



# INSTALL BACK-UP POWER & AUXILIARIES

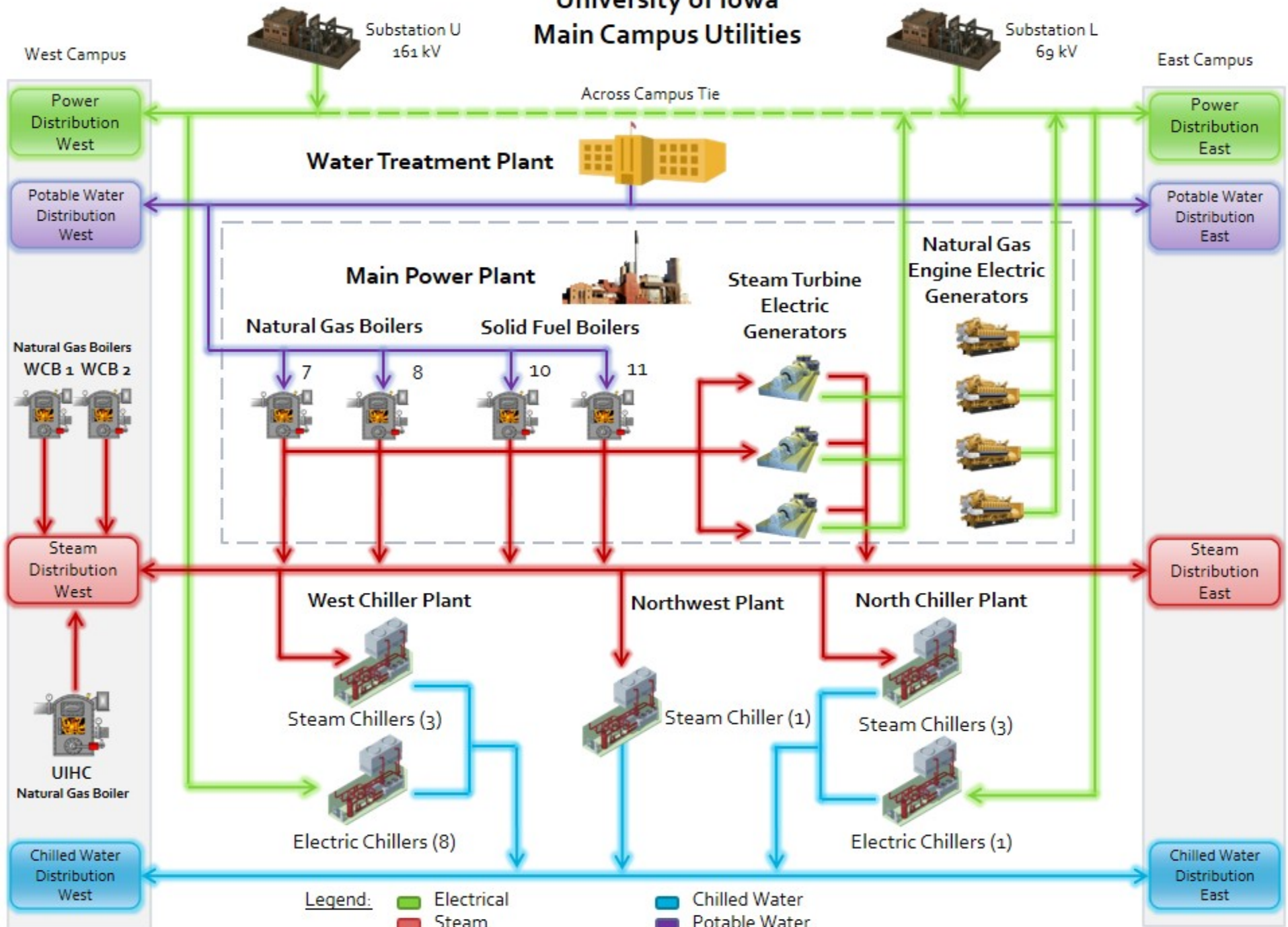


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# AGENDA

- Introductions
- Campus Utilities Overview
- Back-up Power Need and Project Goals
- Project Design and Construction
- Commissioning
- Best Practices and Lessons Learned
- Questions

# University of Iowa Main Campus Utilities



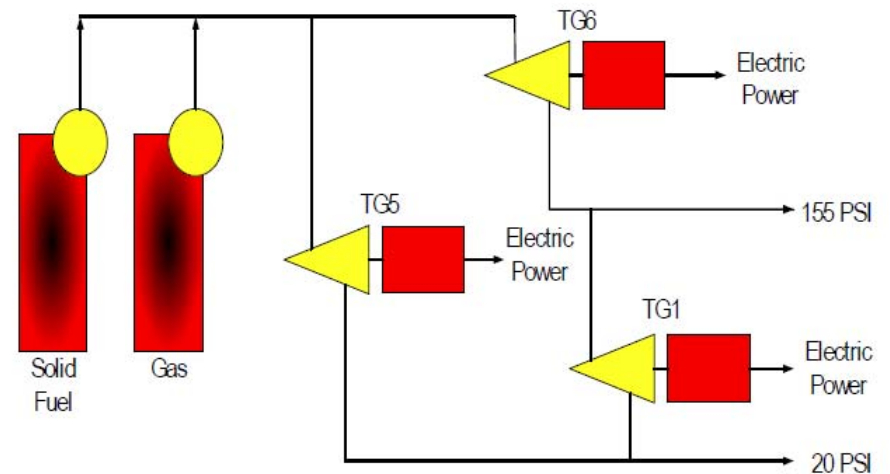




# MAIN POWER PLANT OVERVIEW

- Four (4) boilers: 600+ klb/hr
- Three (3) steam turbine generators: 24.7 MW
- Six (6) off-site natural gas and one (1) biomass boiler

Turbine	Installed	Type	Capacity (kW)
TG-01	1946	Back Pressure Steam Turbine	3,000
TG-05	1960	Back Pressure Steam Turbine	3,000
TG-06	1976	Back Pressure Steam Turbine	18,000
DG-07	1985	Diesel Engine Generator	1,700



# BACK-UP POWER AND PROJECT GOALS

- Replace need for distributed diesel generators on campus
- Address National Emissions Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines (NESHAP RICE)
- Back-up power needed for critical new construction (Papajohn Biomedical Discovery Building)



## Media advisory: Massive magnet arrives at University of Iowa

Magnetic imaging scanner weighs 42 tons, equal to six elephants, will advance brain research

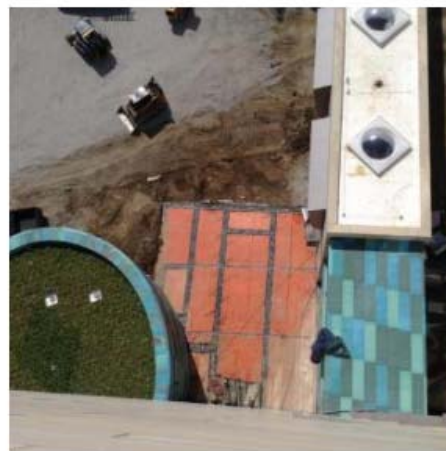
BY: RICHARD C. LEWIS | 2014.06.04 | 09:53 AM

**WHAT:** The University of Iowa has obtained one of the world's most sophisticated magnetic resonance imaging instruments. The magnet, weighing 42 tons or the equivalent of six male adult elephants, will be lifted by crane and deposited in the new Pappajohn Biomedical Discovery Building on the UI campus.

The 7 Tesla magnet will propel UI research forward by yielding clearer, higher-resolution images of the brain, thus enhancing researchers' ability to study how the brain works. The UI is one of only about 20 research institutes in the United States— and only about 40 worldwide—with the instrument. It also is the most powerful magnetic imaging device in the state.

The UI purchased the scanner after winning an \$8 million grant from the National Institutes of Health.

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## UI dedicates \$126 million biomedical hub

John and Mary Pappajohn Biomedical Discovery Building houses research from diabetes to heart and lung diseases



Dignitaries gather for the ribbon-cutting ceremony at the dedication of the Pappajohn Biomedical Discovery Building Wednesday, Oct. 15. Photo by Susan McClellan.

BY: RICHARD C. LEWIS | 2014.10.15 | 04:03 PM

The University of Iowa ushered in a new age of accelerated research in biomedicine with the formal opening on Wednesday, Oct. 15, of the \$126 million John and Mary Pappajohn Biomedical Discovery Building (PBDB).

The 256,000-square-foot building on the UI health sciences campus will house “high-risk, high-reward” research in diabetes, deafness, and brain science as well as complex diseases affecting the heart and lungs.



Photo courtesy the UI Foundation.

At a dedication ceremony, UI administrative leaders, donors, members of the state Board of Regents, state lawmakers, and researchers said the building will unite scientists who want to improve understanding of the fundamentals of biology and disease and to make discoveries that improve human health. These advances promise to create jobs and businesses in the state, while putting the UI at the forefront of biomedical research.

# BACK-UP POWER AND PROJECT GOALS

- Main Power Plant (MPP) Black Start
  - Diesel generator (DG-07) provides partial black start of MPP
  - New capacity to maintain MPP operations during utility power outage
- Utility Electric Curtailment Program
  - Financial incentives for reducing peak electric demand
  - Additional generation capacity for peak shaving and/or curtailment
  - Incentives based on contracted demand (kW) reduction during peak periods



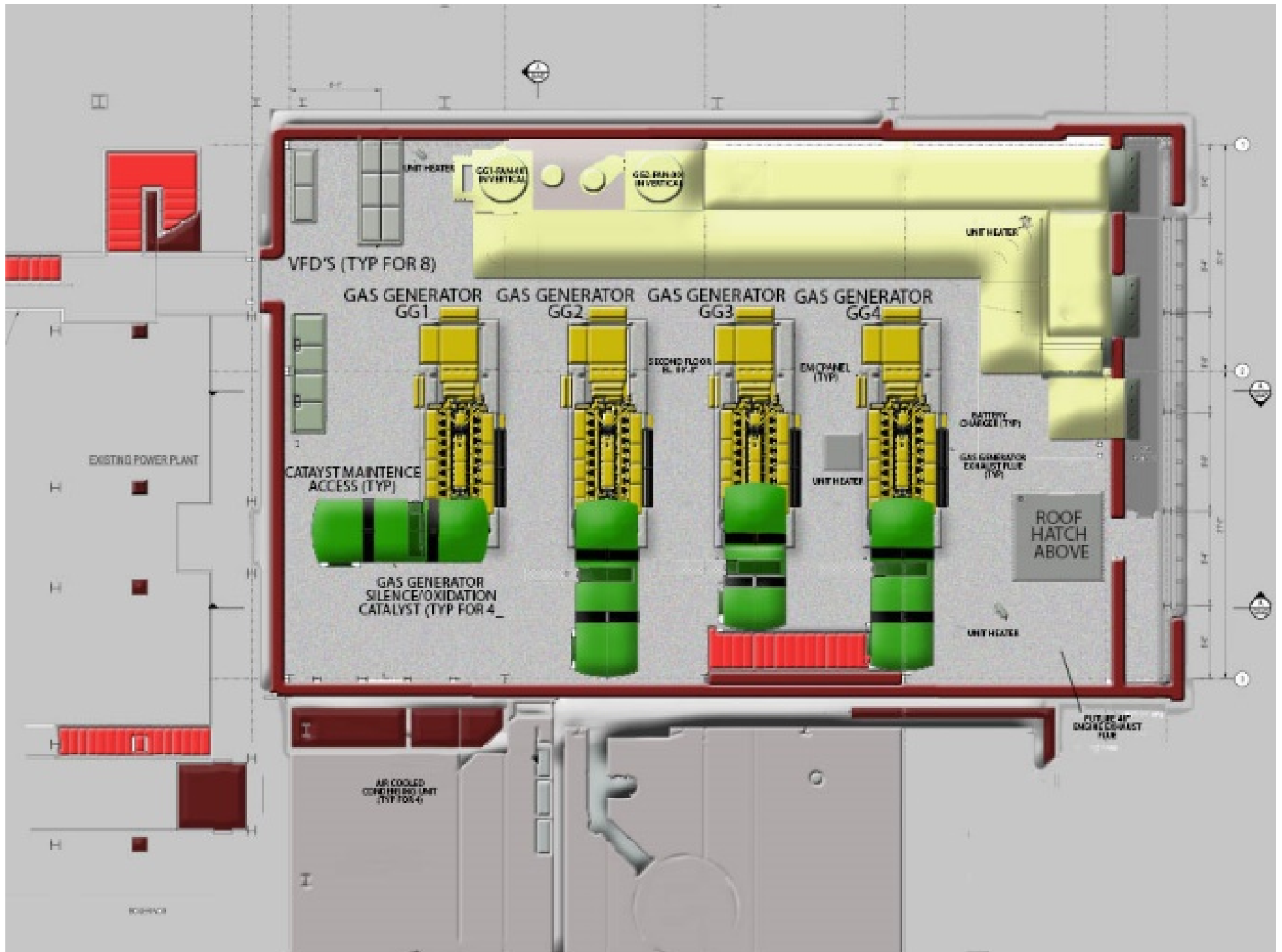
# PROJECT DESIGN AND CONSTRUCTION

- Construct new back-up power facility
- 8 MW (nominal) back-up power capacity
- Four 2,050 kW, 13.8kV Caterpillar G3520C engine generators
- Minimize impact to surrounding noise and aesthetics



# BEFORE AND AFTER

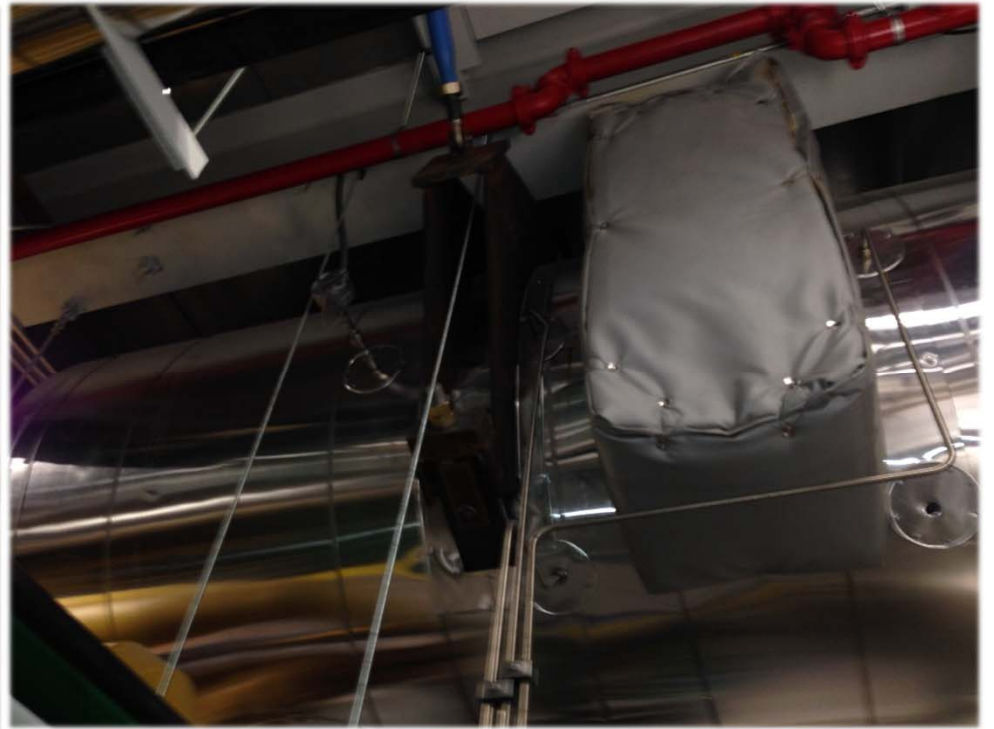
















# RELOCATION OF EXISTING SERVICES





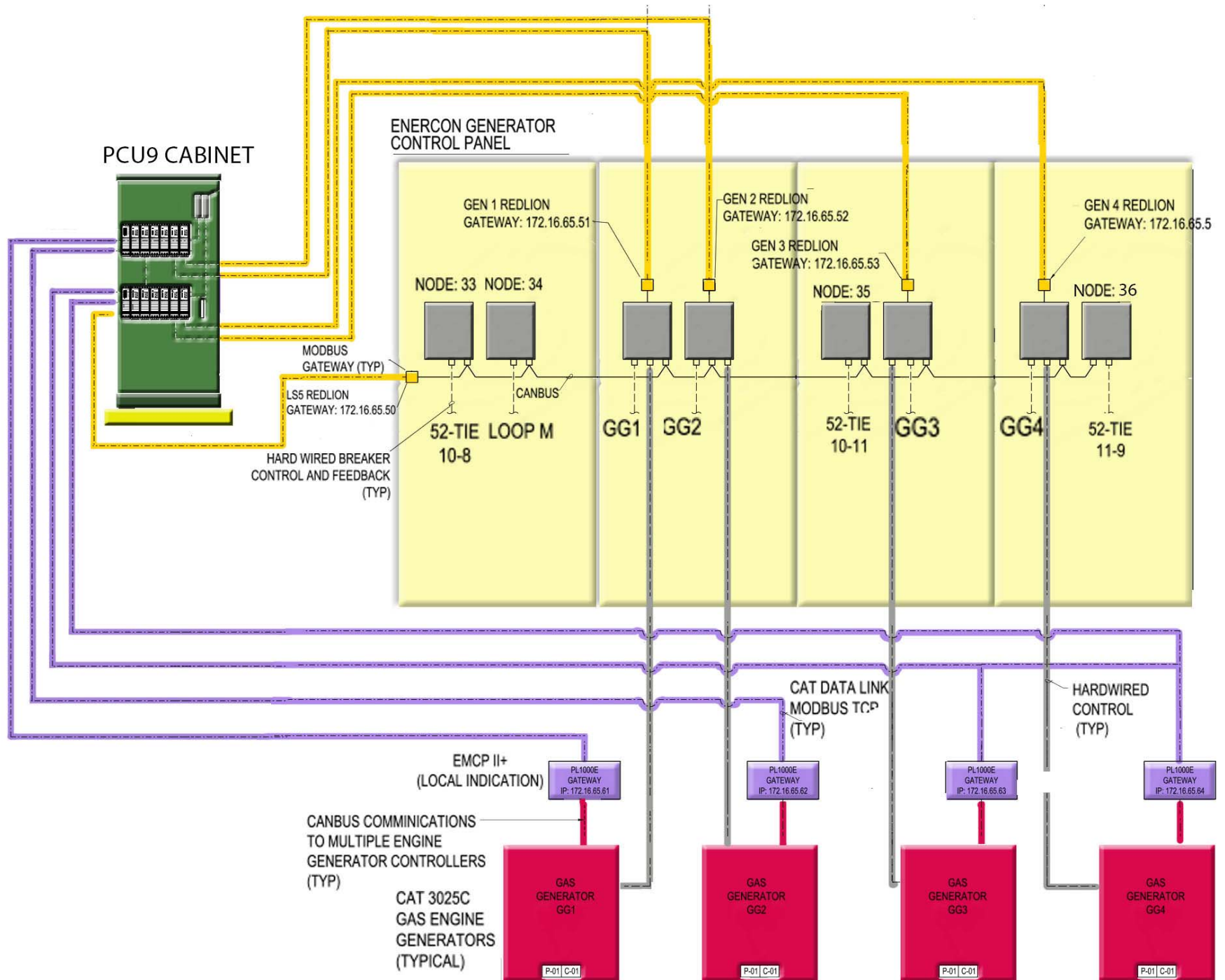
# UTILITY TUNNEL BELOW BUILDING





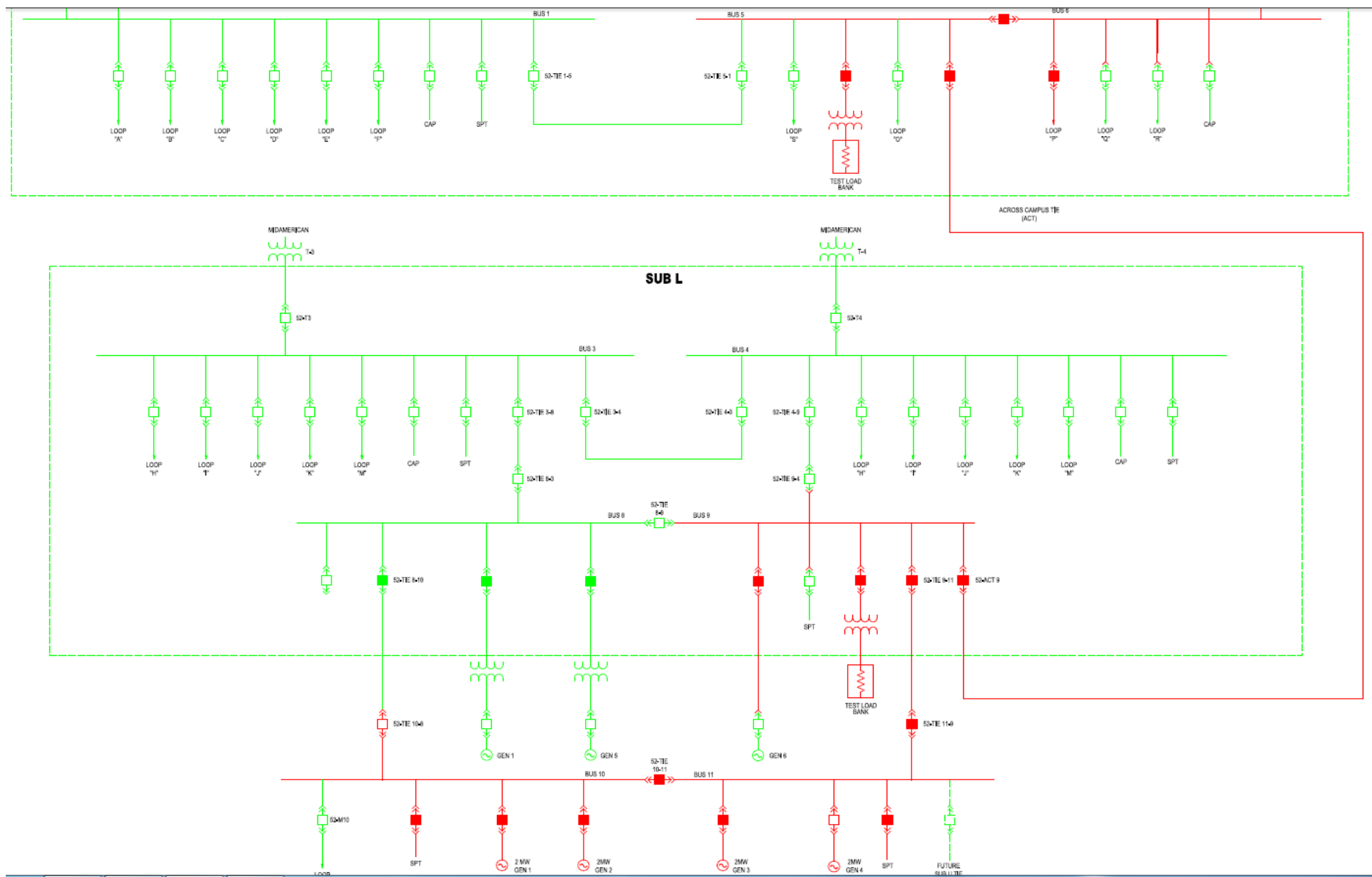
# ELECTRICAL AND CONTROLS





# COMMISSIONING

- Get CX Agent involved early and develop checklists early
- Project wiring diagrams
- Operating/control system description with equipment vendor-supplied data and review
- Control system FAT with Control Service Technician and equipment vendor in attendance
- Loop checkout utilizing vendor representatives
- Setup historian (PI, etc.) prior to startup
- Startup and testing procedures prior to startup efforts





# BEST PRACTICES & LESSONS LEARNED

- Outage sequencing and plant risk management
- Commissioning is king
- 80 + page document guided the team
- Startups are startups, expect issues
- Digging deep holes by a river is never a good idea

# AWARDS

Project won the Grand Prize Award (Energy) in the 2015 American Council of Engineering Companies of Iowa's Engineering Excellence competition.



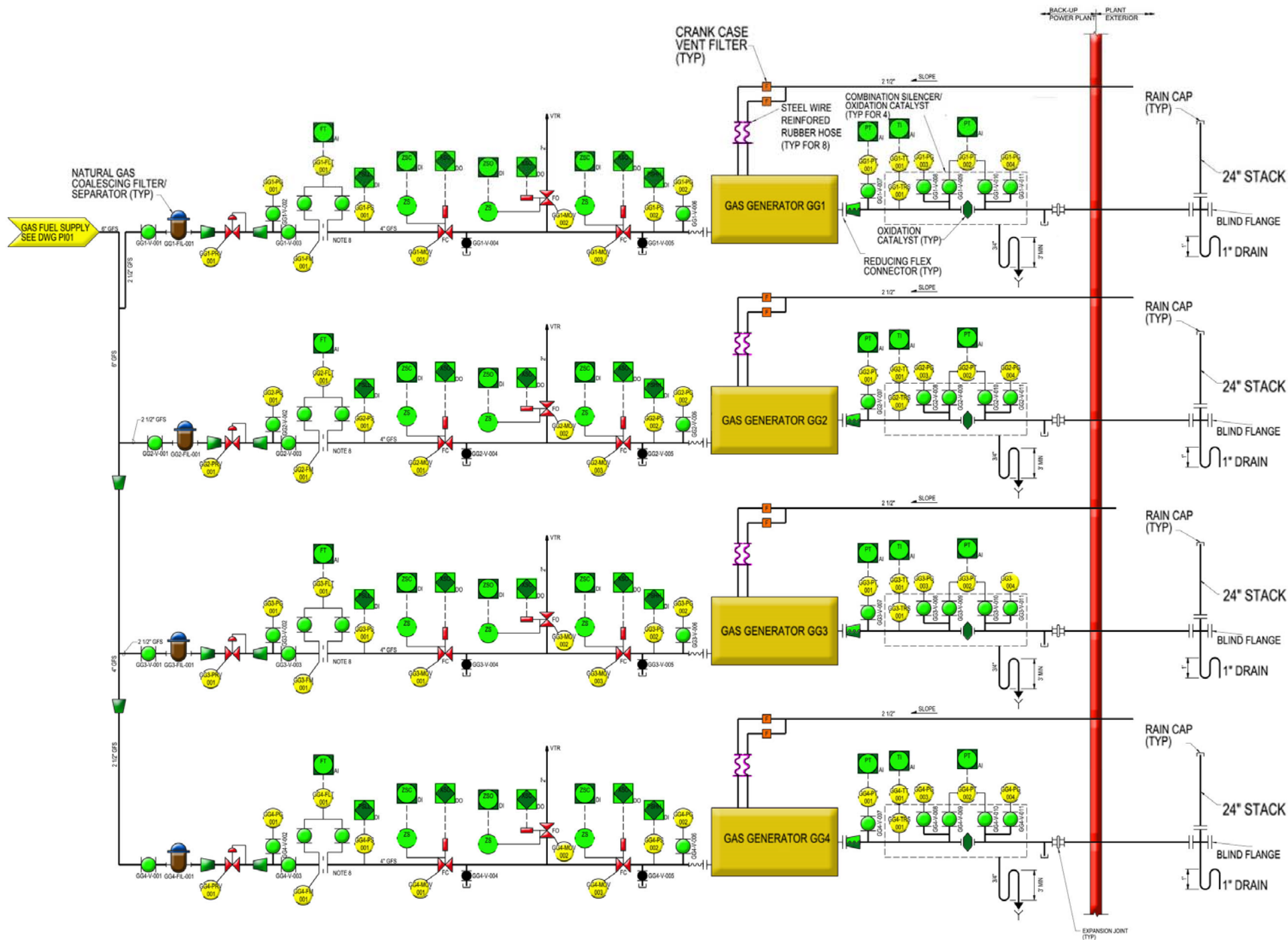
# QUESTIONS

ACEC

AMERICAN COUNCIL OF ENGINEERING COMPANIES

100 Years of Excellence







# ENGINE AUXILIARY SYSTEMS

- Engine silencers with CO catalysts
- Install (4) air-cooled radiators on roof and closed-loop glycol coolant system
- Dedicated ventilation system totaling 300,000 CFM
- 13.8kV main-tie-main arc-resistant synchronizing switchgear
- Expansion of Main Power Plant ABB Distributed Control System (DCS)

# PROVISIONS FOR FUTURE 9,200 kW ENGINE GENERATOR







# MINIMIZE IMPACT TO SURROUNDING NOISE AND AESTHETICS

- Engine silencers
- Slow speed, low noise radiator fans
- Roof-top screen wall
- Sand-filled masonry block wall
- Exhaust fan silencers
- Ventilation ductwork fittings

