 1983 100-year elevation: 722' to 723' , adjusted 100-year & 500-year peak flood after hydrologic study by GeoEnvironmental Inc (GZA): 723'3" & 725'
- Control room floors are at 722'11" and 721'10" elevations. A 100-year flood here would result in ~ 4" and 18" water, a 500-year flood would be at ~ 28" and 42"
  - Most of the control panels have been installed on the floor, so flooding the control room would short-circuit multiple pieces of equipment, including relays, resulting in the loss of protection on major equipment



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# Substation & Equipment Elevation, Cont'd

- Sensitive transmission equipment panel elevations in the yard range from 723'8" – 726'; however, over 75% of them are installed under 725'



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# Environmental Constraints

- Substation is within 100-year flood zone, surrounded by wetlands, rare plants and wetland mitigation areas on all sides (except access).
- Substation site considered at High Risk for extreme participation and riverine flooding events by the Resilient MA Action Team's Climate Resilience Design Standard Tool (EOEEA).
- Maintenance projects are heavily scrutinized by regulatory agencies given these constraints.
- Any modifications to “future-proof” the substation to increase resilience from more frequent flooding/climate impacts would undergo significant agency scrutiny and require detailed alternatives analysis, including the evaluation of alternate sites.



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# Substation Concerns' Pictures



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# Substation Concerns' Pictures, Cont'd



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# Substation Concerns' Pictures, Cont'd



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# Options Analysis

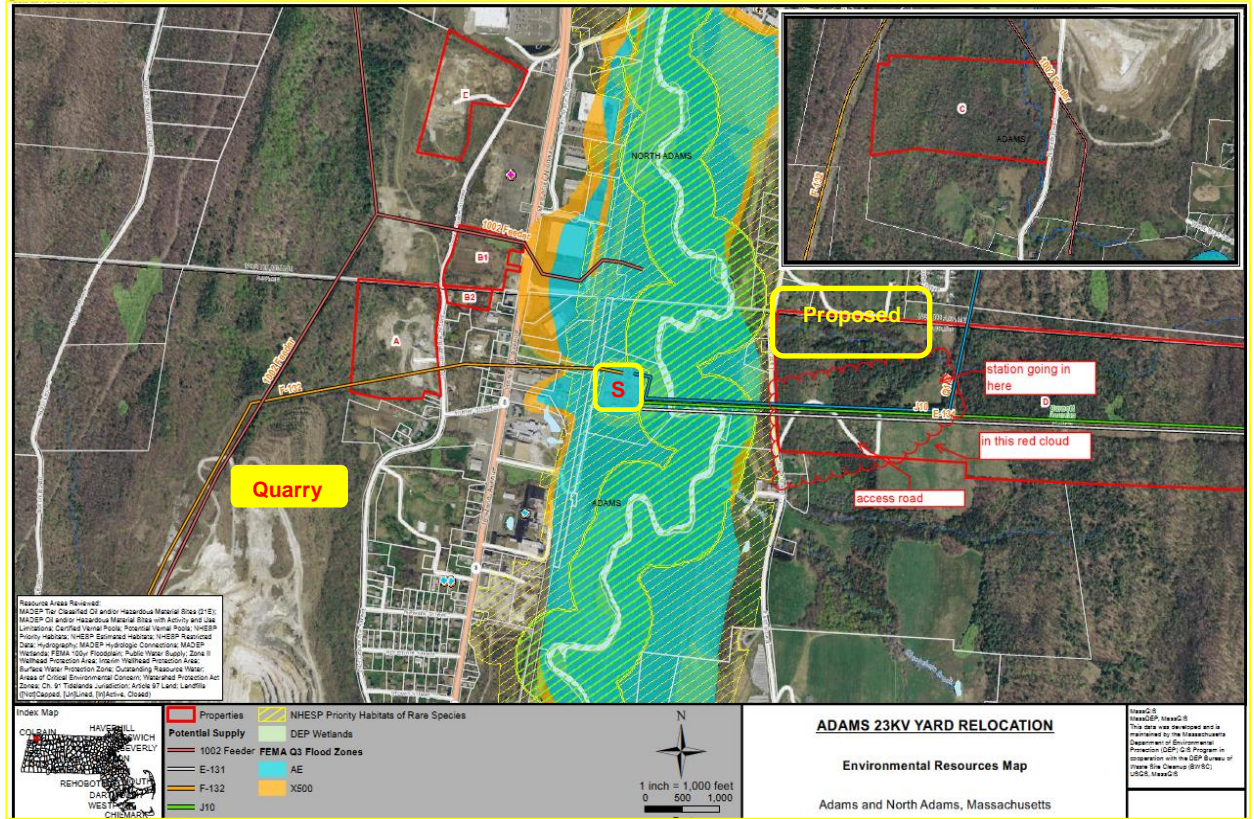
- Raise/rebuild of impacted equipment at the existing location was ruled out due to flood plain constraints (as noted in slide 11)
- Perimeter barriers were ruled out due to environmental constraints.
  - The agencies, MassDEP and the Natural Heritage & Endangered Species Program in particular, are highly sensitive to the repetitive impacts that have occurred in this area. A detailed alternative analysis would be required and scrutinized.
  - Given the high groundwater table adjacent to and within the substation, it's likely that groundwater will still inundate the substation during storm events given the permeable nature of the ground conditions



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- Alternative site analysis was completed. Over a dozen parcel locations were considered, but ruled out due to the following criteria:

- The proposed site satisfied all the above-mentioned criteria



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# Proposed Solution

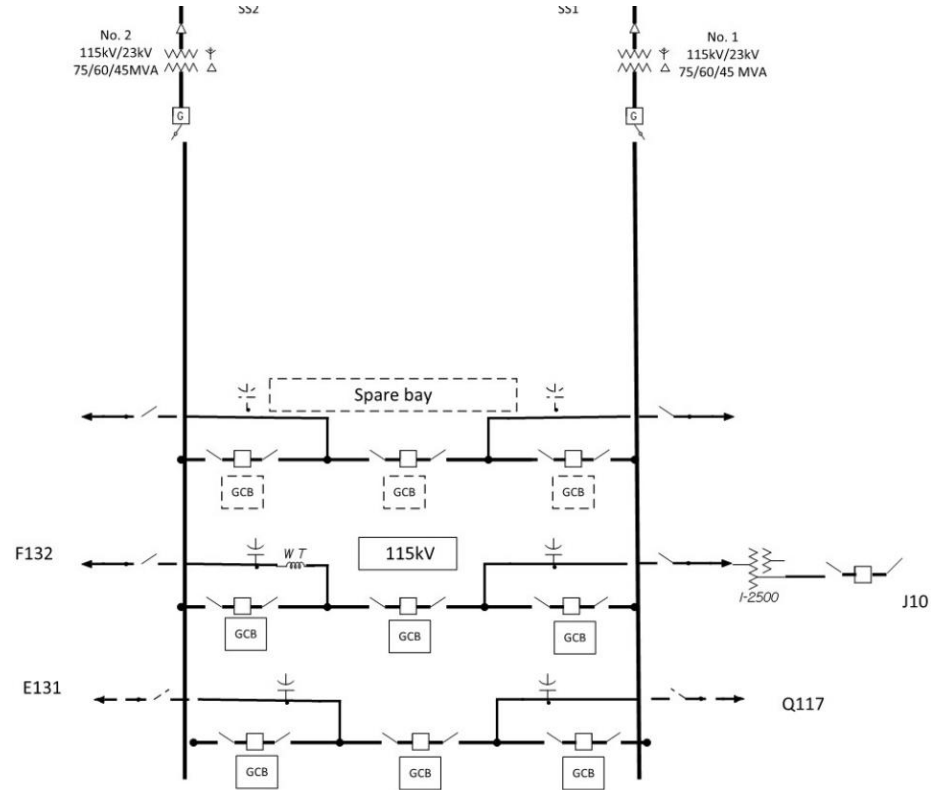
## Relocate substation to a higher elevation and install new assets:

- Preferred location: 1640 Church St, North Adams, elevation between 2,585' - 3,155'
- Install new assets for each yard and reroute the overhead line in and out of the new location
- Major new assets include:
  - Two 115kV bays of 115kV 3000 Amp tubular aluminum bus
  - Six 123kV 3000 Amp gas circuit breakers, one 69kV vacuum circuit breaker
  - One 115kV/69kV/14kV Auto with tertiary 30/40/50 MVA transformer, two 115kV/23kV 45/60/75 MVA delta/grounded Y power transformers
- Expected in service date will be the first quarter of 2030
- Existing substation will be removed, stabilized and allowed to revegetate
- 115kV T5 and breakers will be kept as spares, a few line structures will be reused for F-132 or D-Lines to the new location and the rest will be removed
- Total T&D Project Cost \$133.5M (+50/-25%), \$55.1M PTF

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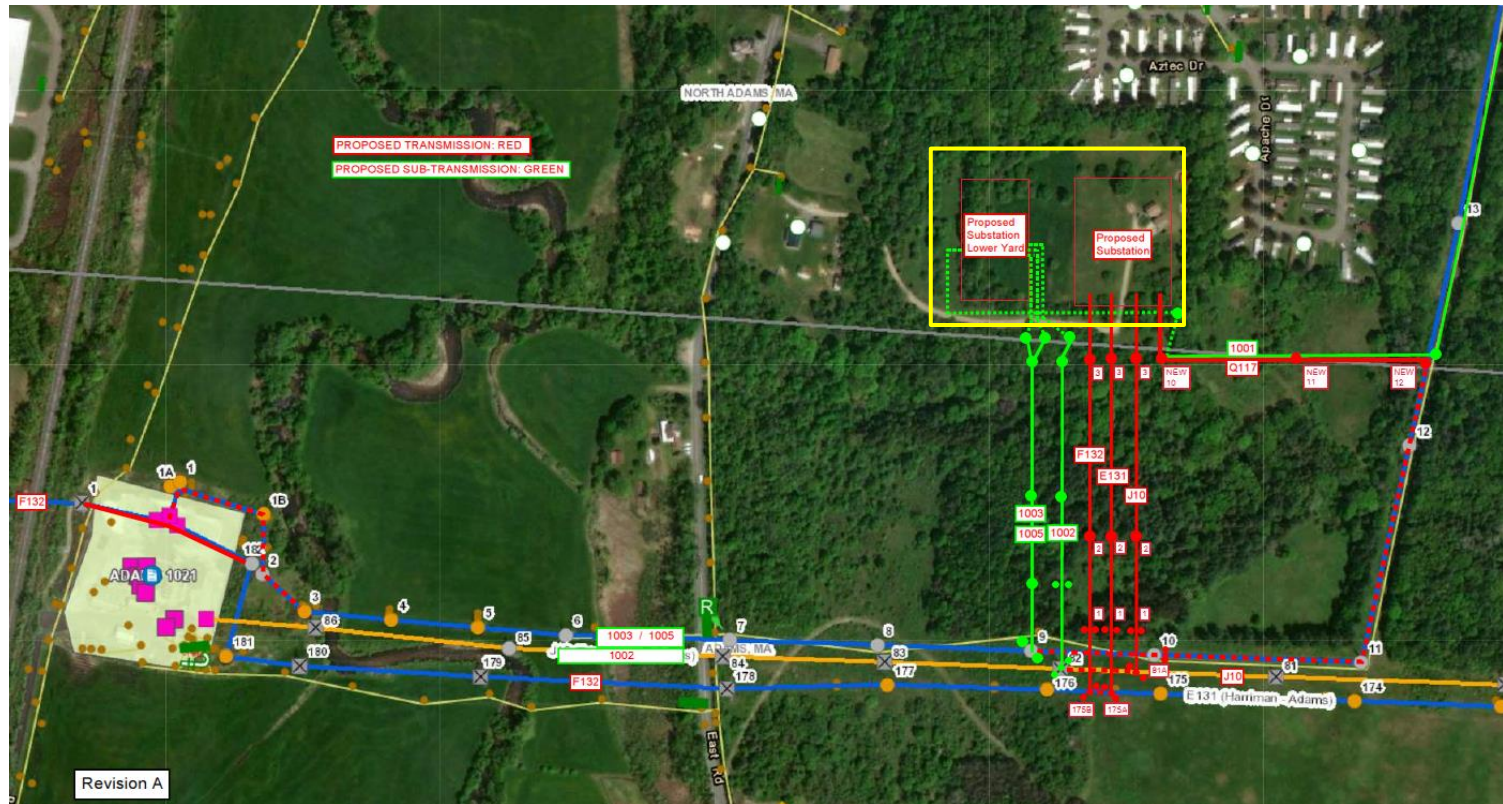


# Proposed Substation One-Line Diagram



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# Proposed Substation Layout



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