



So you want to be your  
own Utility

*are you nuts?*

# Introducing UAF



- Founded in 1917
- Approximately 10,000 students at the Fairbanks campus
- 1,200 degrees awarded
- Over 2,000 faculty and staff
- 3,400,000 square feet of academic, research, administrative and housing space
- \$124 Million in Research dollars coming to UAF
- Approximately 14,000 degree heating days

# UAF CHP at a glance

- Third campus CHP facility is currently under construction
- Steam heat
  - Two 50,000 lb/hr coal boilers (1964)
  - One 100,000 lb/hr oil boiler (1972)
  - One 100,000 lb/hr oil or gas boiler (1986)
  - One 240,000 lbs/hr coal fired CFB (2018)
- Electricity
  - 10 MW steam turbine (1980)
  - 9.6 MW diesel engine generator (1999)
  - 17 MW steam turbine (2018)
  - 4,160 volt distribution system (1964-present)
  - 12,470 volt distribution system (2010-2012)
- Walk-through utilidor system
- 1,800 ton district chilled water system(lower campus only) (2005)

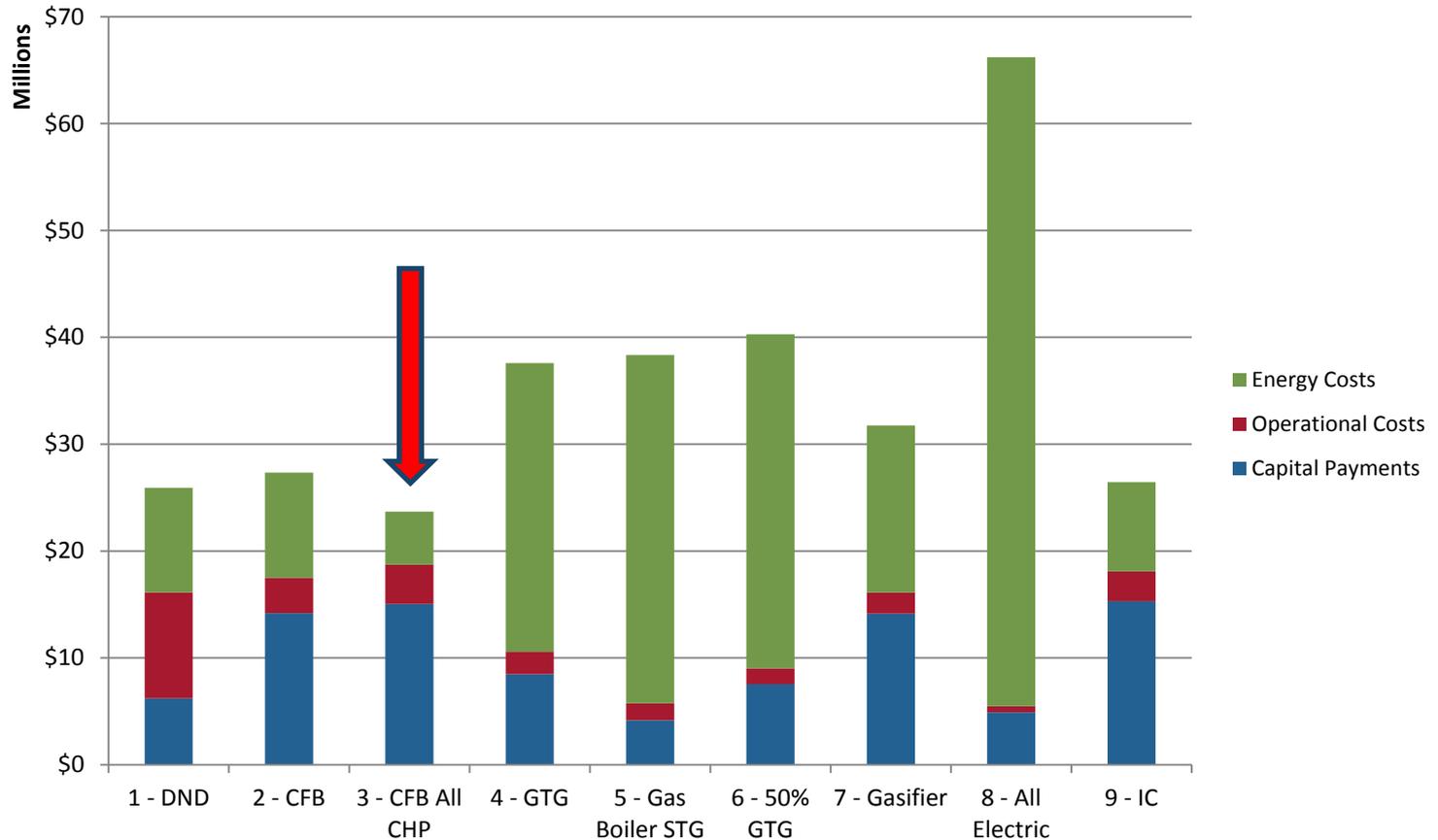


# Evaluated Options

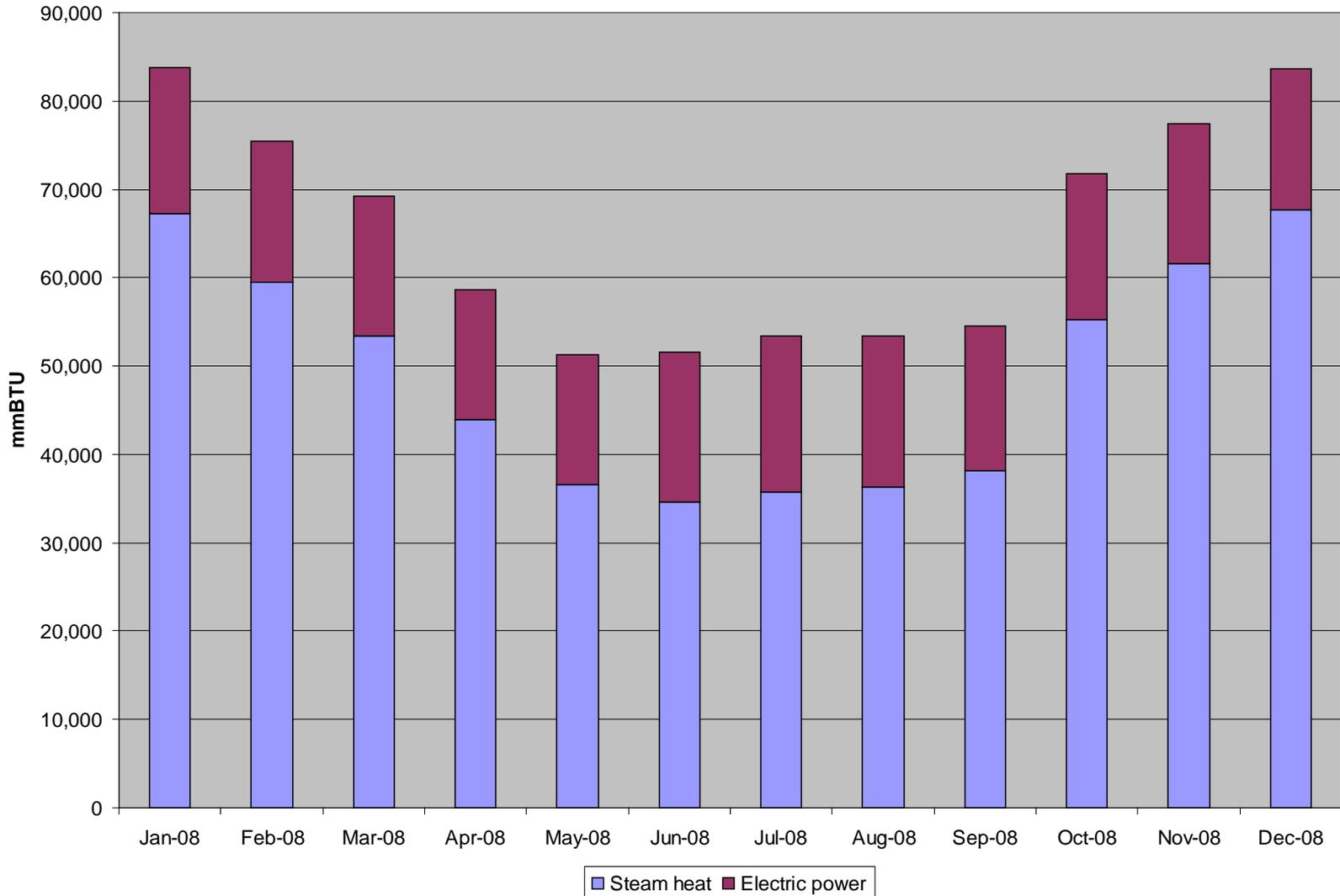
1. Rehab existing boilers
2. CFB and new backpressure steam turbine (heat following only)
3. CFB and condensing steam turbine (100% of future needs)
4. Gas turbine, fired HRSG, steam turbine (100% of future needs)
5. Gas boilers and steam turbine
6. Gas turbine, fired HRSG, steam turbine (50% of future needs)
7. Gasifier, gas boiler and steam turbine
8. Electric (convert campus to electric heat)
9. Gasifier, reciprocating engines, heat recovery
10. MSW gasifier and gas boiler, and steam turbine
11. Small modular nuclear reactor

# Study Results

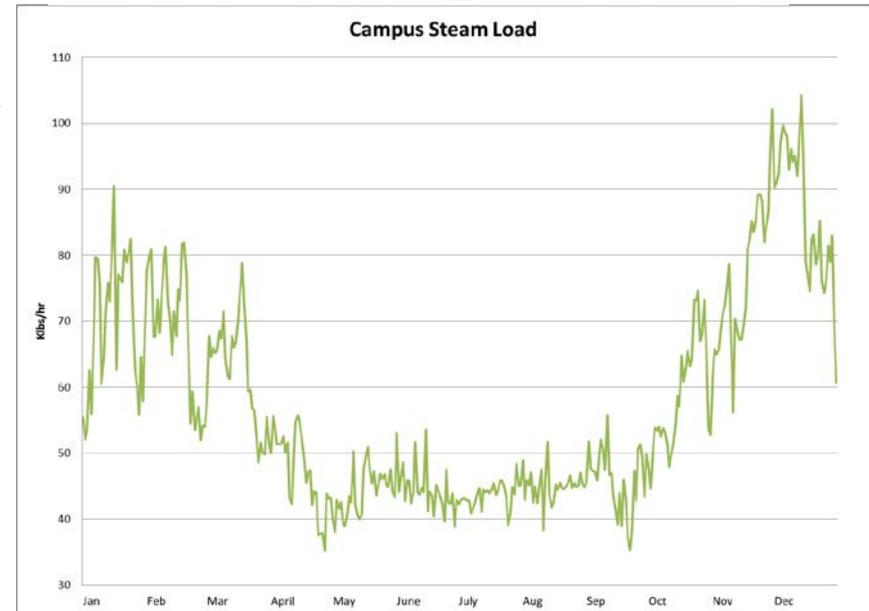
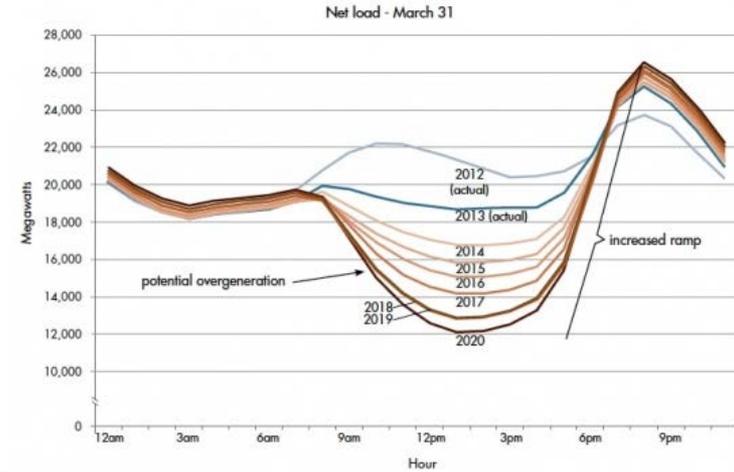
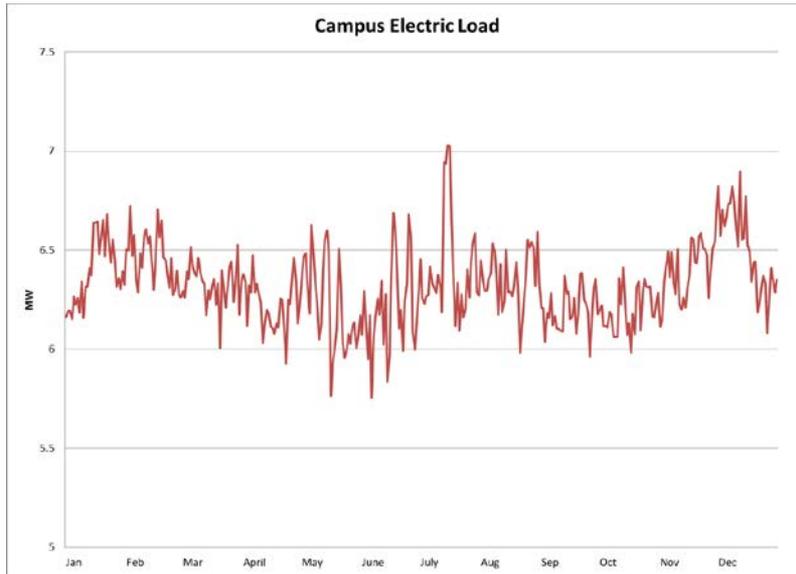
## Annual Cost Comparison with Base Rate Assumptions Year 2024



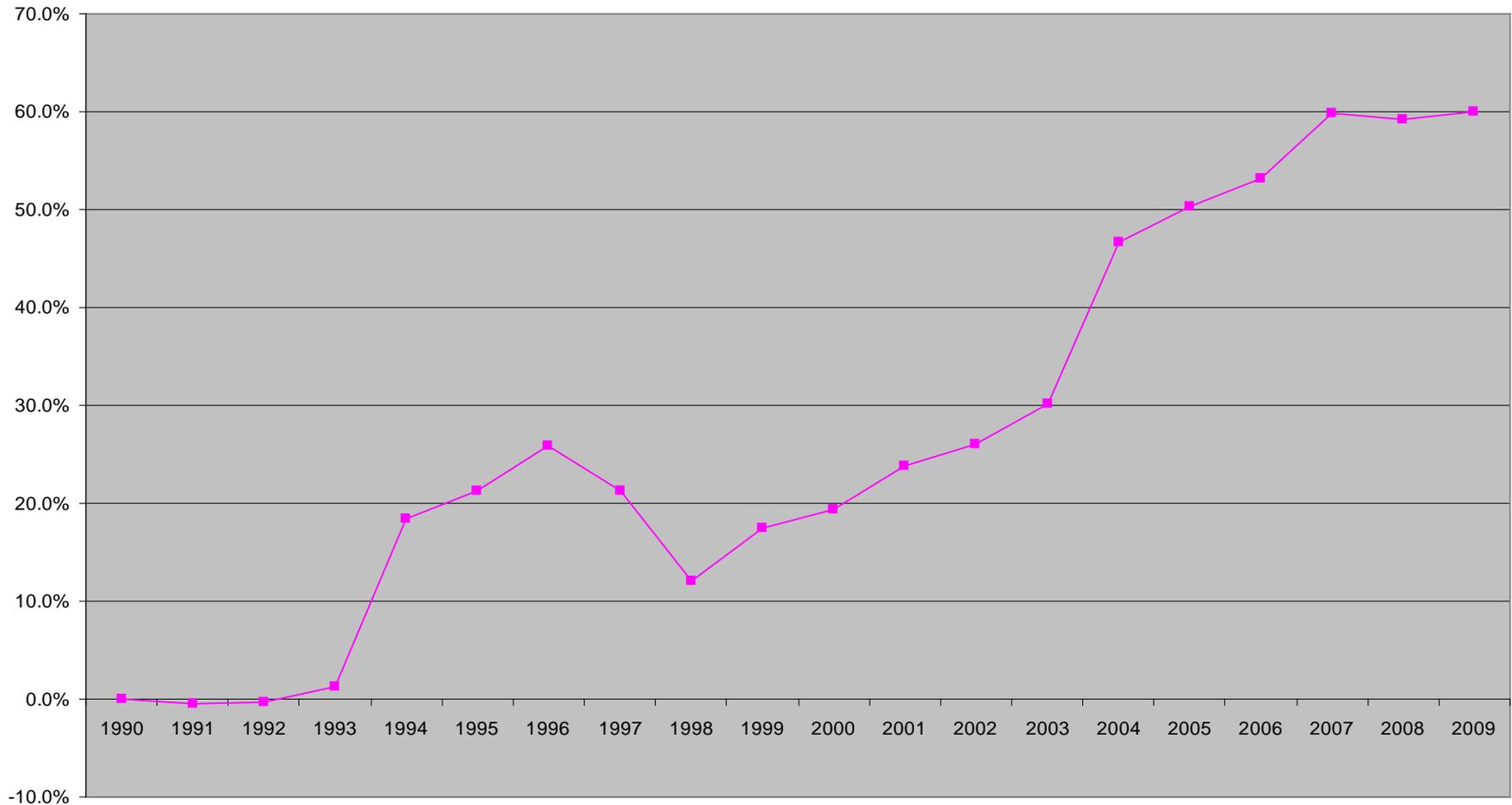
# Load Profiles



# Load Profiles



# UAF's Electrical load growth

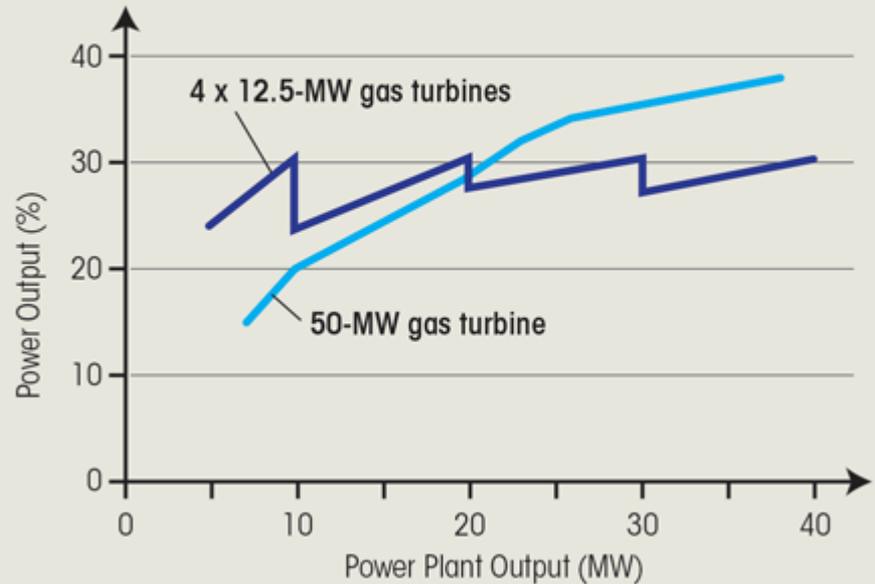


# CHP source selection

- Rankine cycle plant
- *Combined cycle GT*
- *Simple cycle GT*
- *Reciprocating Engines*

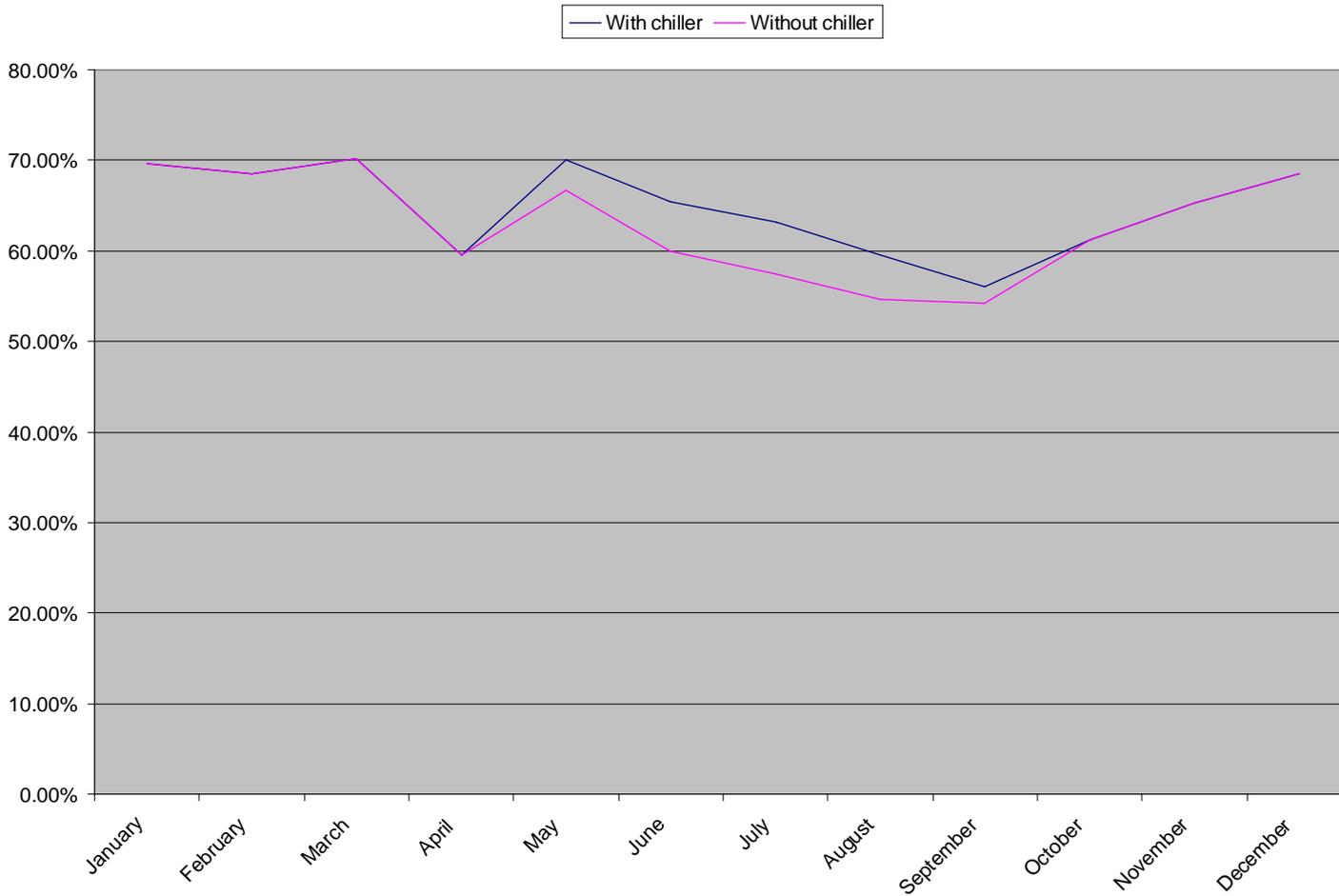
Efficiency vs. Load Comparison

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# Overall Efficiency

Combined heat and power efficiency

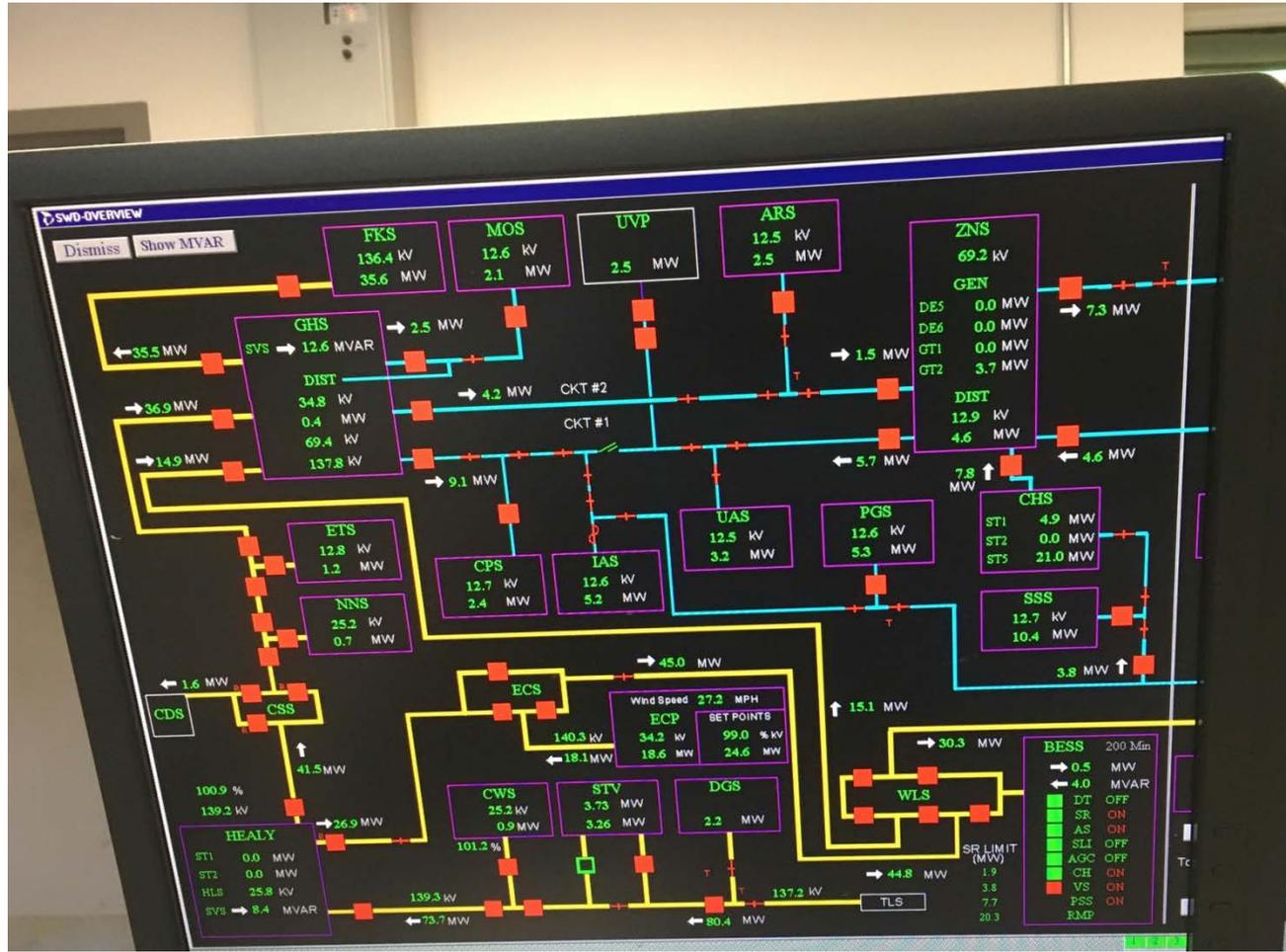


# Work with your Utility

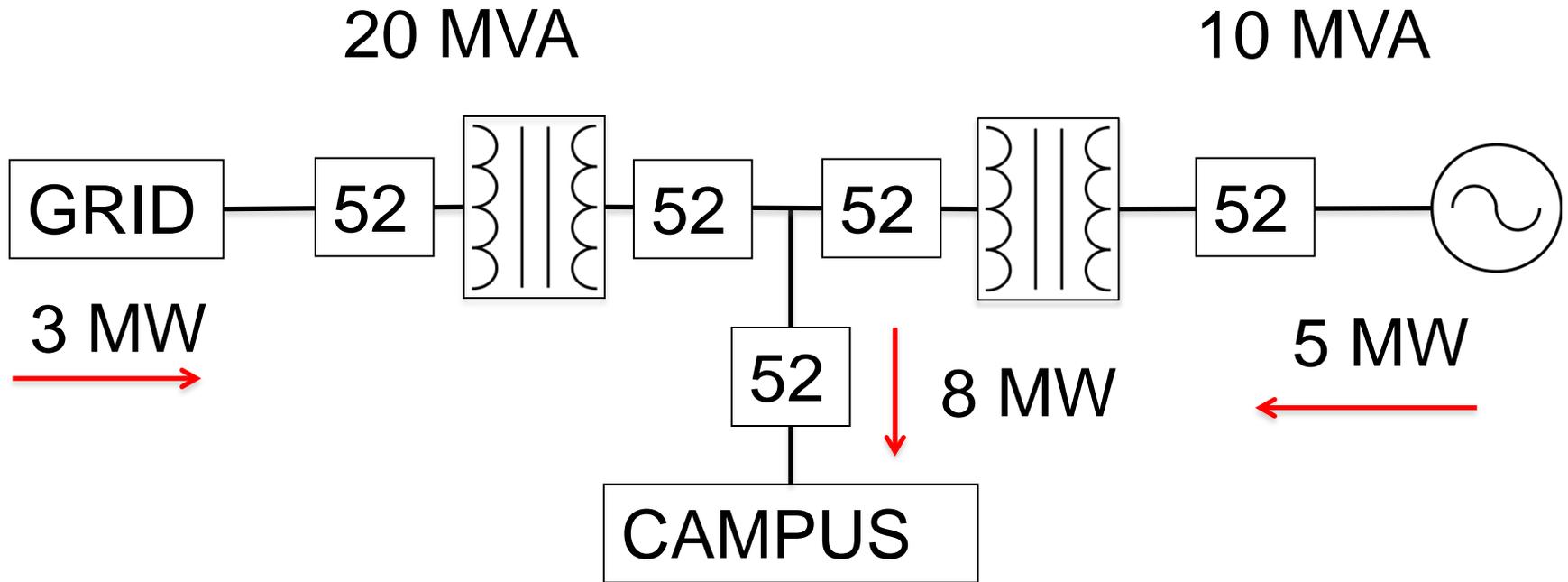
- Try to partner with them
- CHP lowers their revenue
- How can you help them?
- NERC, QF, PURPA



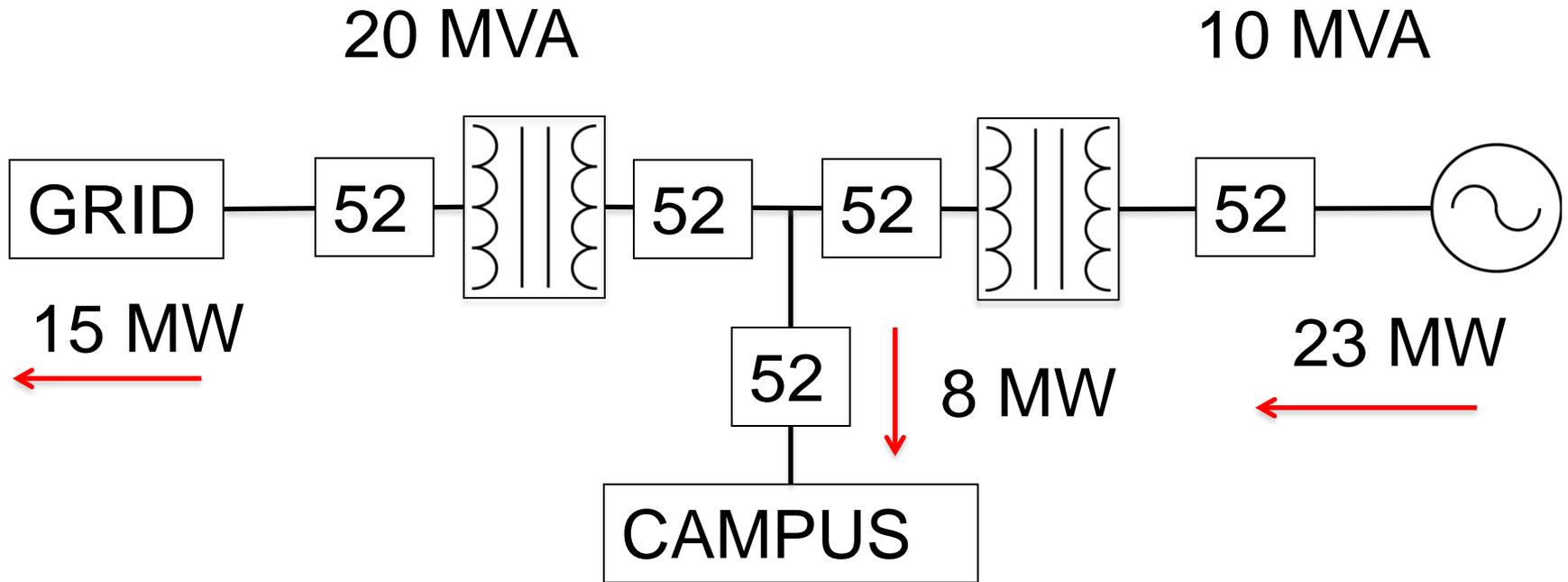
# Your place in the Grid



# Coordination

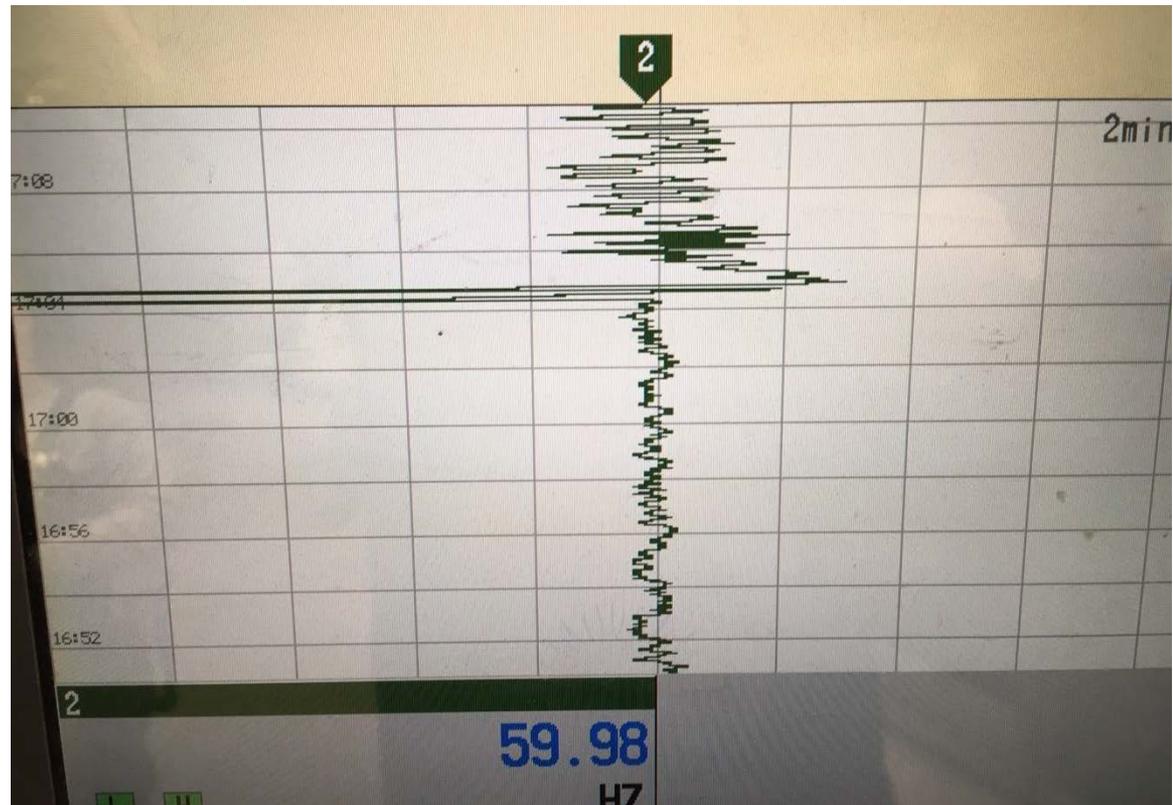


# Coordination



# Know your user's requirements

- Critical power users
- Frequency
- Voltage

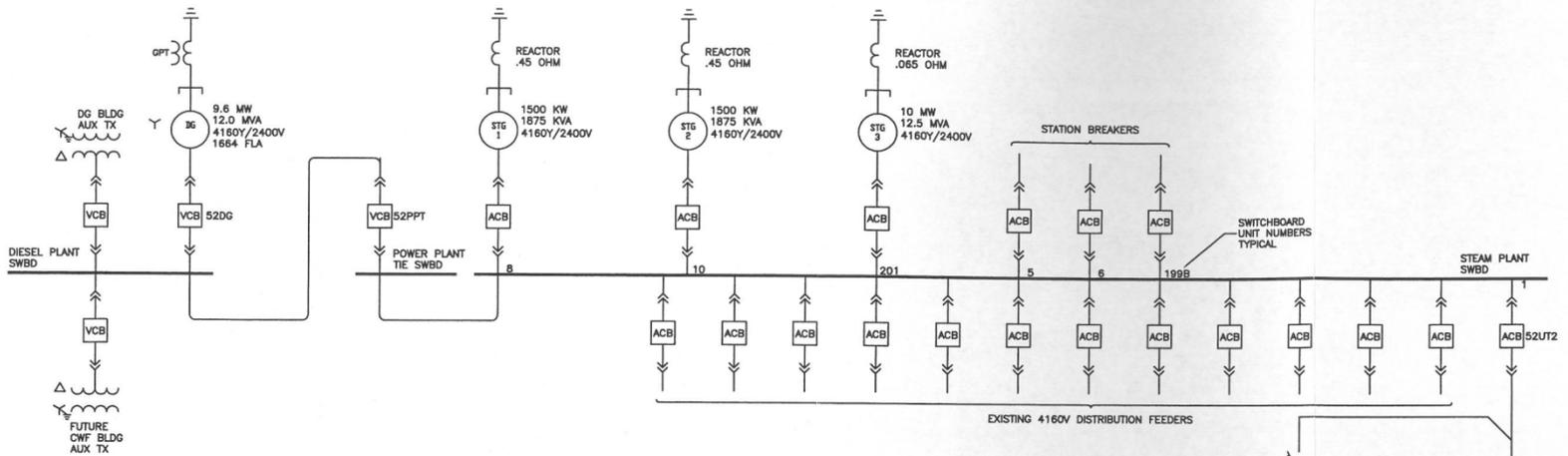


# Islanding

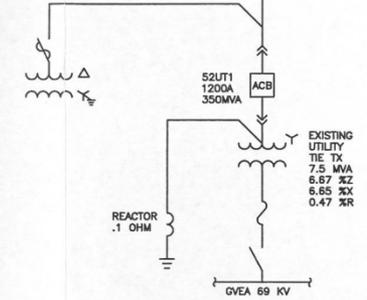


- Why Island?
- Need Frequency Control
- Distribution load characteristics
- Need a Load Management Plan. SILOS
- Might have to shed renewables

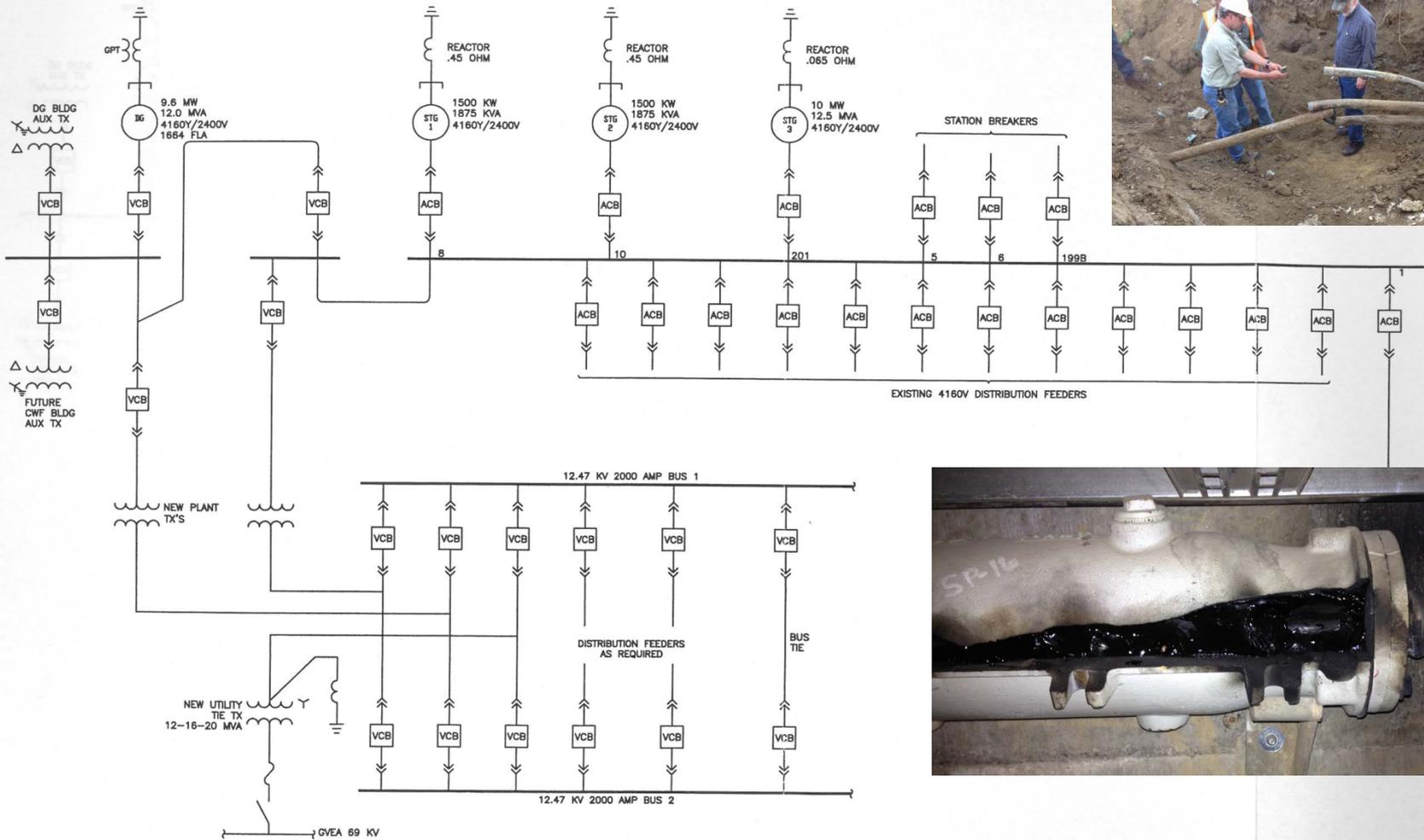
# Need robust distribution system



EXISTING 4160 VOLT STEAM & DIESEL PLANT ONE-LINE



# Need robust distribution system



# Questions?

