UNIVERSITY OF GEORGIA

MIGRATING FROM UNITARY CHILLED WATER TO CENTRALIZED DISTRIBUTION

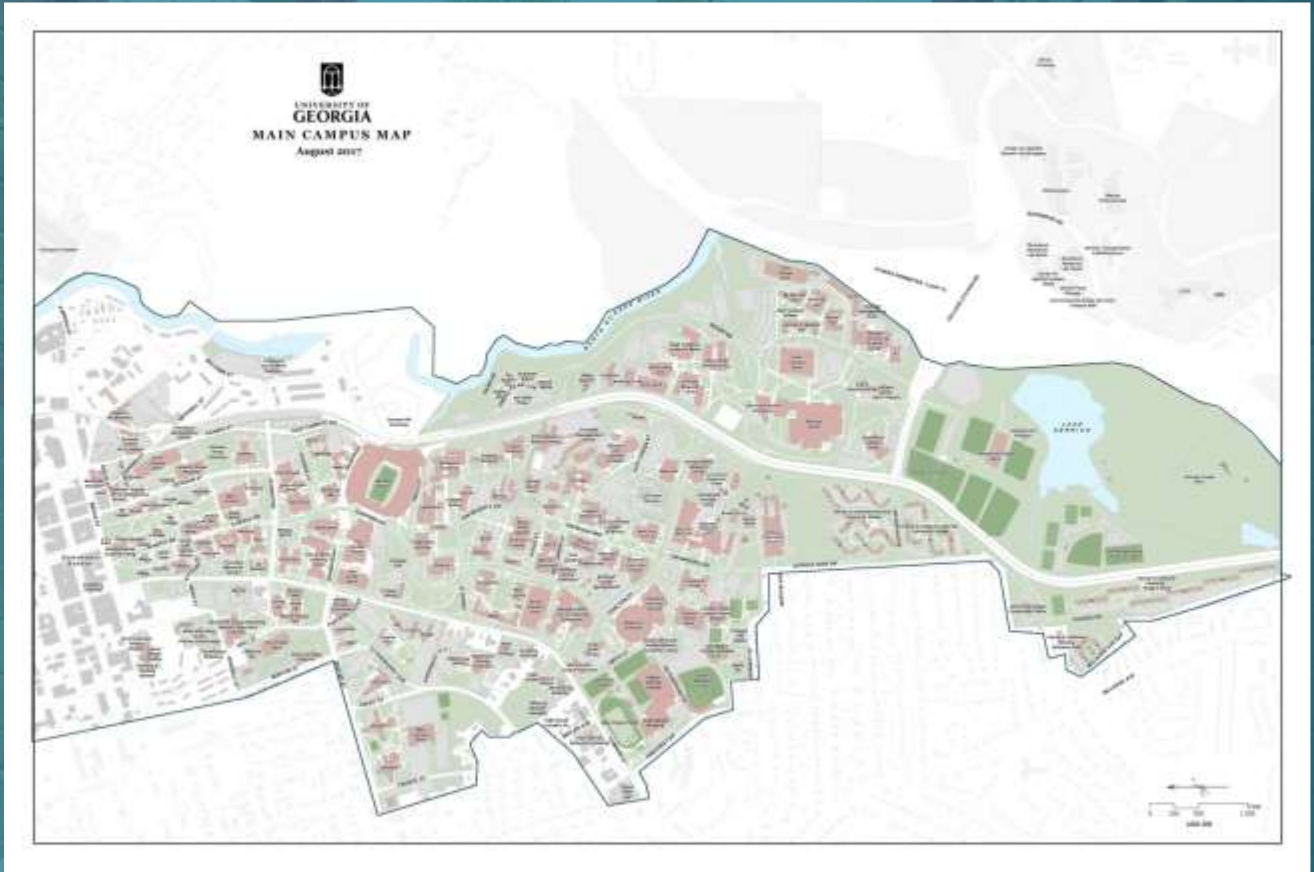
VANCE NALL, PE

RMF Engineering
Reliability. Efficiency. Integrity.

CampusEnergy2019
February 26 - March 1, 2019 | New Orleans, LA | Hilton New Orleans Riverside

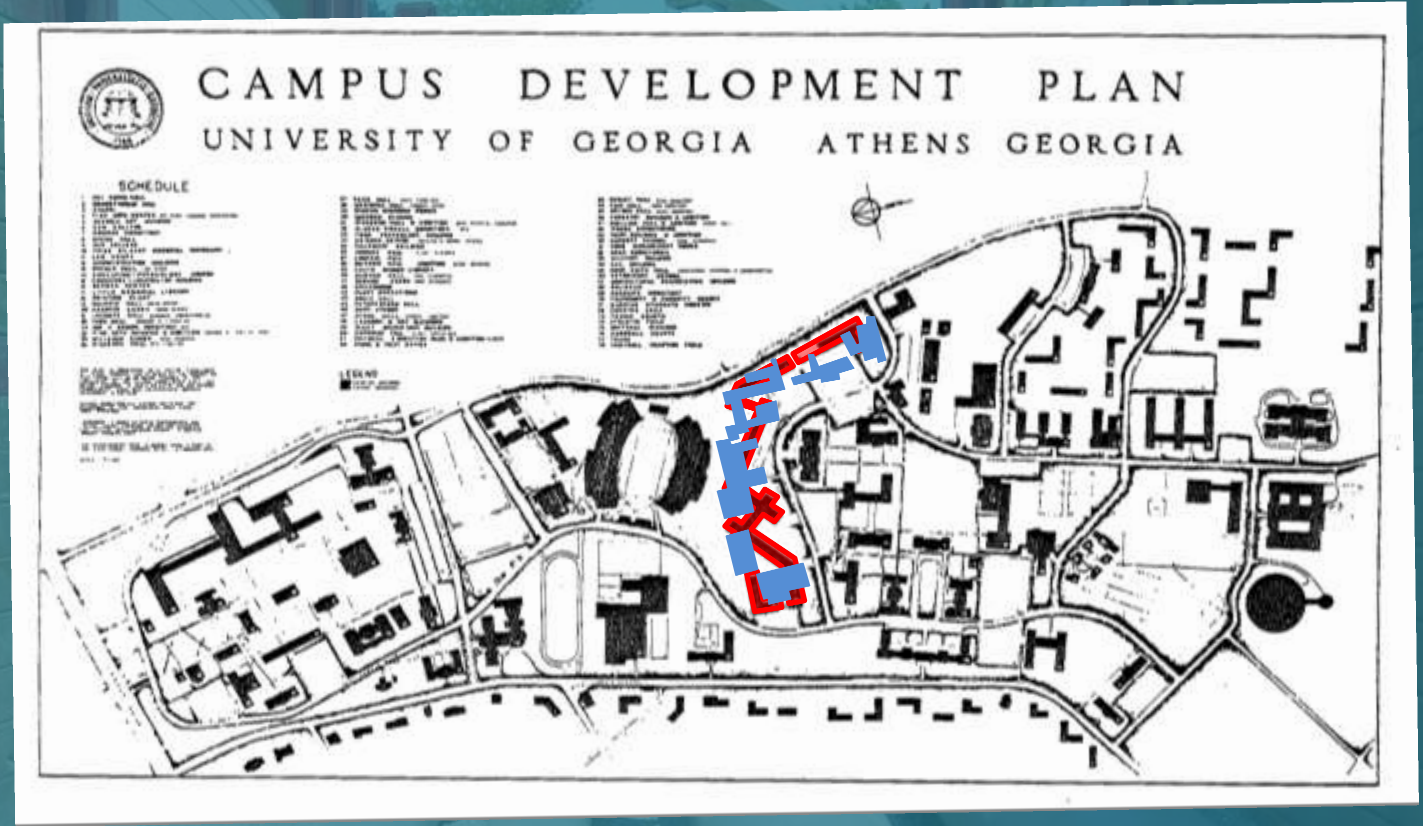
UNIVERSITY OF GEORGIA

UGA PHYSICAL GROWTH



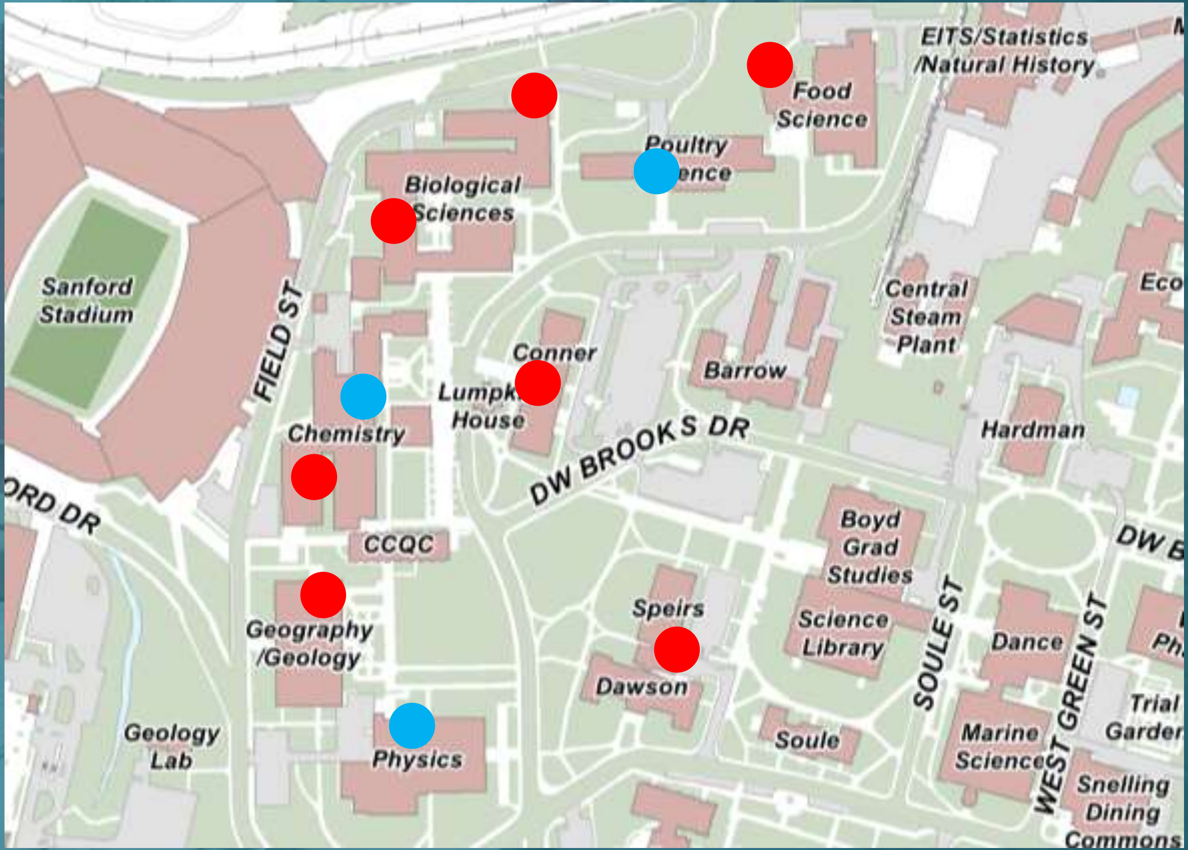
2017
1805
1852
1874
1905
1940
1947
1975
1983
2017

SCIENCE CENTER DEVELOPMENT



SCIENCE CENTER DEVELOPMENT

- 7 Steam Absorption Chillers
- 3 Electric Centrifugal Chillers



NEED RELIABILITY AND REDUNDANCY

- Modern Science Center
  - Research intensive, multi-story classroom and laboratory
  - Modern architecture – fewer adaptations to hot climate
  - Single point of failure in Unitary HVAC systems - Downtime
- 1975 – John Casey proposed Central Chilled Water
- Alternative was Distributed Chilled Water System
  - Load Diversity
  - Allowed for non-critical outages

SYSTEM TYPE COMPARISON

COMPARISON CRITERIA	UNITARY
FIRST COST	LOW
MAINTENANCE COST	HIGH
ENERGY COST	HIGH
RELIABILITY	LOW
EASE OF MAINTENANCE	DIFFICULT
OPERATIONAL COMPLEXITY	AVERAGE
TOTAL NUMBER OF CHILLERS	HIGH
ACOUSTIC IMPACT	AVERAGE
ARCHITECTURAL AND SITE IMPACT	AVERAGE

UNIVERSITY OF GEORGIA

SYSTEM TYPE COMPARISON

COMPARISON CRITERIA	UNITARY	DISTRIBUTED
FIRST COST	LOW	MEDIUM
MAINTENANCE COST	HIGH	HIGH
ENERGY COST	HIGH	MEDIUM
RELIABILITY	LOW	MEDIUM
EASE OF MAINTENANCE	DIFFICULT	DIFFICULT
OPERATIONAL COMPLEXITY	AVERAGE	DIFFICULT
TOTAL NUMBER OF CHILLERS	HIGH	MEDIUM
ACOUSTIC IMPACT	AVERAGE	AVERAGE
ARCHITECTURAL AND SITE IMPACT	AVERAGE	AVERAGE

UNIVERSITY OF GEORGIA

SYSTEM TYPE COMPARISON

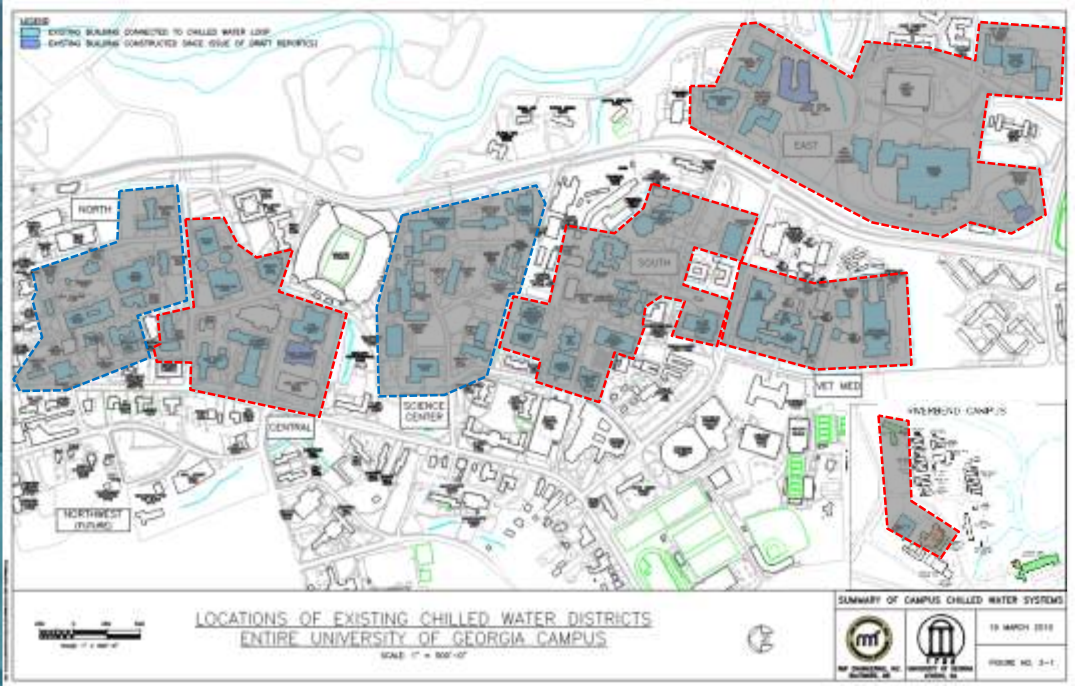
COMPARISON CRITERIA	UNITARY	DISTRIBUTED	CENTRAL
FIRST COST	LOW	MEDIUM	HIGH
MAINTENANCE COST	HIGH	HIGH	LOW
ENERGY COST	HIGH	MEDIUM	LOW
RELIABILITY	LOW	MEDIUM	HIGH
EASE OF MAINTENANCE	DIFFICULT	DIFFICULT	EASY
OPERATIONAL COMPLEXITY	AVERAGE	DIFFICULT	SIMPLE
TOTAL NUMBER OF CHILLERS	HIGH	MEDIUM	LOW
ACOUSTIC IMPACT	AVERAGE	AVERAGE	IMPROVED
ARCHITECTURAL AND SITE IMPACT	AVERAGE	AVERAGE	IMPROVED

DEVELOPMENT OF DISTRICT LOOPS

- 20 years with no redundancy at the Science Center
  - O&M working nights to keep chillers online in daytime
- 1980 – Study commissioned to investigate solution
- 1981 Design and Construction began on Science Center Chilled Water Loop (3-pipe system)

DISTRIBUTED LOOPS 1981 - 2002

- 1981 Science Center
- 1985 North Campus
- 1986 Vet school Loop
- 1989 South Loop
- 1998 East Campus Loop
- 2001 Central Loop
- 2002 Riverbend Campus



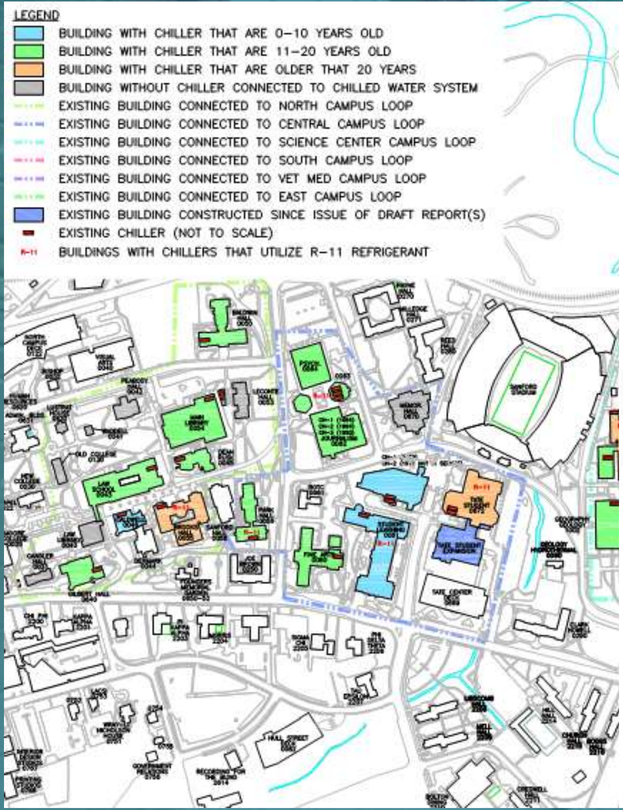
DRIVERS TO CENTRALIZE

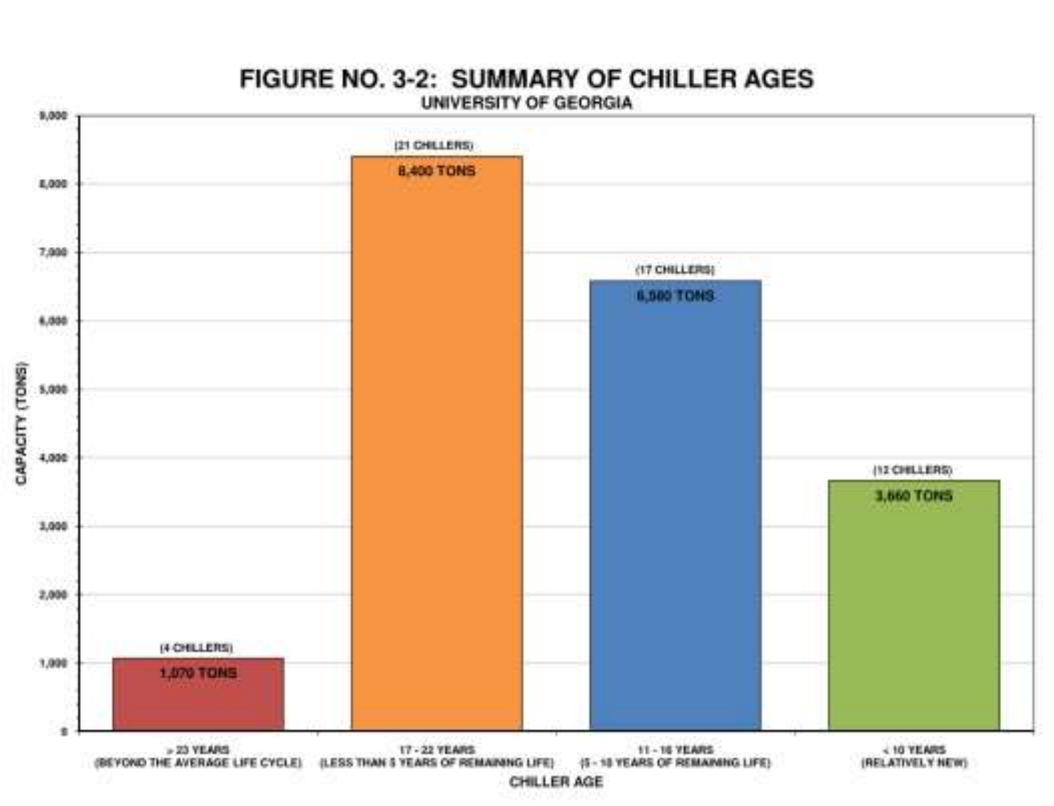
- The problems with distributed chiller plants:
  - Multiple smaller chillers - maintenance
  - Multiple mechanical rooms that could be program space
  - Multiple cooling towers across campus – noise and biological concerns
  - Complex controls required for staging
  - Hydraulic challenges
  - Chiller loading inefficiencies

PLANNING & DEVELOPMENT

- Master Planning CHW Growth and Development
  - Tied to architectural master plan
  - Review of hydraulics and system age
  - Campus wide approach of loading and capacity review
- Develop Regional Plants
  - Larger, interconnected distribution systems
  - Relocation of capacity from buildings to plants

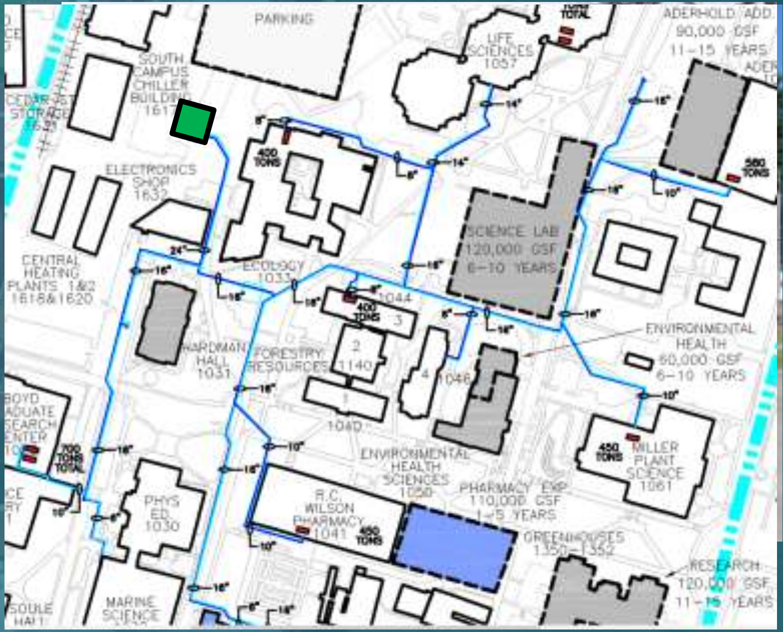
TAKING STOCK



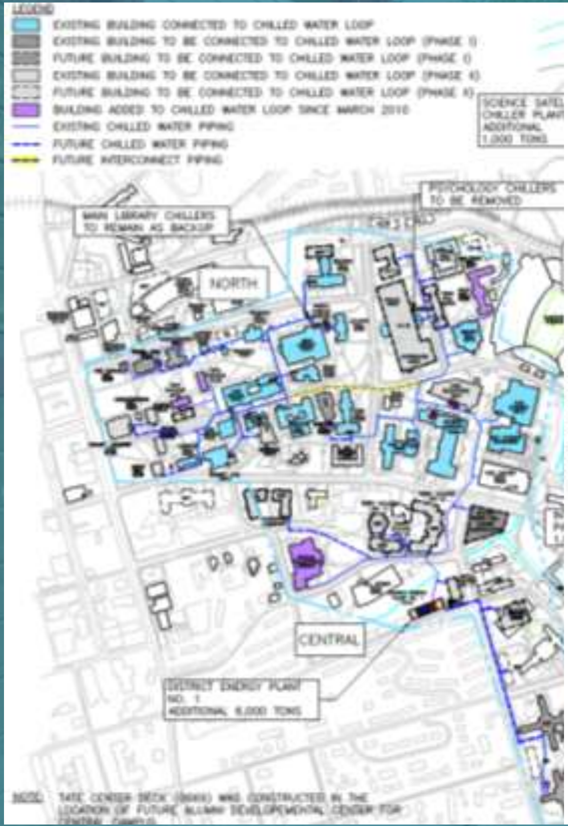


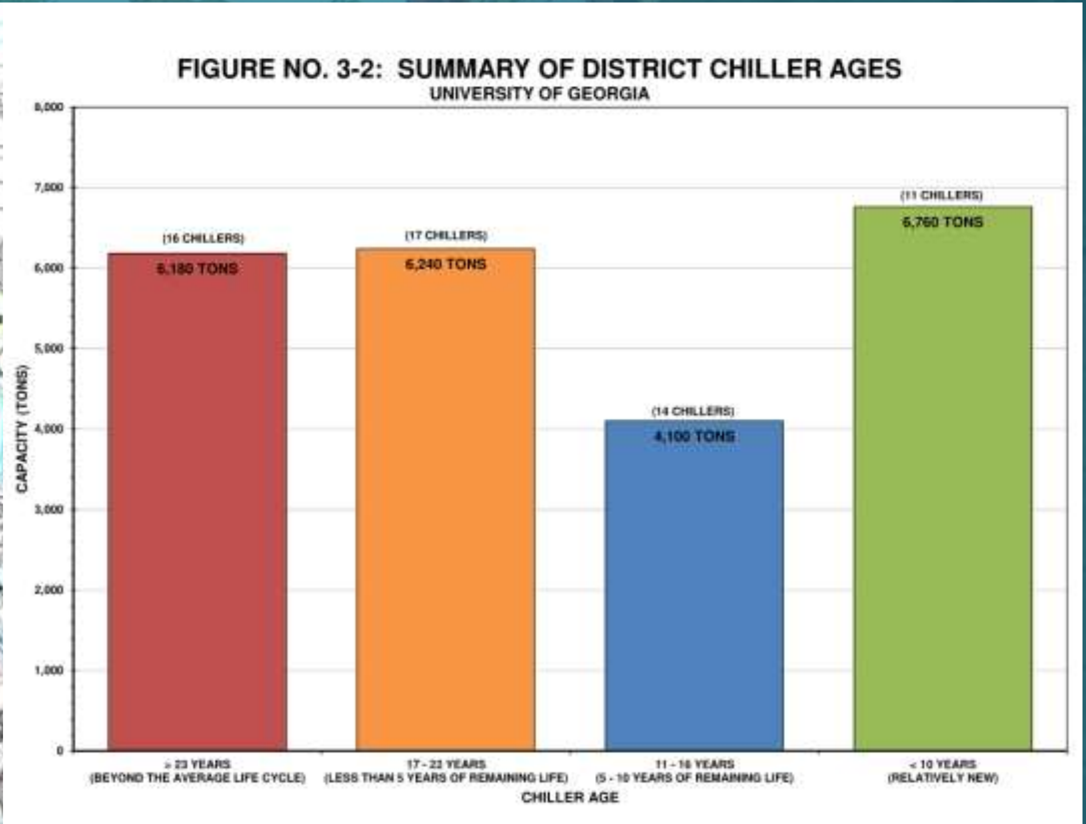
TIPPING POINT – SOUTH LOOP

- Pharmacy South in Design
  - No Tower Space
- South Anchor Plant
  - Designed for cogeneration; absorption chillers inactive
  - Connected to South Loop
- (2) 1,000 Ton Centrifugal Chillers
- First Central Chilled Water Plant - 2008



THE PLAN FOR CENTRAL PLANTS





DEP2 – SOUTH / SCIENCE LOOP

- (2) 1,000 Ton Original Building
- (3) 1,000 Ton in New Annex
  - (3) 1,000 Tons Future Capacity
- 8,000 Tons CHW Capacity
- Plans for future consolidation and retirement of building chillers

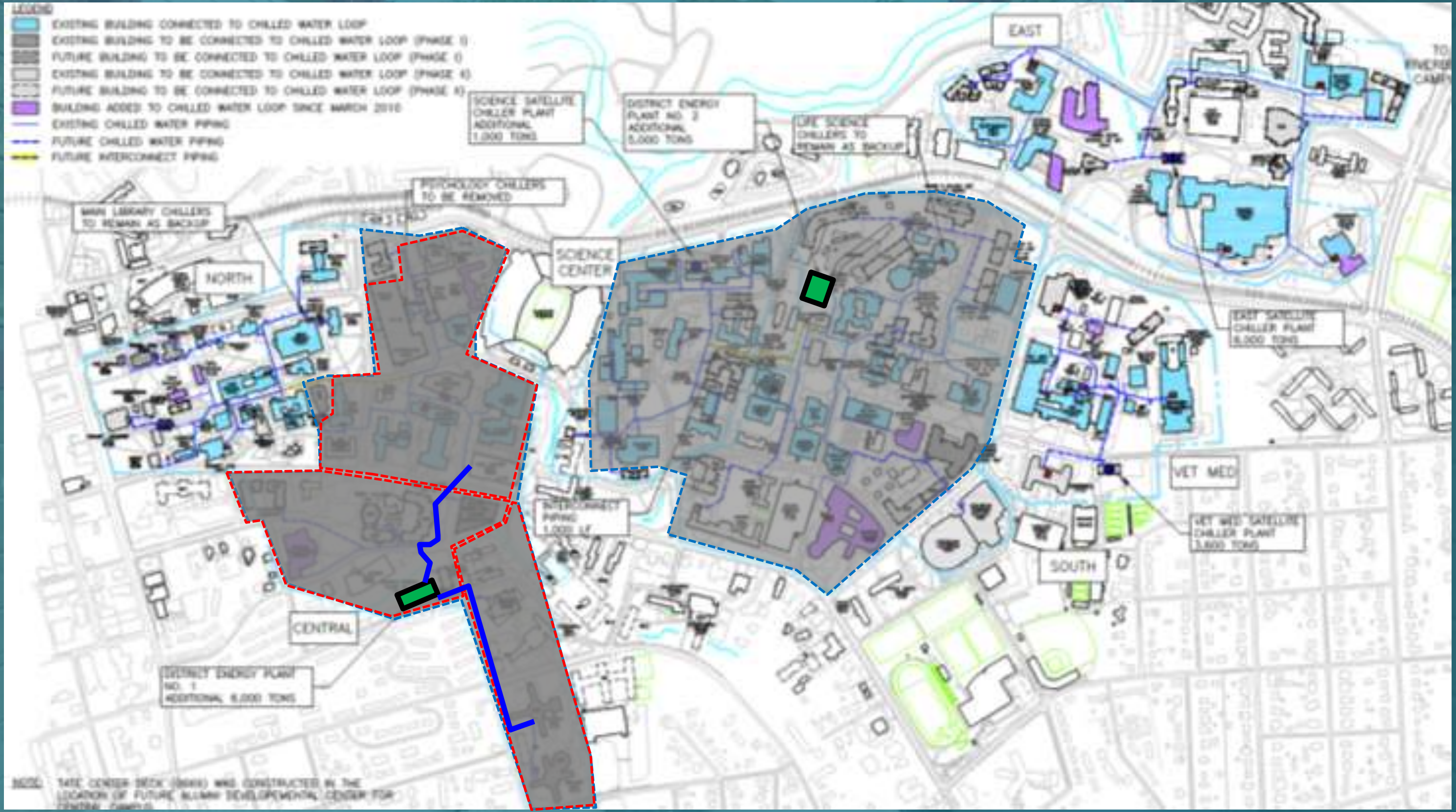
TIPPING POINT – CENTRAL LOOP

- Tate Center Expansion
  - Planning Study Performed
  - Plant Identified
  - Tower Location?
- Development of NW Precinct
  - Special Collections Library
  - Terry College of Business
- District Plant 1 Identified

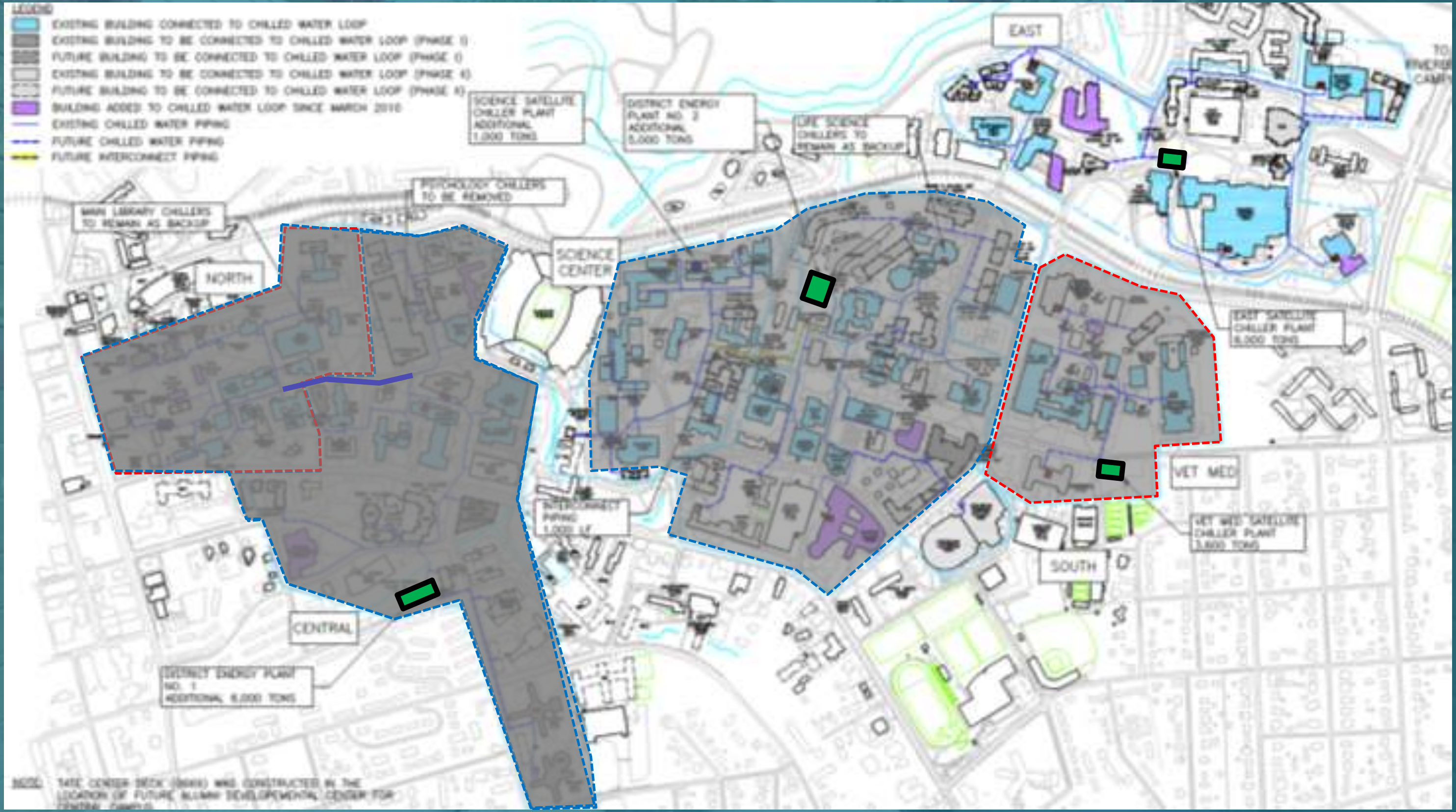
DEP1 – CENTRAL LOOP

- Steam to Heating Water
  - Low Temperature Hot Water Distribution
- 10,000 Tons CHW Capacity
- Accommodate Housing & Dining Upgrades
  - Brumby, Russell, Creswell
  - Bolton Dining Commons

THE PLAN FOR CENTRAL PLANTS



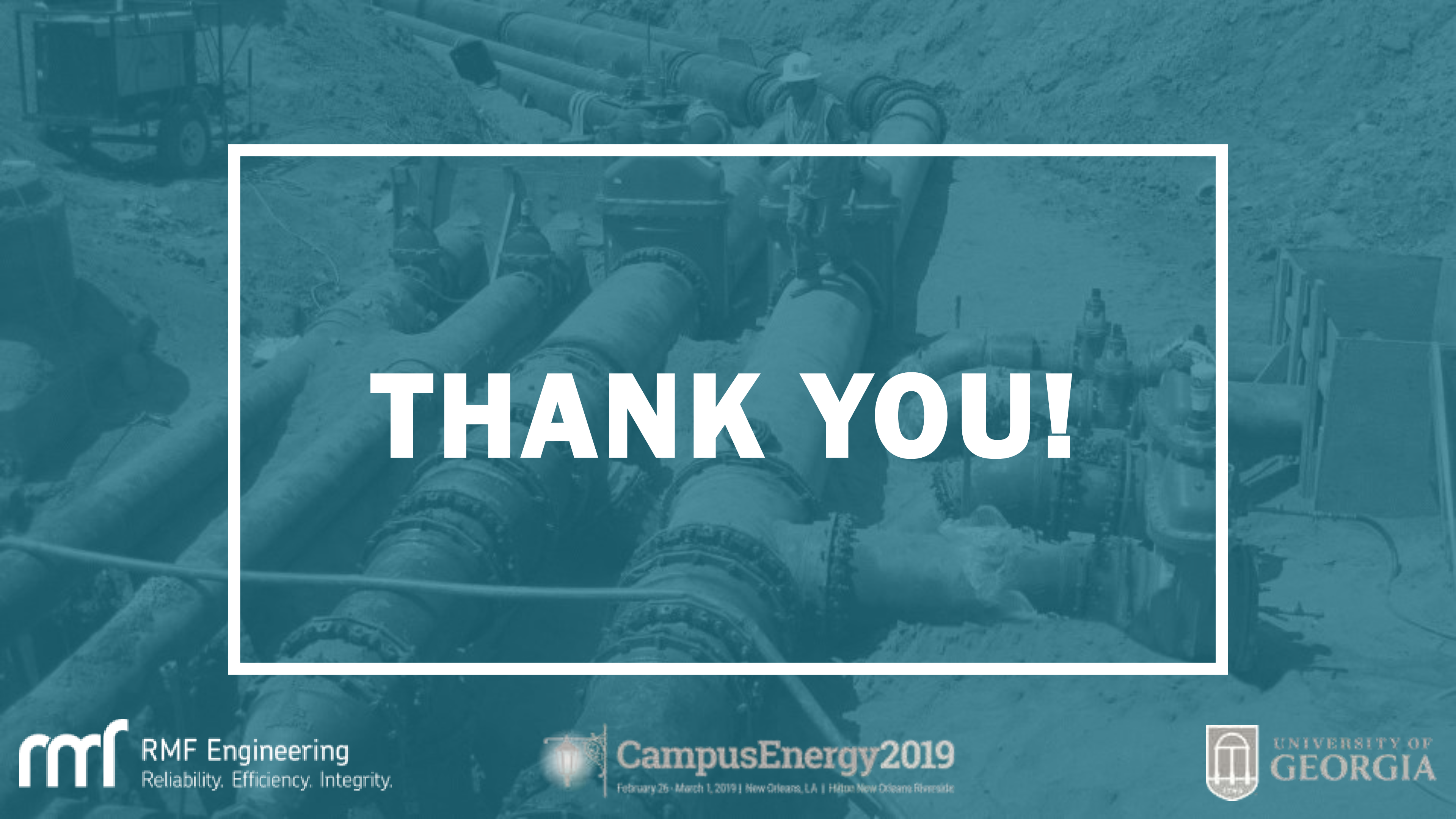
WHERE DO WE GO FROM HERE?



TAKEAWAYS

- Master Planning / coordination with architectural – Look for Utility corridors, Potential District Energy Plant Sites
- Don’t forget Electrical Planning
- Use Large buildings as opportunities to create districts
- Explore Revenue Sources – CHW sales, Ga. Power Energy Rebate Programs, ESCOs
- Took 33 years for UGA to get from Unitary to Central

  – have a plan and start where you can


THANK YOU!
RMF Engineering
Reliability. Efficiency. Integrity.
CampusEnergy2019
February 26 - March 1, 2019 | New Orleans, LA | Hilton New Orleans Riverside
UNIVERSITY OF
GEORGIA