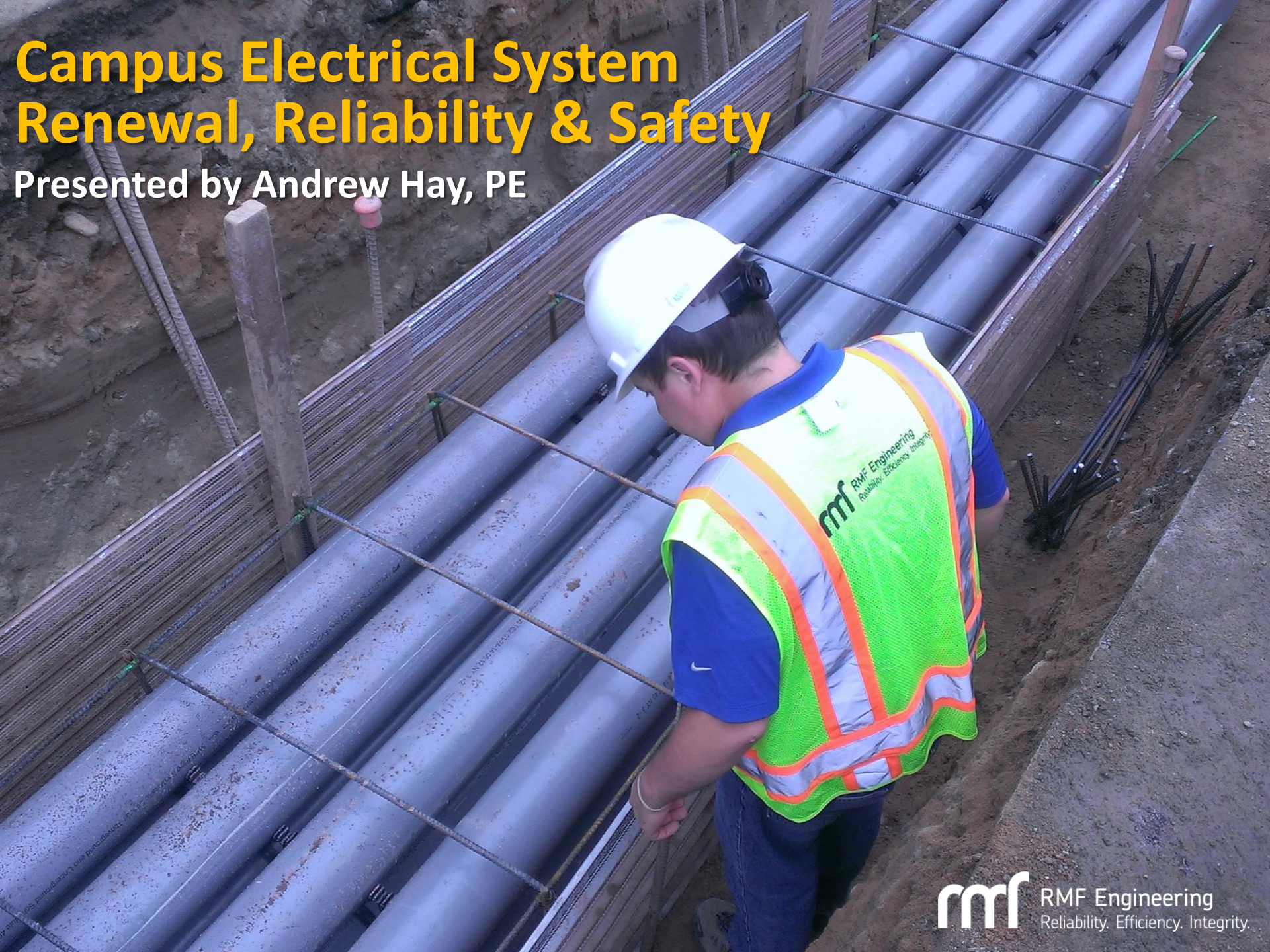
Campus Electrical System Renewal, Reliability & Safety

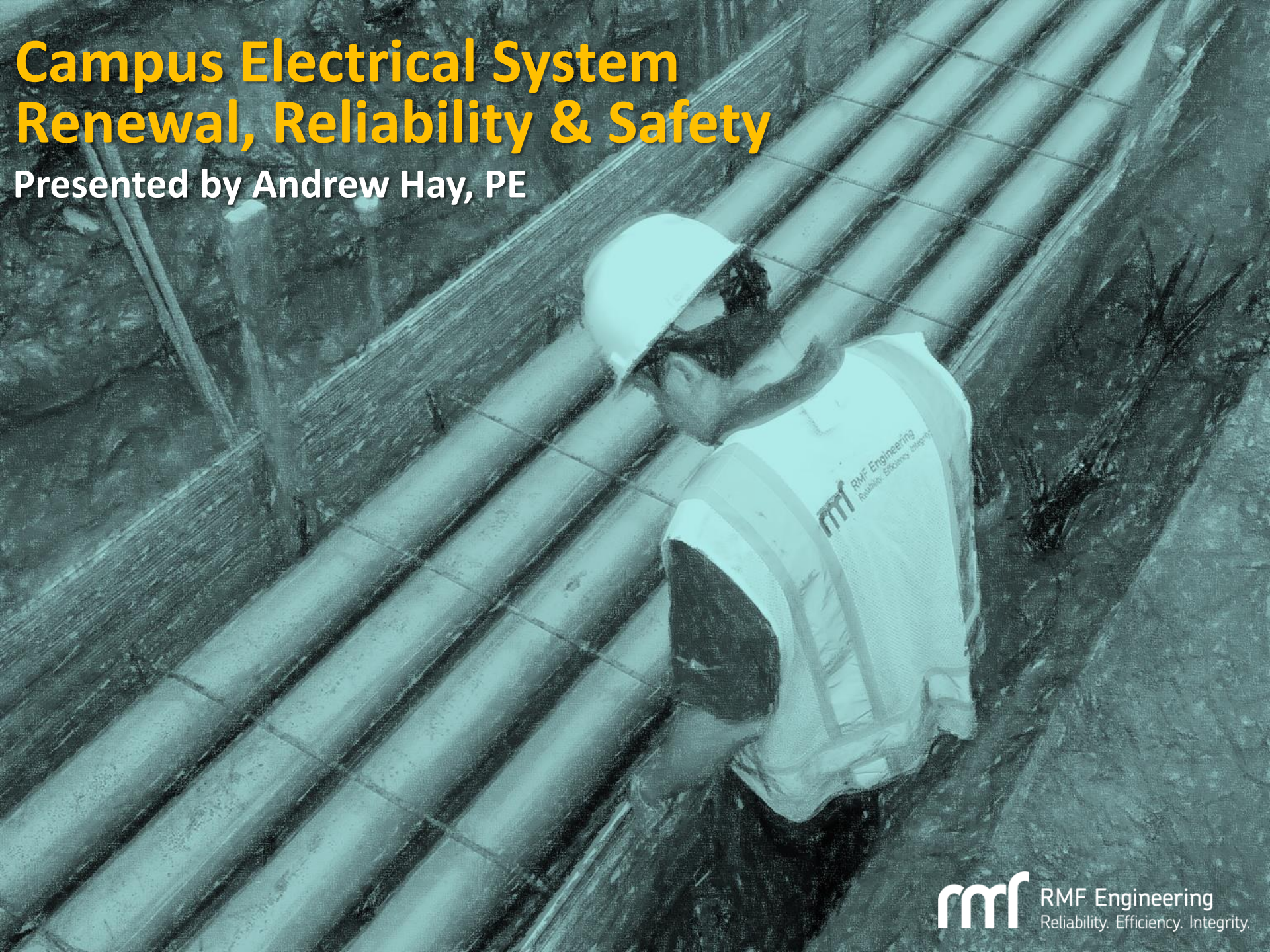
Presented by Andrew Hay, PE



RMF Engineering
Reliability. Efficiency. Integrity.

Campus Electrical System Renewal, Reliability & Safety

Presented by Andrew Hay, PE



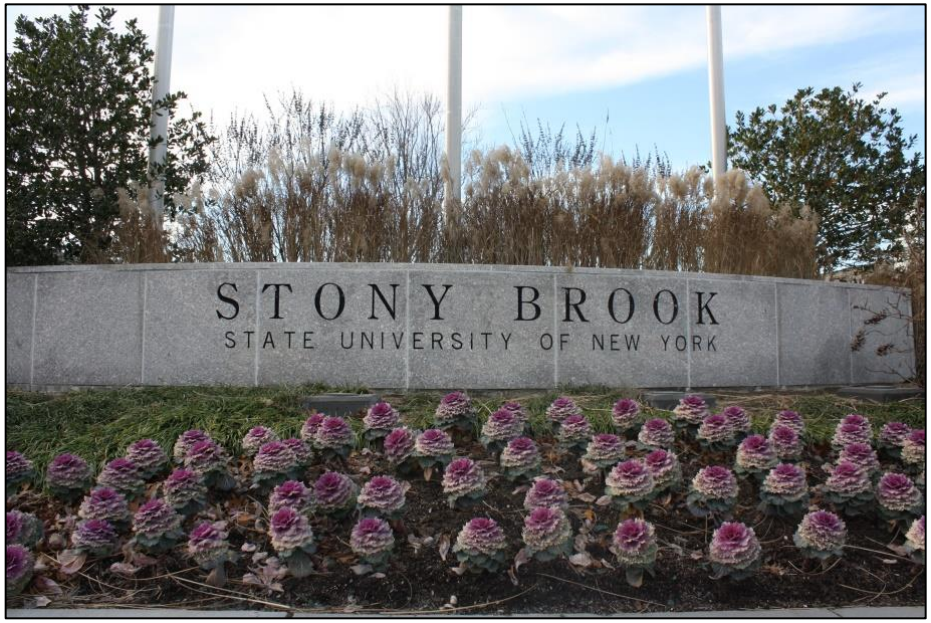
RMF Engineering
Reliability. Efficiency. Integrity.

Key Factors of Resilient Electrical Systems

- **Reliability**
- **Flexibility**
- **Safety**
- **Maintainability**

Stony Brook University

- **25,000 students on a 1,000 acre campus on Long Island**
- **200 major buildings with a combined area of more than 11 million GSF**
- **1 of 10 universities nationwide recognized by the National Science Foundation for combining research with undergraduate education**

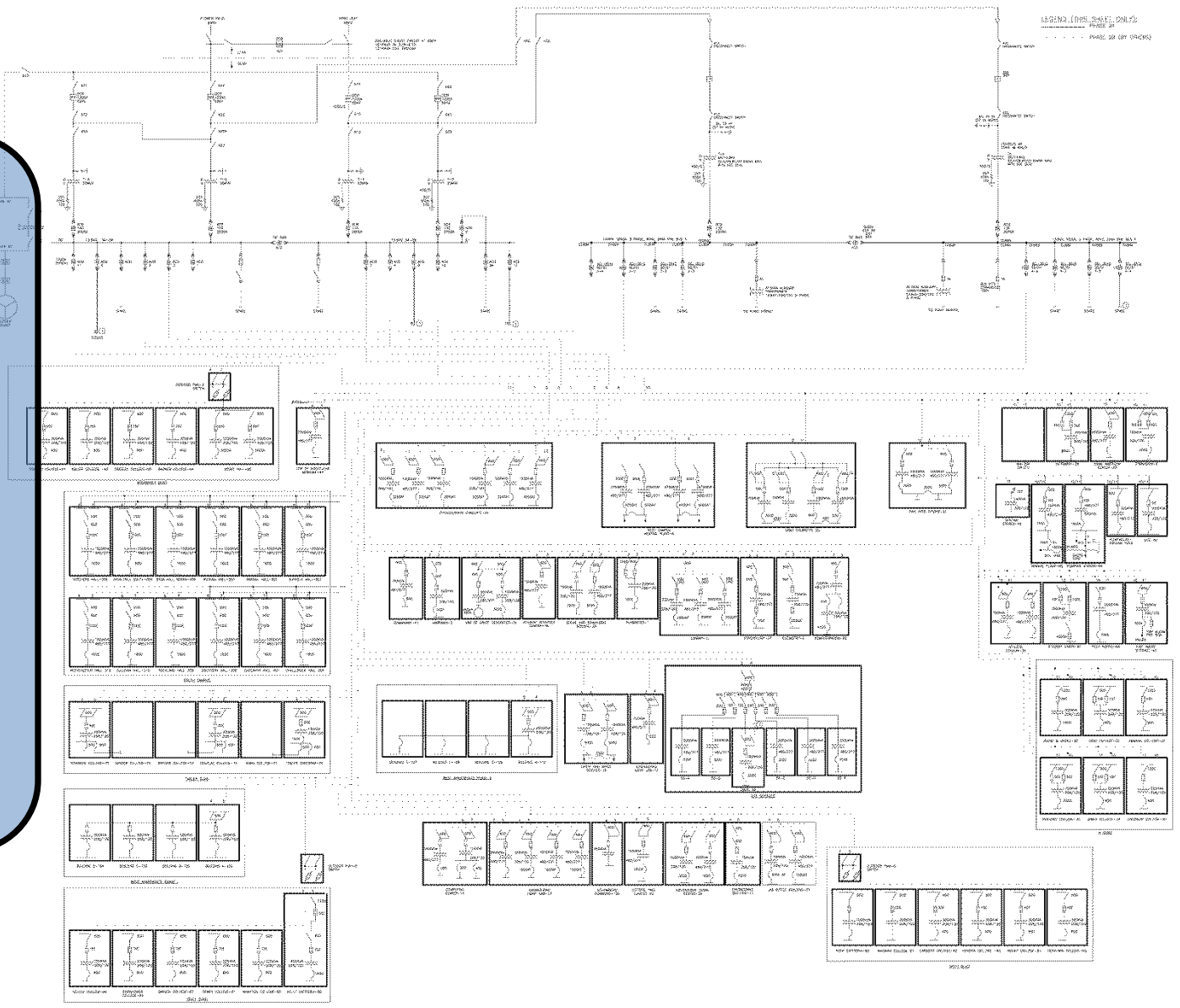


Stony Brook University Hospital

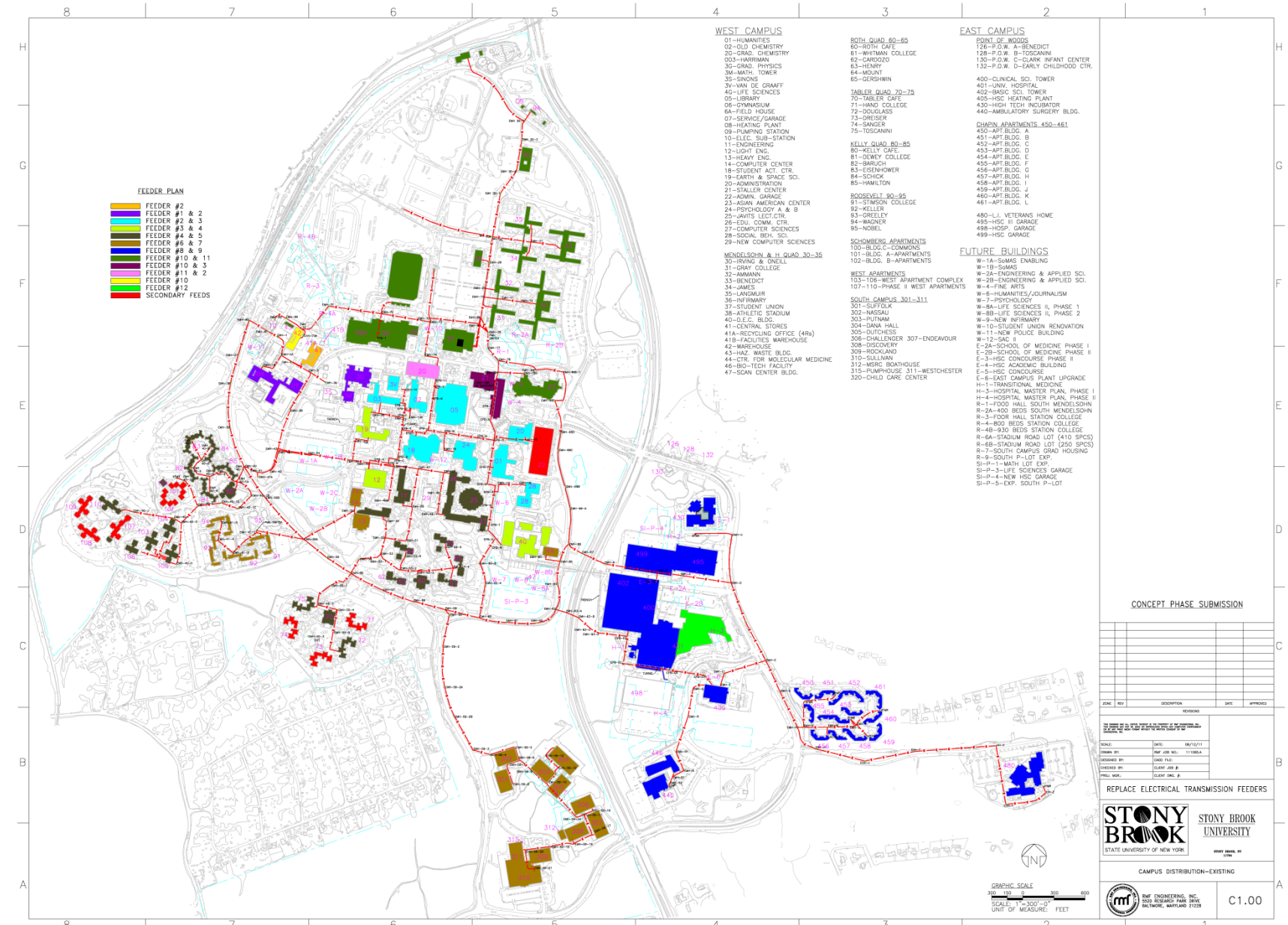
- 600 bed hospital serves as the region's only Level 1 Trauma Center
- 100,000 emergency room visits in 2014
- Currently building an 8 level 240,000 SF Medicine and Research Translation (MART) Building and 225,000-square-foot new Bed Tower
- $100 million in research expenditures

Existing Campus System Configuration

- 36MVA Peak Demand
- 30 MW on-site 3rd party operated cogeneration
- 16,500 tons of electric cooling
- 13.8kV Dual Radial System Distribution
- 13 Distribution Feeders



Existing Feeder Configuration



Reliability Concerns of System

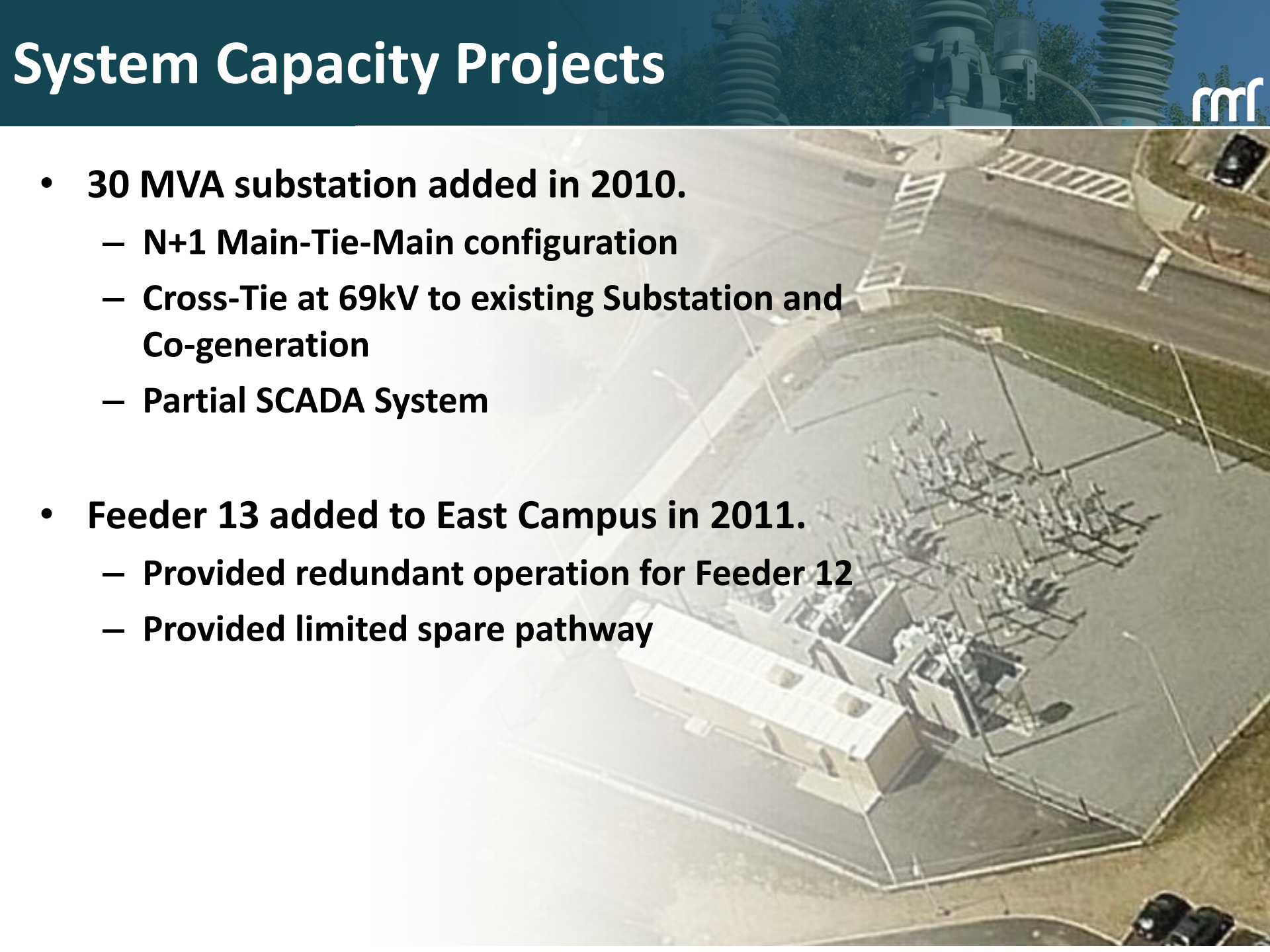
- Aging Infrastructure – 50 years
- Capacity – Substations and Distribution
- Diversity in Distribution Feeders
- Existing pathway limitations
- Maintenance Issues

- 2-3 Failures per year for the last 10 years
  - Some failures required 10+ temporary generators to maintain operation

System Capacity Projects

- **30 MVA substation added in 2010.**
  - **N+1 Main-Tie-Main configuration**
  - **Cross-Tie at 69kV to existing Substation and Co-generation**
  - **Partial SCADA System**

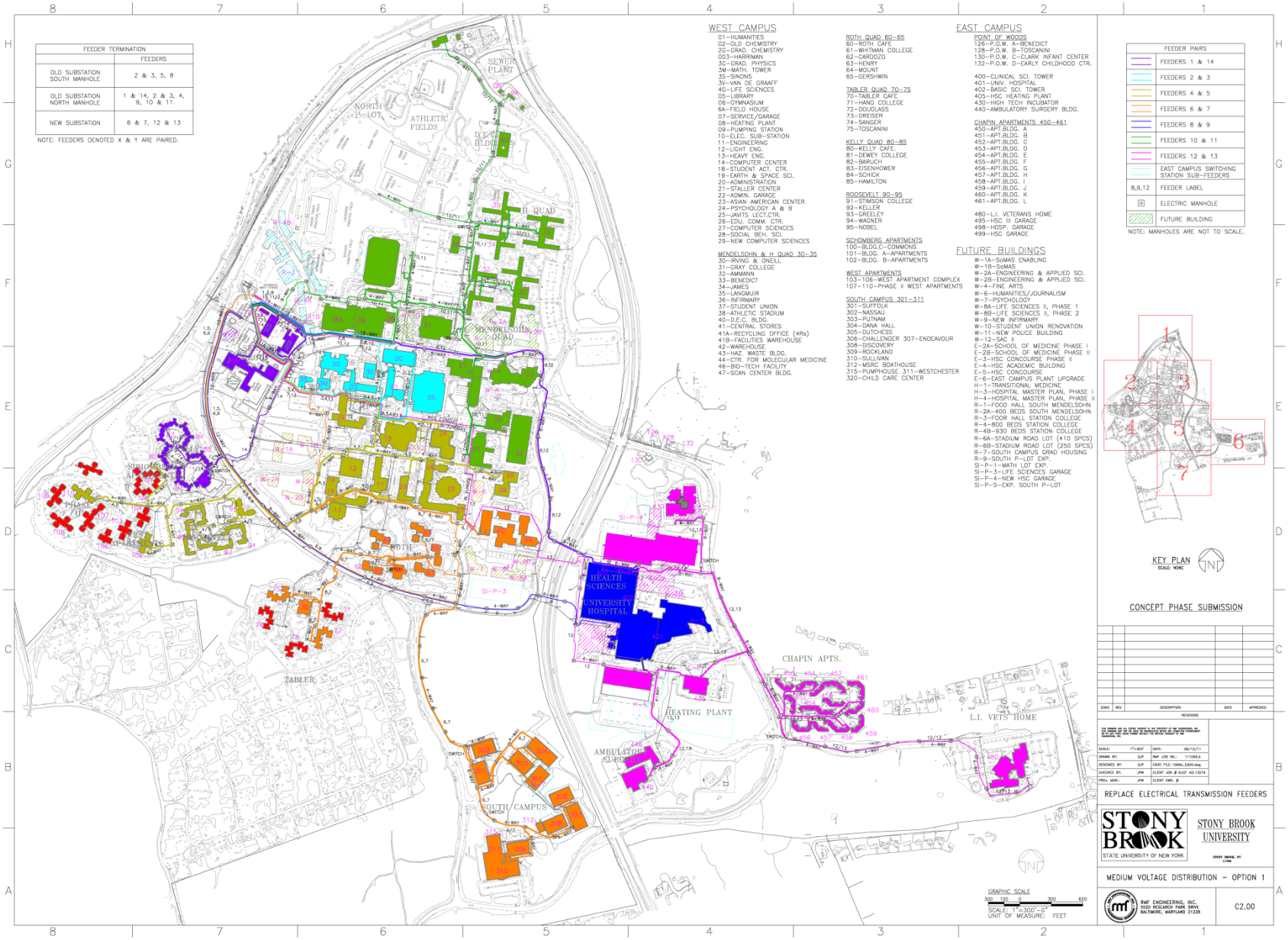
- **Feeder 13 added to East Campus in 2011.**
  - **Provided redundant operation for Feeder 12**
  - **Provided limited spare pathway**



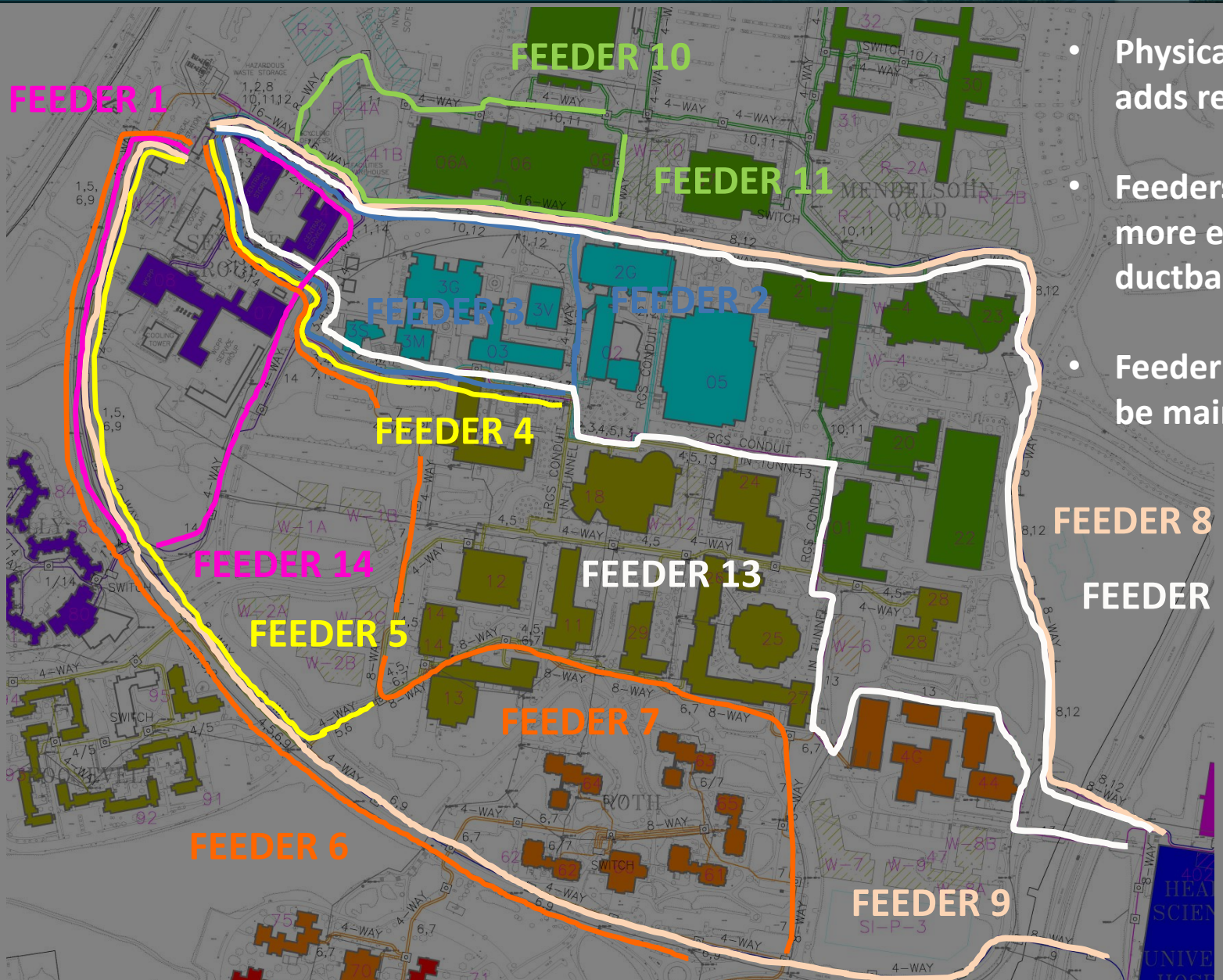
Distribution Upgrades

- Goal to replace and upgrade all 15kV distribution on the campus down to building service entrance.
- 10 Miles of Electrical Ductbanks with 170 Electrical Manholes
- 117 Building Connections
- Two Trenchless Crossings of County Rd.
- Multiple Bid Packages
- Total Project Cost $46 million

New Distribution Segregation



Pathways



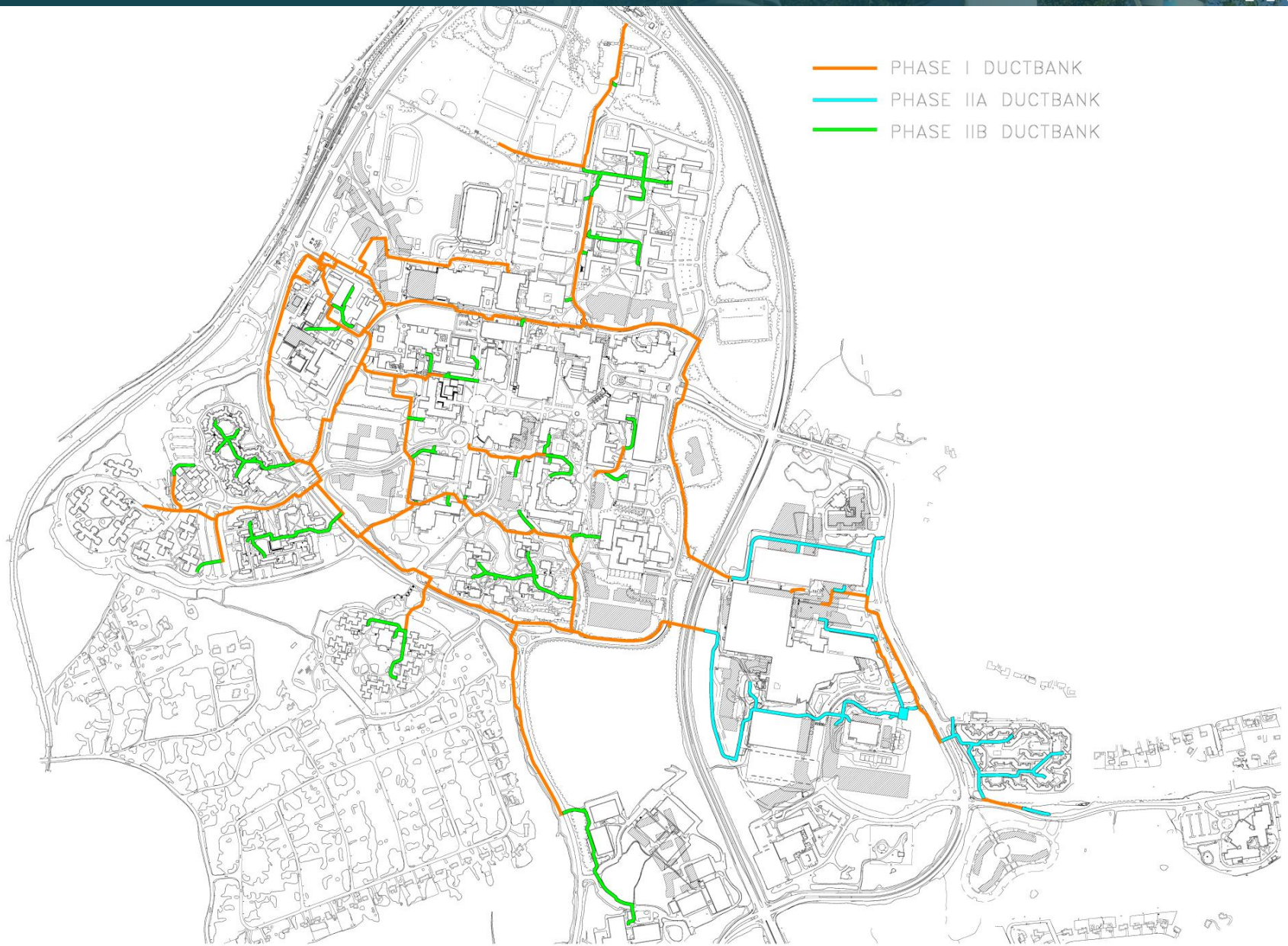
- Physical separation adds redundancy
- Feeders grouped for more efficient use of ductbanks
- Feeder 13 pathway to be maintained

East Campus Single Line

- **New Switch Station**
  - **1200A, 4-bus, 15kV switchgear**
  - **Provides increased flexibility**
  - **Increased resiliency to critical portion of campus**
  - **Planned for future Utility or Generation source and power factor correction**

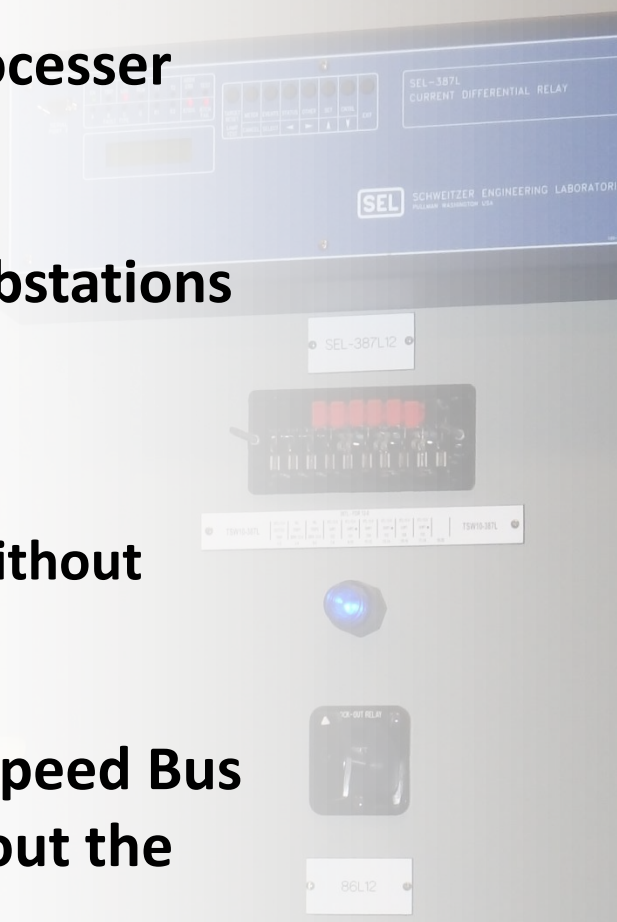
  - **(Graphic is a work in progress)**

Project Phasing



Protective Relays & Personnel Safety

- All distribution relays upgraded to micro-processer relays
- Backup relay scheme implemented on all substations
  - Provides reliability for system protection
  - Provides method for relays to be serviced, without effect to active system
- Use of Low Resistance Grounding and High speed Bus Differential to limit Arc Flash levels throughout the system
- Complete SCADA control of all major substations with remote operation

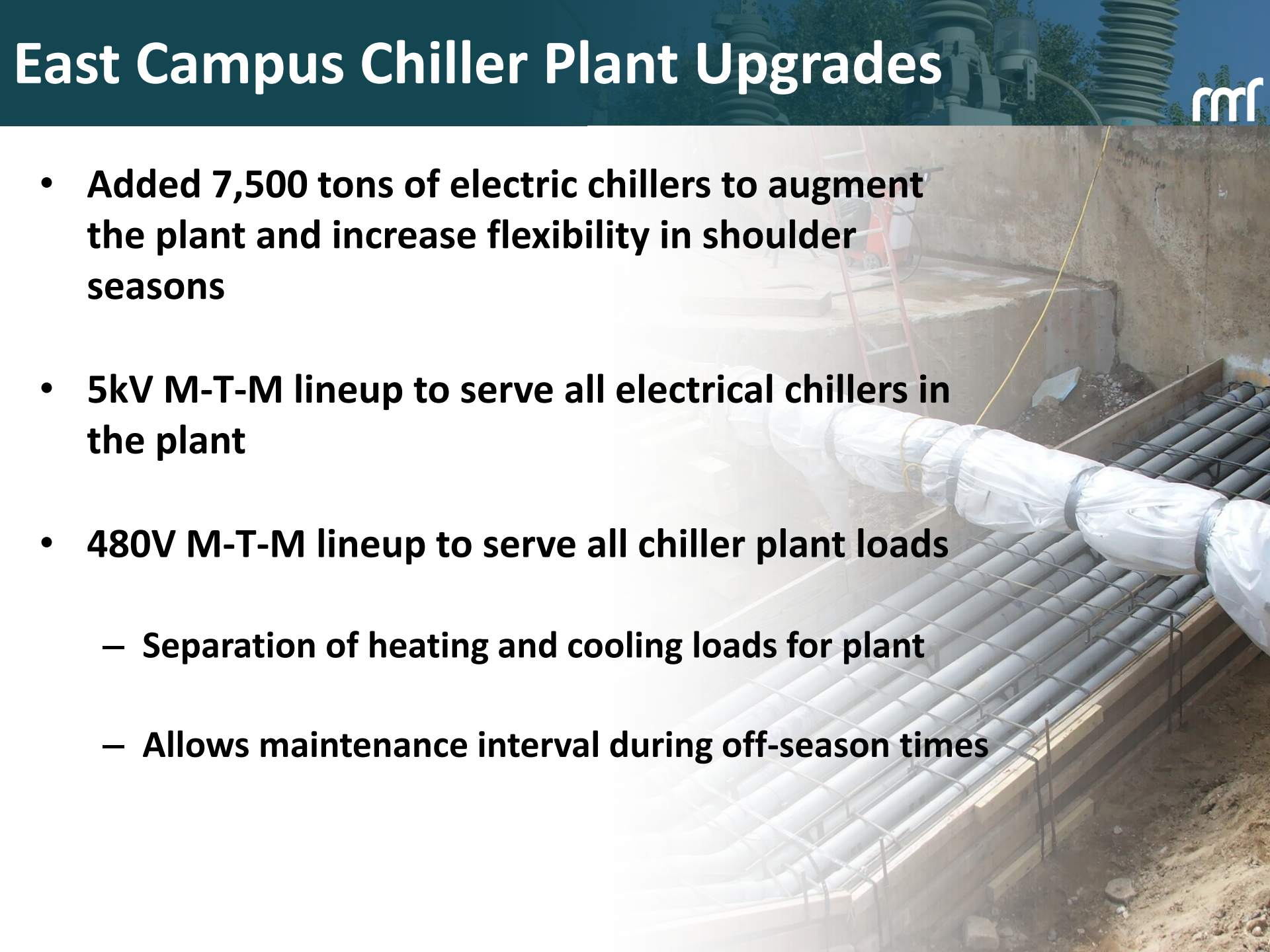


East Campus Plant Expansion

- 9,000 ton capacity to serve Medical Center
- 85,000 PPH Boiler capacity for heating water supply steam to Medical Center
- Year round operations
- All electric for heating and cooling supplied by single M-T-M Unit substation

East Campus Chiller Plant Upgrades

- **Added 7,500 tons of electric chillers to augment the plant and increase flexibility in shoulder seasons**
- **5kV M-T-M lineup to serve all electrical chillers in the plant**
- **480V M-T-M lineup to serve all chiller plant loads**
  - **Separation of heating and cooling loads for plant**
  - **Allows maintenance interval during off-season times**



High Resistance Grounding

- Installed on the East Plant 480V unit substation
- Limits ground faults to 5A
  - Loads do not trip off in response to a ground fault
  - Increase in personnel safety
  - Decrease equipment damage
  - Ground current meters on all feeders to aid with troubleshooting
- Added requirement for single phase load isolation
- Modifications required on existing equipment

Conclusion

- **Increase resiliency of entire distribution system**
- **Increase capacity for future expansion**
- **Increase safety and reduce response time**

INTERNATIONAL DISTRICT ENERGY ASSOCIATION

CAMPUSENERGY2016

Campus Electrical System Renewal, Reliability & Safety

For more information:

Andrew. Hay@rmf.com

RMF Engineering

Reliability. Efficiency. Integrity.