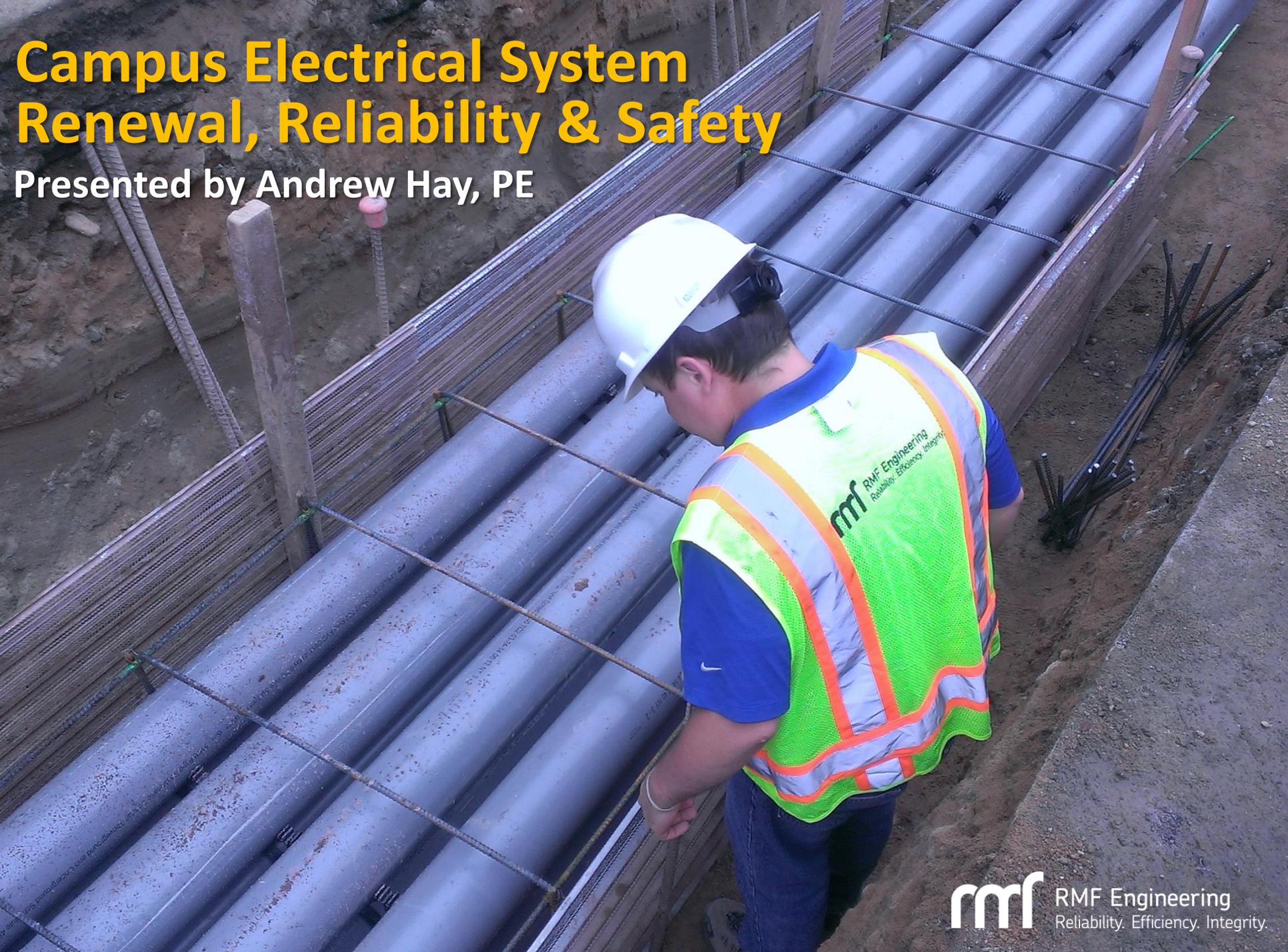


Campus Electrical System Renewal, Reliability & Safety

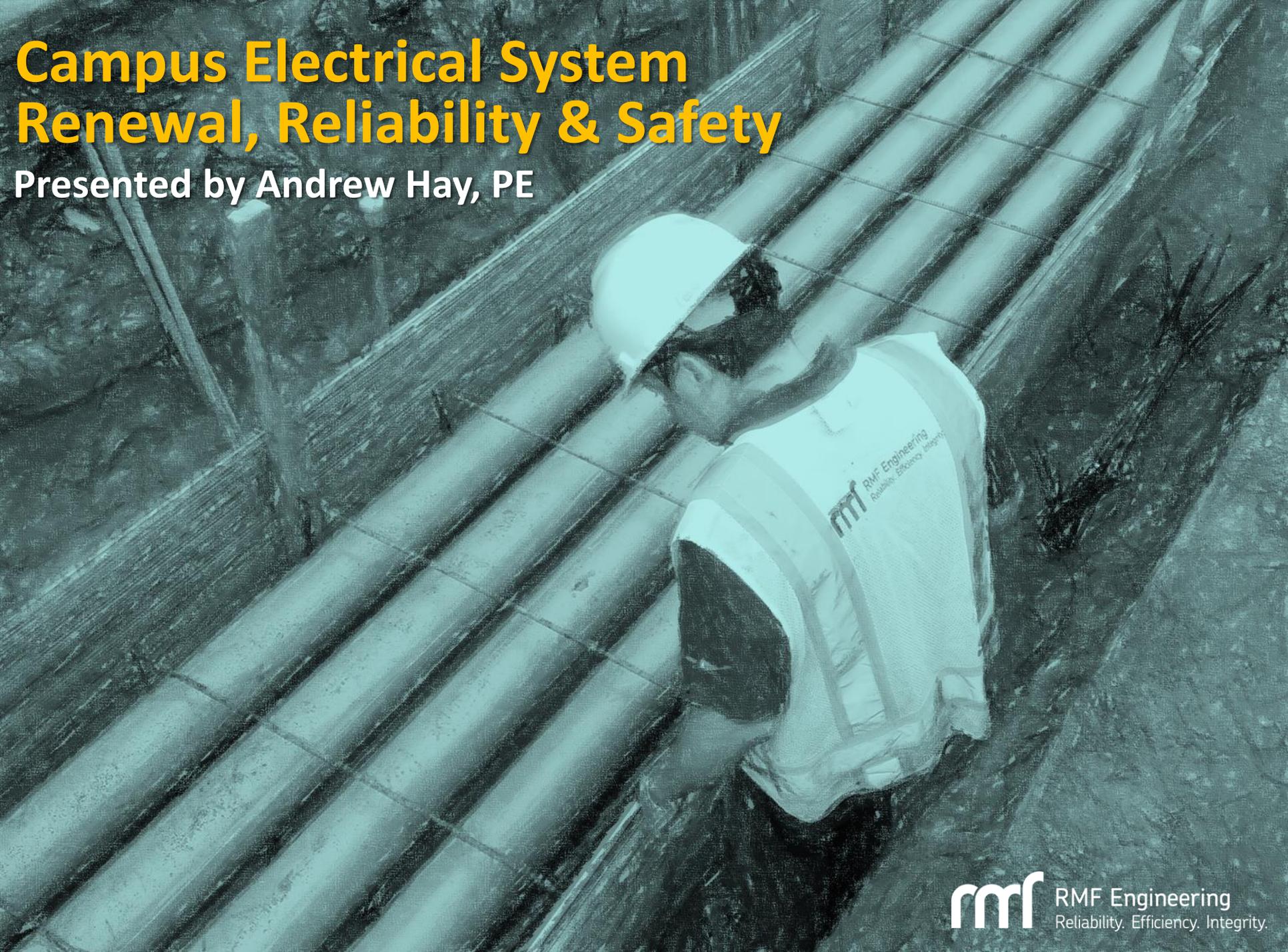
Presented by Andrew Hay, PE



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



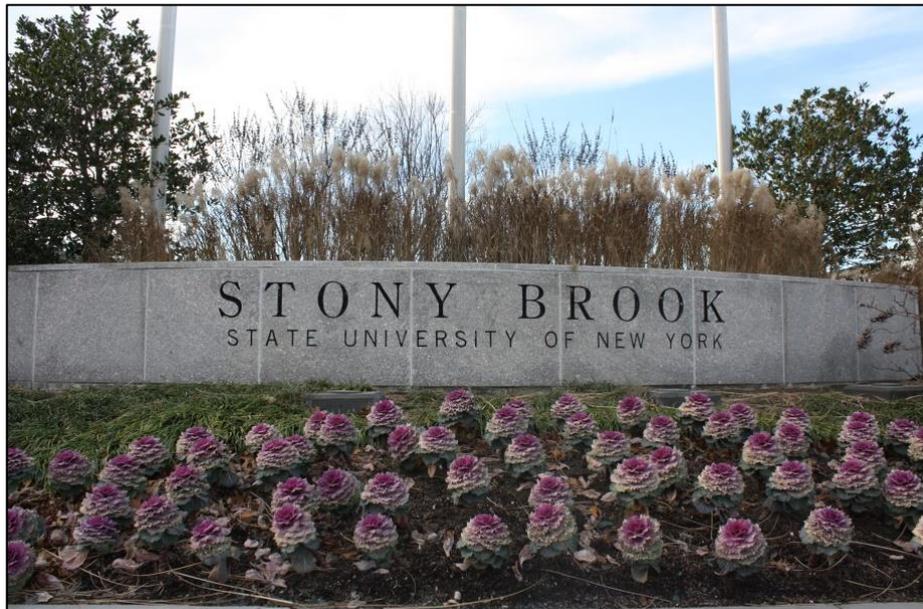
- **Reliability**
- **Flexibility**
- **Safety**
- **Maintainability**



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



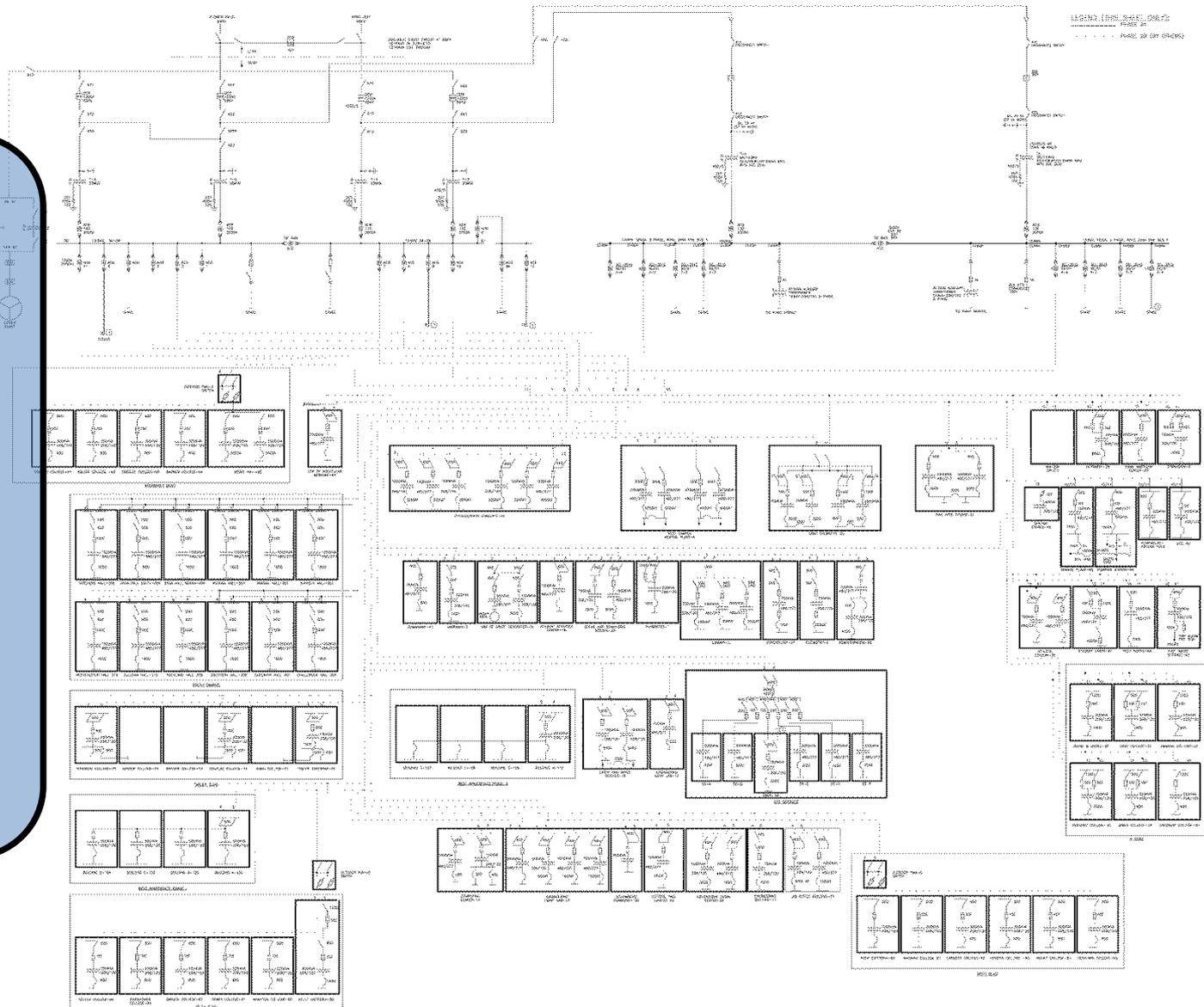
- 600 bed hospital serves as the region's only Level 1 Trauma Center
- 100,000 emergency room visits in 2014
- Currently building an 8 level 240,000 SF Medicine and Research Translation (MART) Building and 225,000-square-foot new Bed Tower
- \$100 million in research expenditures



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

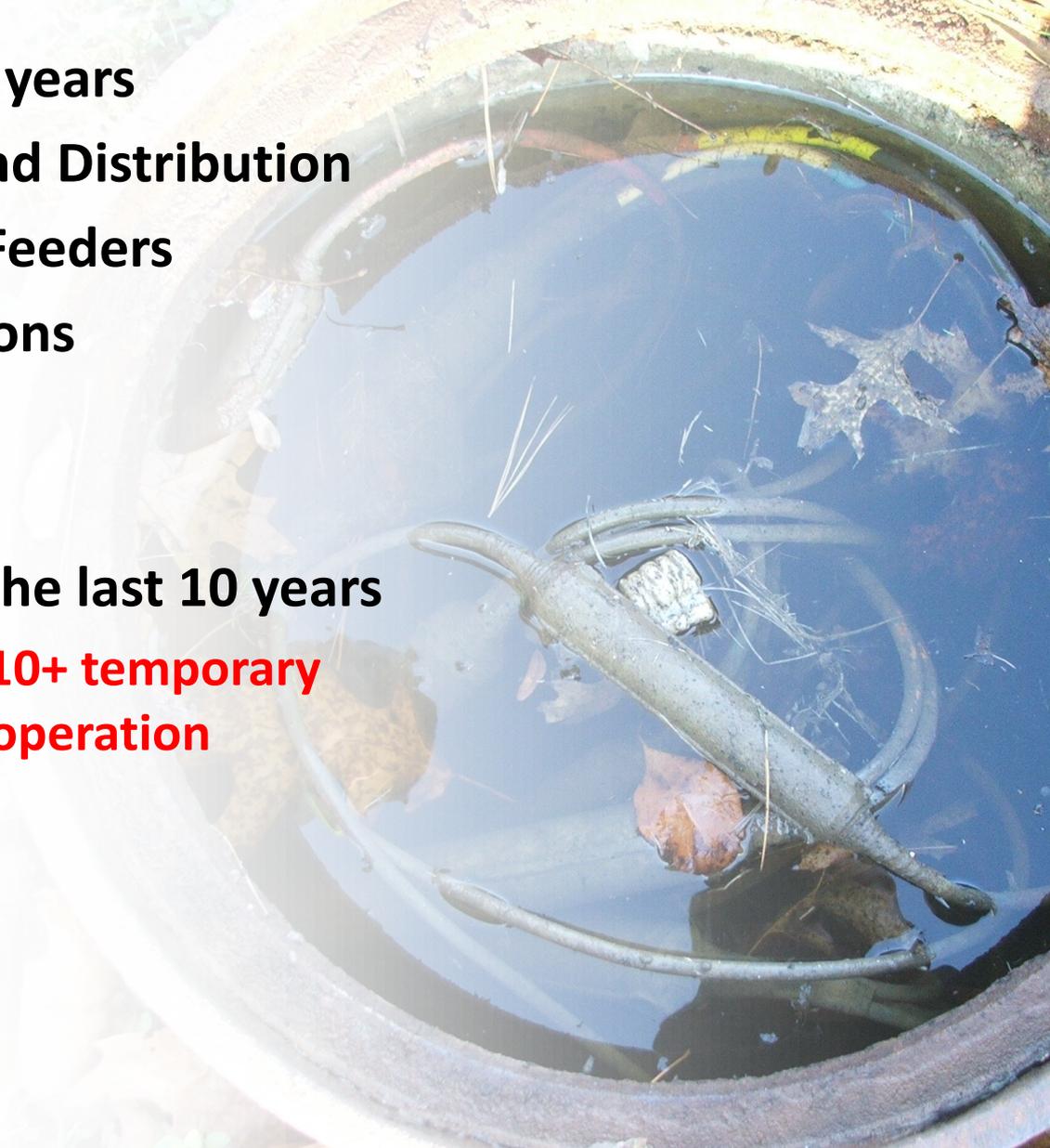


Reliability Concerns of System



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

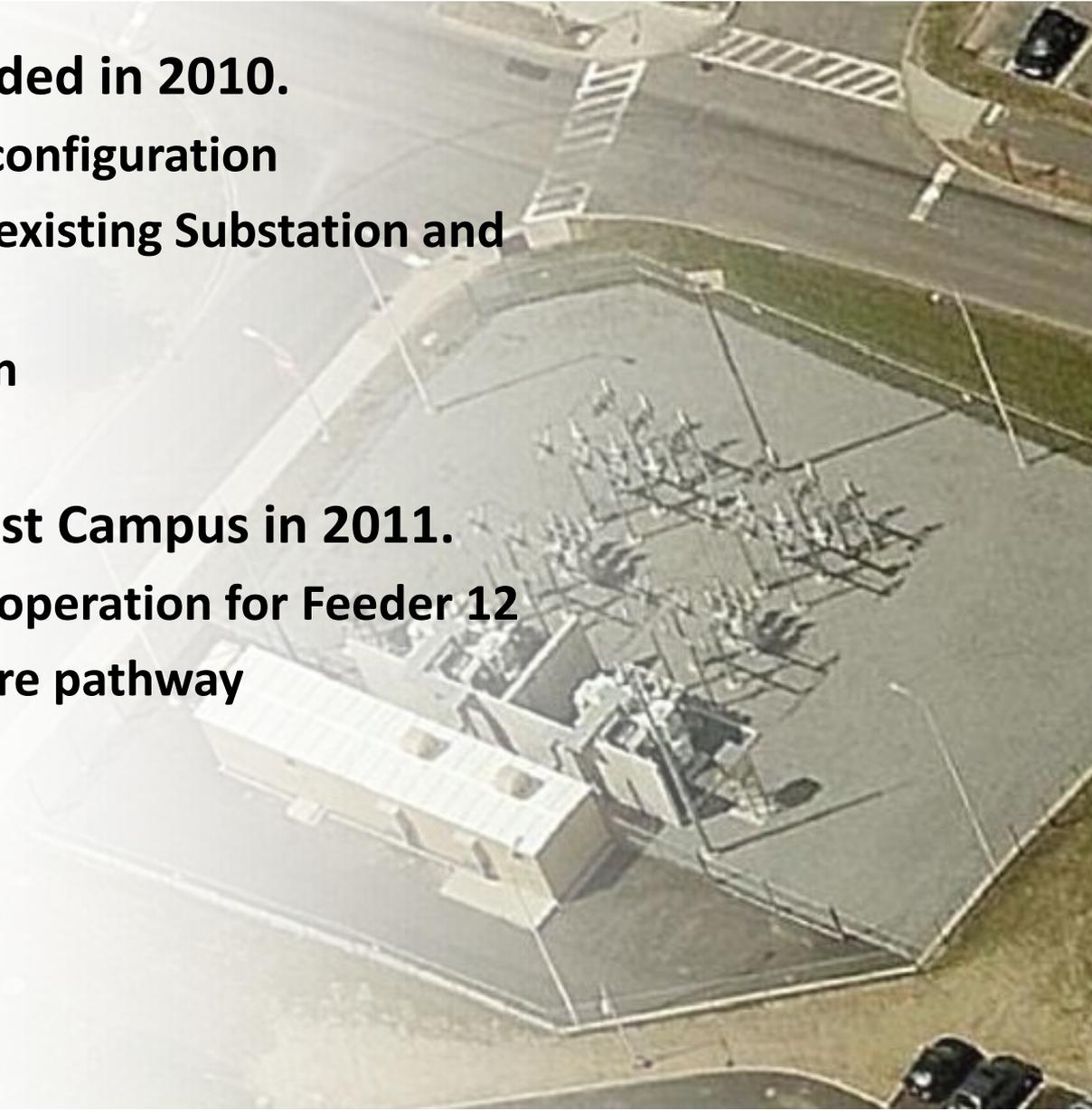
- 2-3 Failures per year for the last 10 years
 - Some failures required 10+ temporary generators to maintain operation



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



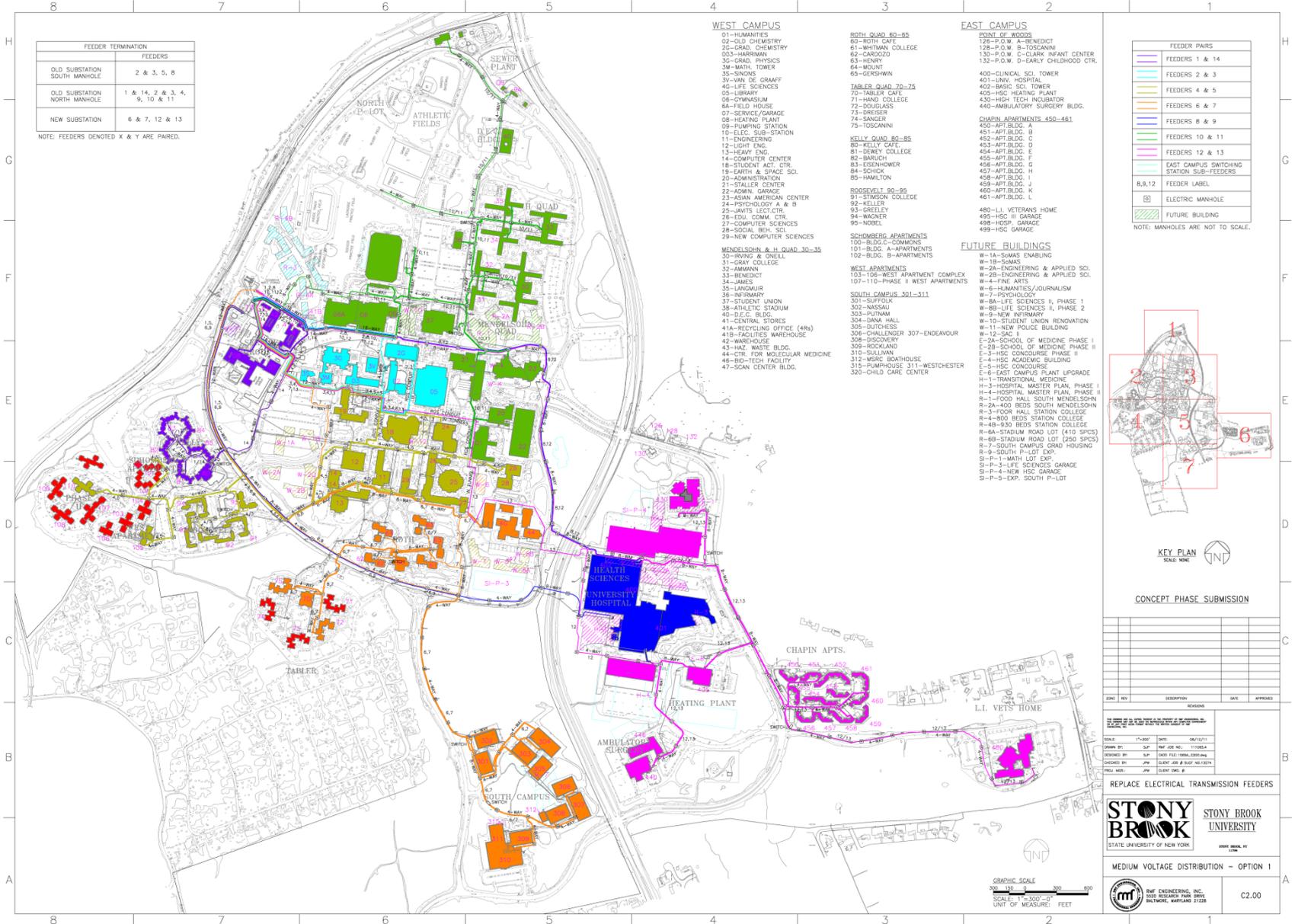
Distribution Upgrades



- **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



FEEDER TERMINATION	
FEEDERS	
OLD SUBSTATION SOUTH MANHOLE	2 & 3, 5, 6
OLD SUBSTATION NORTH MANHOLE	1 & 14, 2 & 3, 4, 9, 10 & 11
NEW SUBSTATION	6 & 7, 12 & 13

NOTE: FEEDERS DENOTED X & Y ARE PAIRED.

WEST CAMPUS

- 01-HUMANITIES
- 02-OLD CHEMISTRY
- 03-GRAD. CHEMISTRY
- 03-HARRMAN
- 35-MATH. TOWER
- 35-WONK
- 36-VAN DE GRAFF
- 40-LIFE SCIENCES
- 05-LIBRARY
- 06-GYMNASIUM
- 64-FIELD HOUSE
- 07-SERVICE/GARAGE
- 08-HEATING PLANT
- 09-PUMPING STATION
- 10-ELEC. SUB-STATION
- 11-ENGINEERING
- 12-LIGHT ENG.
- 13-HEAVY ENG.
- 14-COMPUTER CENTER
- 18-STUDENT ACT. CTR.
- 19-EARTH & SPACE SCI.
- 20-ADMINISTRATION
- 21-STALLER CENTER
- 22-ADMIN. GARAGE
- 23-ASIAN AMERICAN CENTER
- 24-PSYCHOLOGY A & B
- 25-JAMTS LECT.CTR.
- 26-EDUC. COMM. CTR.
- 27-COMPUTER SCIENCES
- 28-SOCIAL BEH. SCI.
- 29-NEW COMPUTER SCIENCES
- 30-IRVING & ONELL
- 31-GRAY COLLEGE
- 32-AMMANN
- 33-BENEDICT
- 34-JAMES
- 35-LANGHAIR
- 36-INFIRMARY
- 37-STUDENT UNION
- 38-ATHLETIC STADIUM
- 40-D.C. BLDG.
- 41-CENTRAL STORES
- 41A-RECYCLING OFFICE (41B)
- 41B-FACILITIES WAREHOUSE
- 42-WAREHOUSE BLDG.
- 43-HAZ. WASTE BLDG.
- 44-CTR. FOR MOLECULAR MEDICINE
- 46-BIO-TECH FACILITY
- 47-SCAN CENTER BLDG.

BOTH QUAD 60-65

- 60-ROTH CAFE
- 61-WHITEMAN COLLEGE
- 62-CARDOZO
- 63-HENRY
- 64-MOUNT
- 65-GENSHWIN

TABLER QUAD 70-75

- 70-TABLER CAFE
- 71-HAND COLLEGE
- 72-DOUGLASS
- 73-DRESSER
- 74-SANGER
- 75-TOSCANNI

KELLY QUAD 80-85

- 80-KELLY CAFE
- 81-DEWEY COLLEGE
- 82-SARGENT
- 83-EISENHOWER
- 84-SCHOCK
- 85-HAMILTON

ROOSEVELT 90-95

- 91-STIMSON COLLEGE
- 92-KELLER
- 93-GREELEY
- 94-MORNER
- 95-NOBEL

SCHOMBERG APARTMENTS

- 100-BLDG. C-COMMONS
- 101-BLDG. A-APARTMENTS
- 102-BLDG. B-APARTMENTS

WEST APARTMENTS

- 103-106-WEST APARTMENT COMPLEX
- 107-110-PHASE II WEST APARTMENTS

SOUTH CAMPUS 301-311

- 301-SUIFORD HALL
- 302-NASSAU
- 303-PURDIE
- 304-DANA HALL
- 305-BUTCHESSE
- 306-CHALLENGER 307-ENDAVEROUR
- 308-DISCOVERY
- 309-HOGLAND
- 310-SULLIVAN
- 311-MEDIC ACAD. BUILDING
- 315-PUMPHOUSE 311-WESTCHESTER
- 300-CHILD CARE CENTER

EAST CAMPUS

- POINT OF BEDS
- 126-P.O.W. A-BENEDICT
- 127-P.O.W. B-TOSCANNI
- 130-P.O.W. C-CLARK INFANT CENTER
- 132-P.O.W. D-EARLY CHILDHOOD CTR.
- 400-CUNNINGHAM SCI. TOWER
- 401-UNIV. HOSPITAL
- 402-BASIC SCI. TOWER
- 403-HSC HEATING PLANT
- 430-HIGH TECH INCUBATOR
- 440-AMBULATORY SURGERY BLDG.

CHAPIN APARTMENTS 450-461

- 450-APT.BLDG. A
- 451-APT.BLDG. B
- 452-APT.BLDG. C
- 453-APT.BLDG. D
- 454-APT.BLDG. E
- 455-APT.BLDG. F
- 456-APT.BLDG. G
- 457-APT.BLDG. H
- 458-APT.BLDG. I
- 459-APT.BLDG. J
- 460-APT.BLDG. K
- 461-APT.BLDG. L

480-L.I. VETERANS HOME

- 495-HSC III GARAGE
- 498-HOSP. GARAGE
- 499-HSC GARAGE

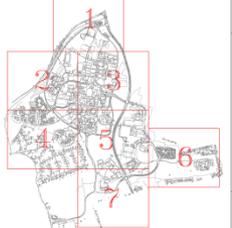
FUTURE BUILDINGS

- W-1A-SOMAS ENLARGING
- W-1B-SOMAS
- W-2A-ENGINEERING & APPLIED SCI.
- W-2B-ENGINEERING & APPLIED SCI.
- W-4-FINE ARTS
- W-7-HUMANITIES/JOURNALISM
- W-7-PSYCHOLOGY
- W-8A-LIFE SCIENCES II, PHASE 1
- W-8B-LIFE SCIENCES II, PHASE 2
- W-9-NEW INFIRMARY
- W-10-STUDENT UNION RENOVATION
- W-11-NEW POLICE BUILDING
- W-12-SAC II
- E-2A-SCHOOL OF MEDICINE PHASE I
- E-2B-SCHOOL OF MEDICINE PHASE II
- E-3-HSC CONDOURSE PHASE II
- E-4-HSC ACADEMIC BUILDING
- E-5-HSC CONDOURSE
- E-6-EAST CAMPUS PLANT UPGRADE
- H-1-TRANSITIONAL MEDICINE
- H-2-HOSPITAL MASTER PLAN, PHASE I
- H-3-HOSPITAL MASTER PLAN, PHASE II
- H-4-HOSPITAL MASTER PLAN, PHASE III
- R-1-FOOD HALL SOUTH MENDELSON
- R-2A-400 BEDS SOUTH MENDELSON
- R-3-FOOD HALL STATION COLLEGE
- R-4-800 BEDS STATION COLLEGE
- R-4B-930 BEDS STATION COLLEGE
- R-6A-STADIUM ROAD LOT (410 SPACES)
- R-6B-STADIUM ROAD LOT (250 SPACES)
- R-7-SOUTH CAMPUS GRAD HOUSING
- R-9-SOUTH P-LOT EXP.
- SI-P-1-MATH LOT EXP.
- SI-P-1-LIFE SCIENCES GARAGE
- SI-P-1-NEW HSC GARAGE
- SI-P-9-EXP. SOUTH P-LOT

FEEDER PAIRS	
	FEEDERS 1 & 14
	FEEDERS 2 & 3
	FEEDERS 4 & 5
	FEEDERS 6 & 7
	FEEDERS 8 & 9
	FEEDERS 10 & 11
	FEEDERS 12 & 13
	EAST CAMPUS SWITCHING STATION SUB-FEEDERS
	FEEDER LABEL
	ELECTRIC MANHOLE
	FUTURE BUILDING ARE NOT TO SCALE.

8.9,12

NOTE: MANHOLES ARE NOT TO SCALE.



KEY PLAN
SCALE: NONE

CONCEPT PHASE SUBMISSION

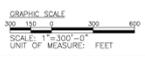
DATE	REVISION	APPROVED

REPLACE ELECTRICAL TRANSMISSION FEEDERS

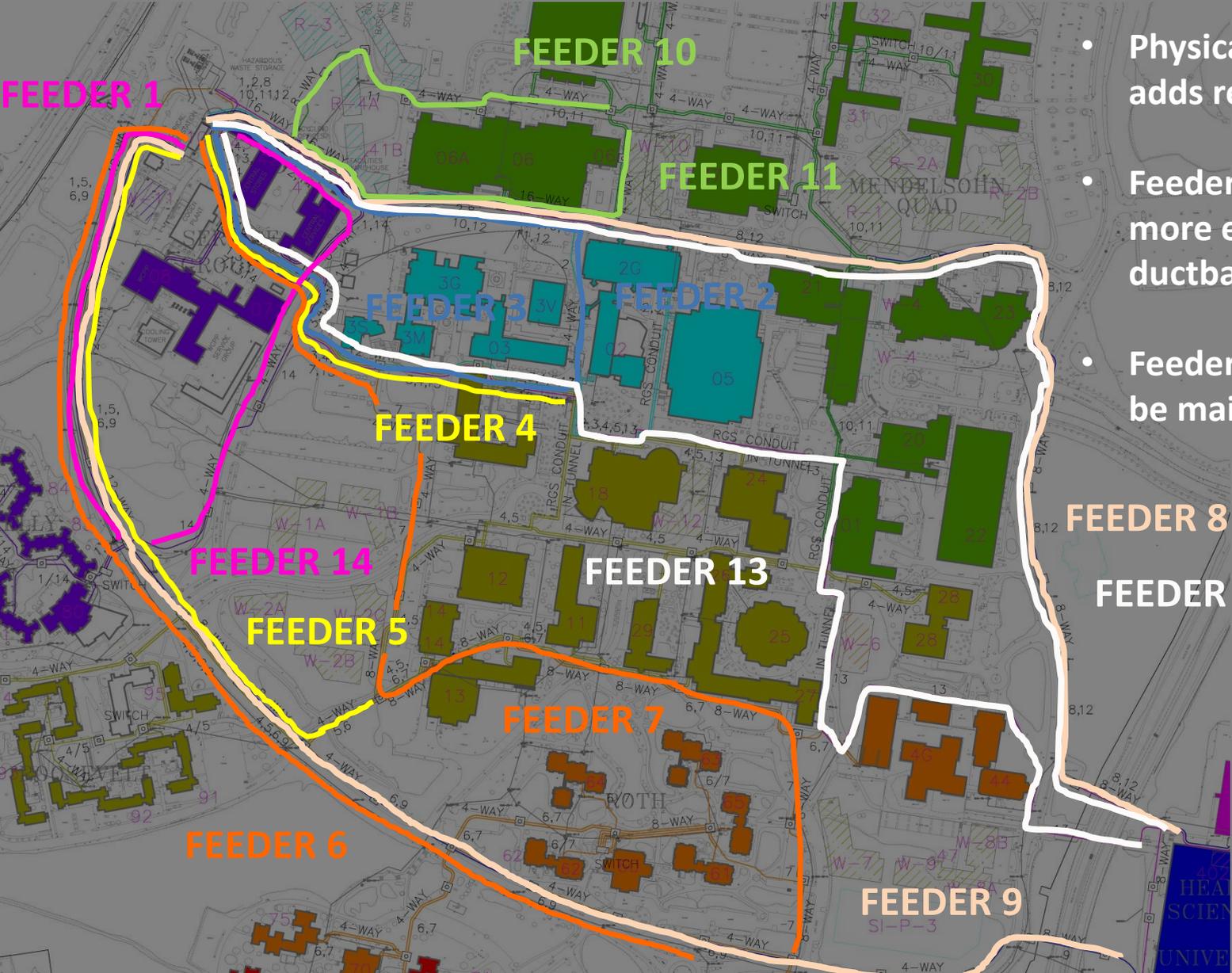
STONY BROOK UNIVERSITY
STATE UNIVERSITY OF NEW YORK

MEDIUM VOLTAGE DISTRIBUTION - OPTION 1

mf ENGINEERING, INC.
1000 WILKINSON AVENUE
ROCKY HILL, CONNECTICUT 06067
C2.00



Pathways



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

East Campus Single Line



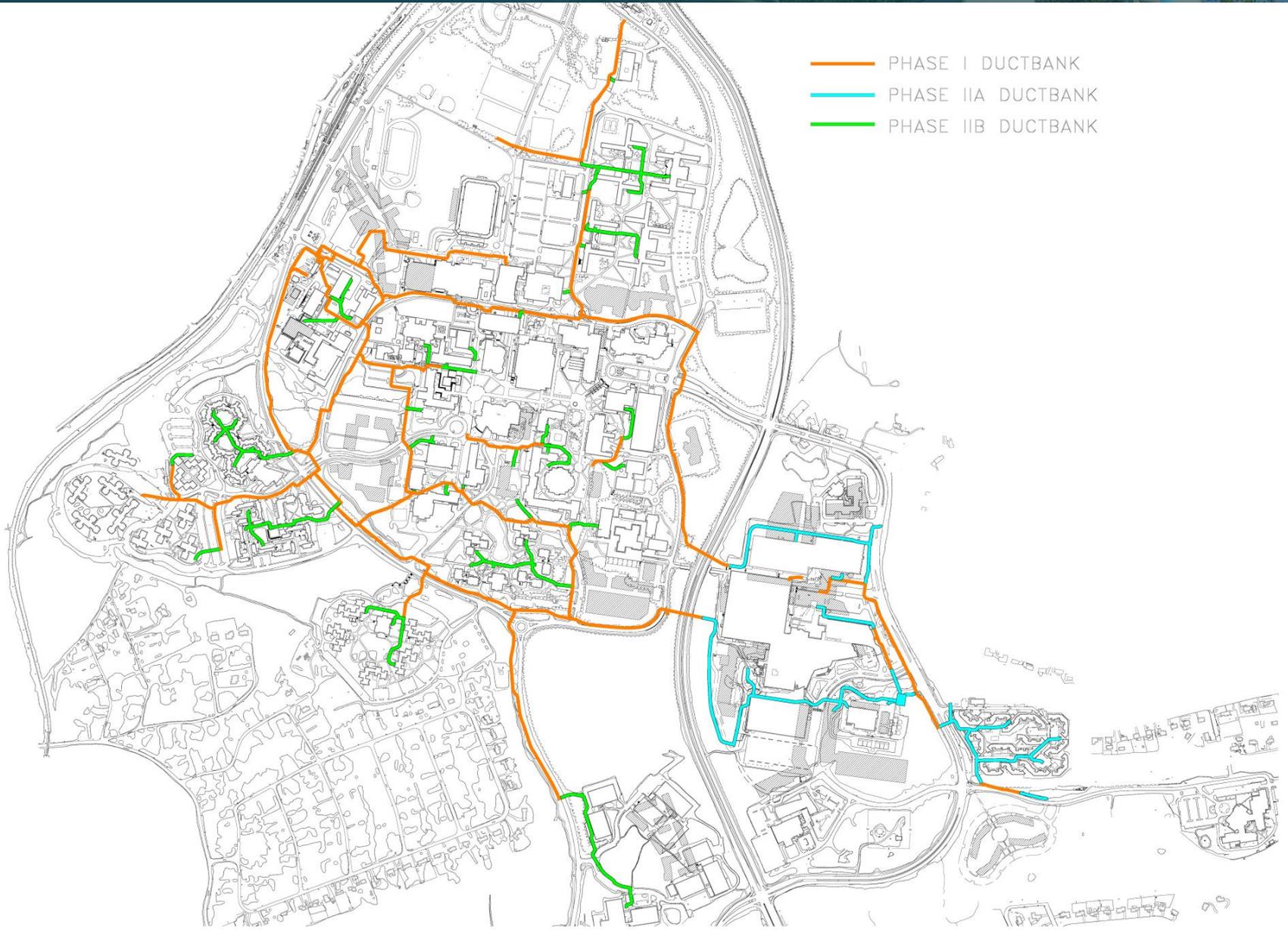
- **New Switch Station**
 - **1200A, 4-bus, 15kV switchgear**
 - **Provides increased flexibility**
 - **Increased resiliency to critical portion of campus**
 - **Planned for future Utility or Generation source and power factor correction**

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

Project Phasing



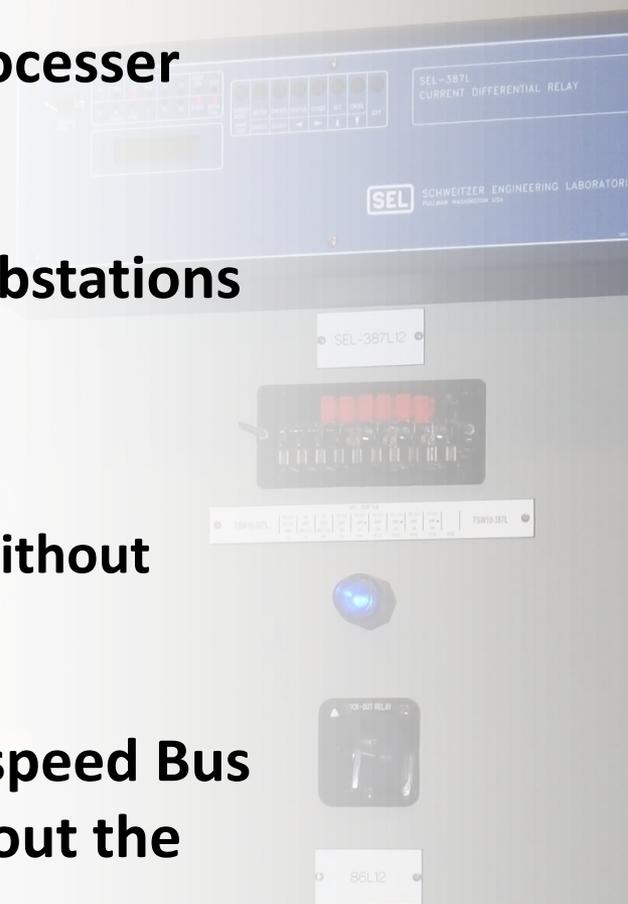
- PHASE I DUCTBANK
- PHASE IIA DUCTBANK
- PHASE IIB DUCTBANK



Protective Relays & Personnel Safety



- **All distribution relays upgraded to micro-processor 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



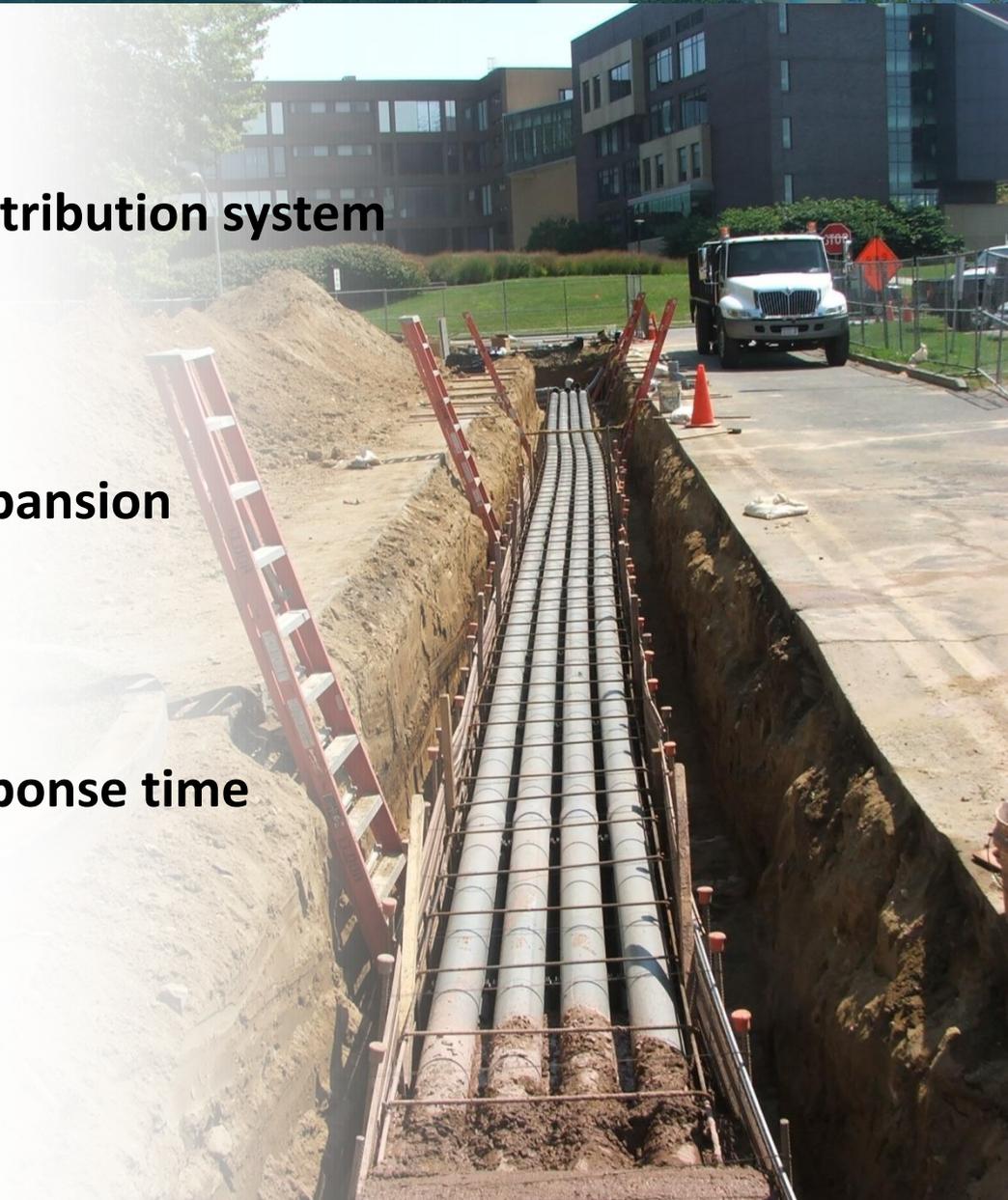
- **Installed on the East Plant 480V unit substation**
- **Limits ground faults to 5A**
 - **Loads do not trip off in response to a ground fault**
 - **Increase in personnel safety**
 - **Decrease equipment damage**
 - **Ground current meters on all feeders to aid with troubleshooting**
- **Added requirement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





CAMPUS ENERGY 2016

Campus Electrical System Renewal, Reliability & Safety

For more information:

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