

An aerial photograph of the University of Alaska Fairbanks campus during the "golden hour" of sunset. The sun is low on the horizon, casting a warm, golden glow over the entire scene. The campus features several large, modern academic buildings with flat roofs and some with unique architectural designs. A central green space with a circular pattern of paths and trees is visible. The campus is surrounded by dense evergreen forests. The overall mood is serene and picturesque.

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)

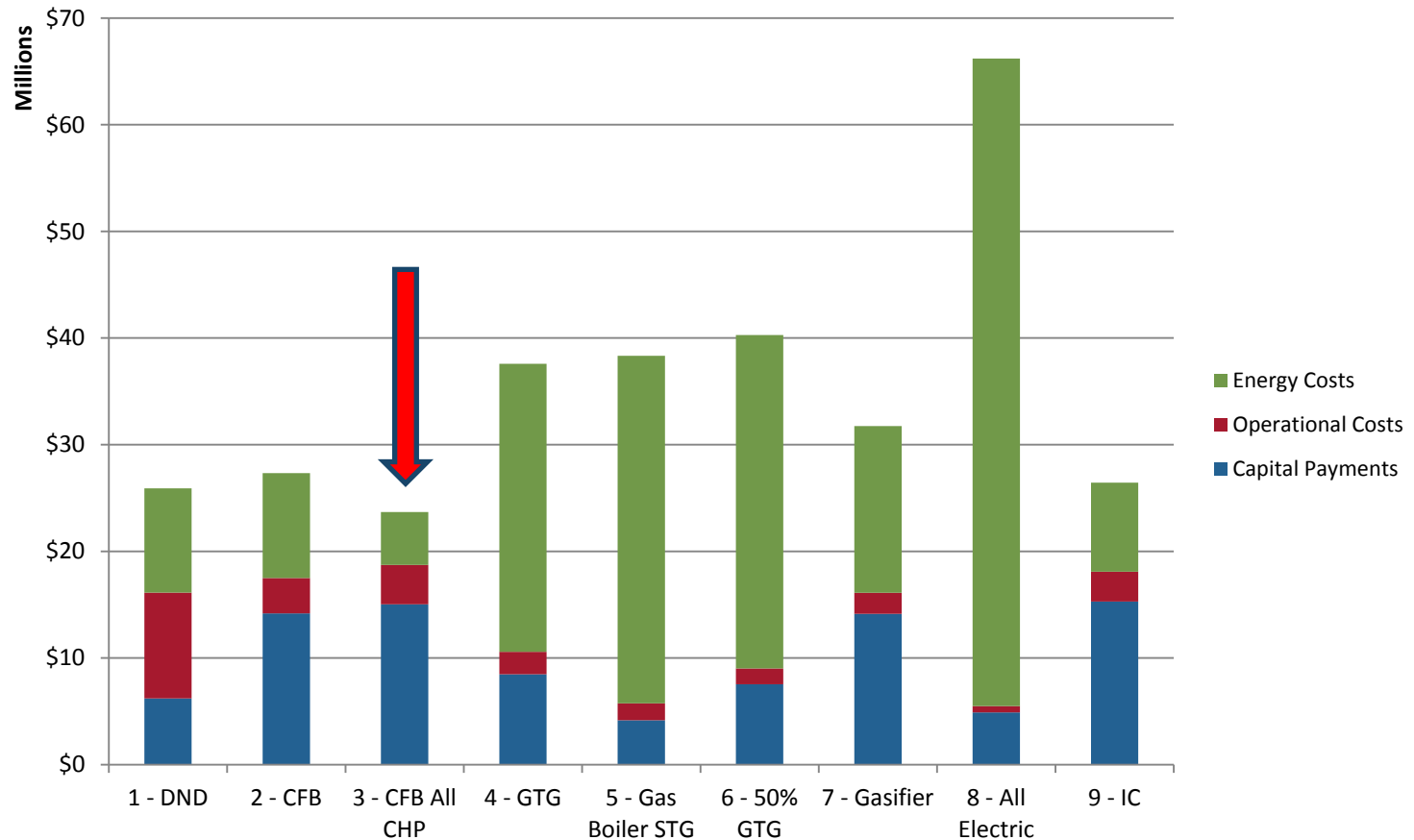


Evaluated Options

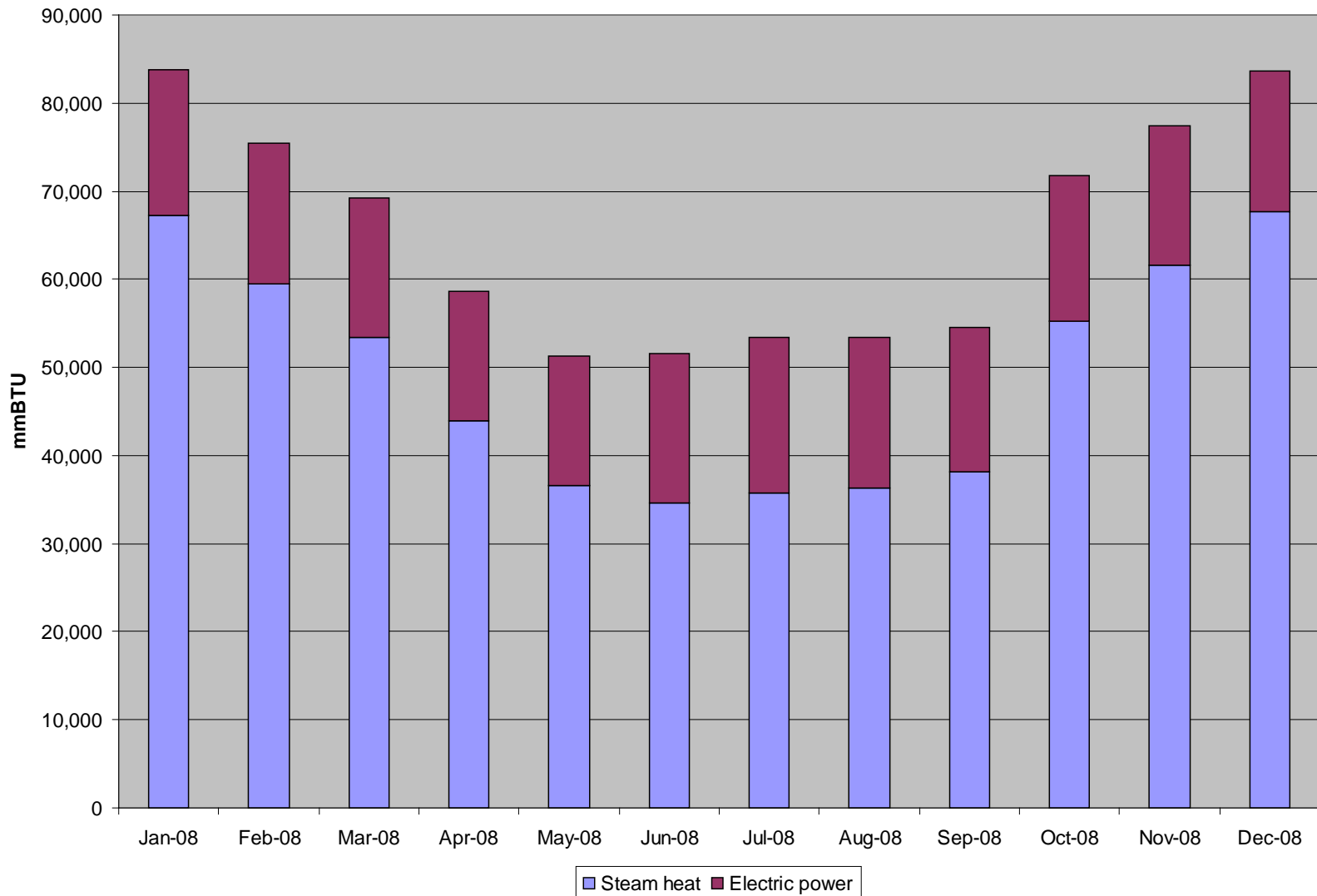
1. Rehab existing boilers
2. CFB and new backpressure steam turbine (heat following only)
3. CFB and condensing steam turbine (100% of future needs)
4. Gas turbine, fired HRSG, steam turbine (100% of future needs)
5. Gas boilers and steam turbine
6. Gas turbine, fired HRSG, steam turbine (50% of future 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

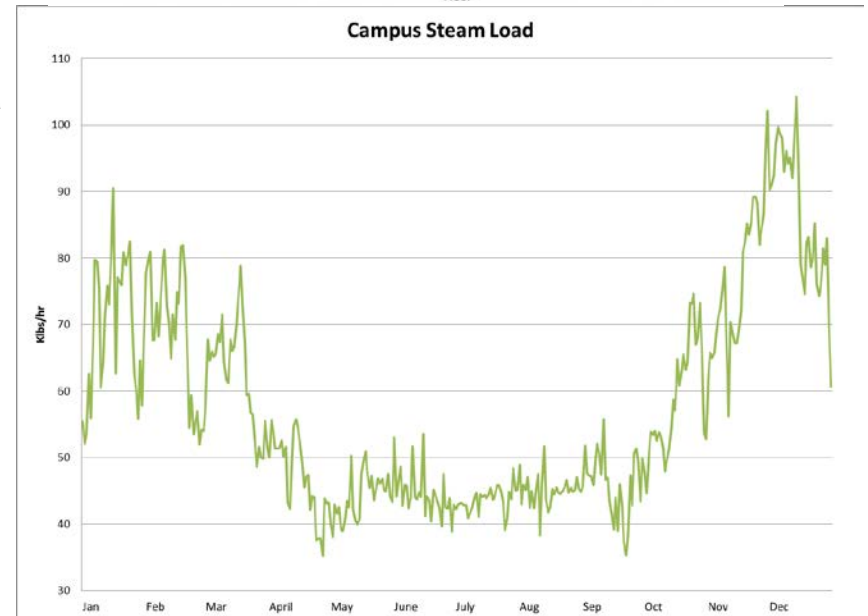
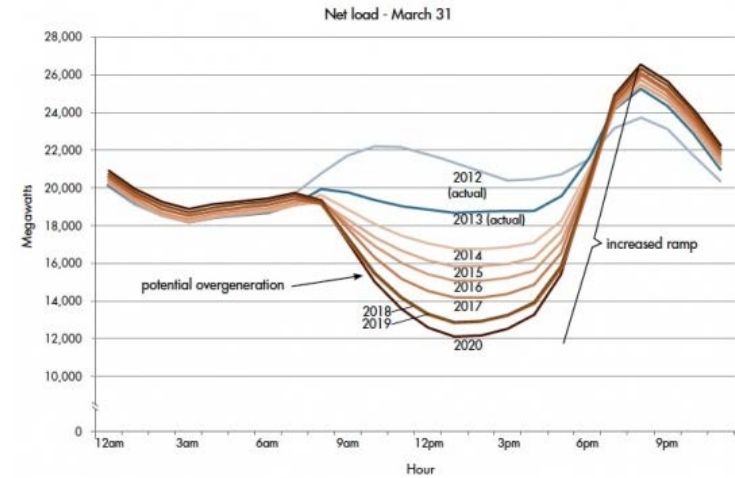
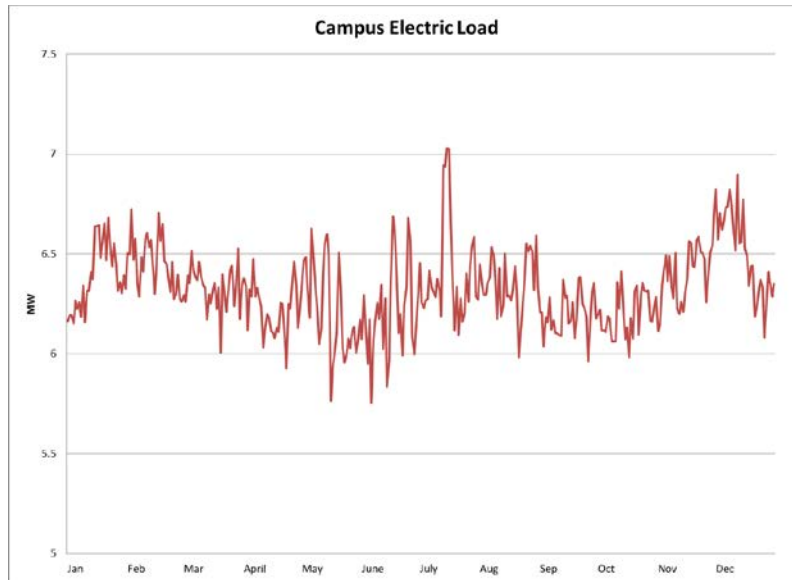
Annual Cost Comparison with Base Rate Assumptions Year 2024



Load Profiles



Load Profiles



UAF's Electrical load growth

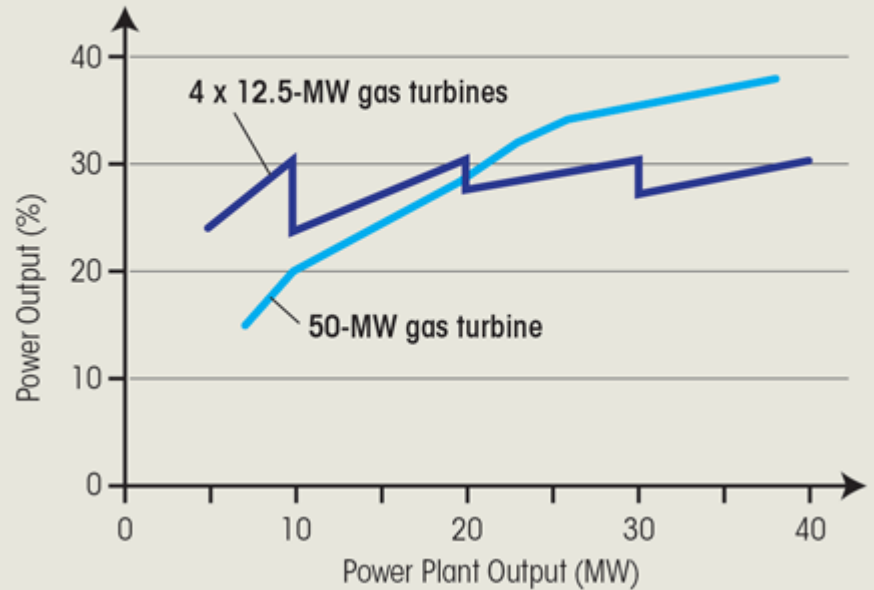


CHP source selection

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

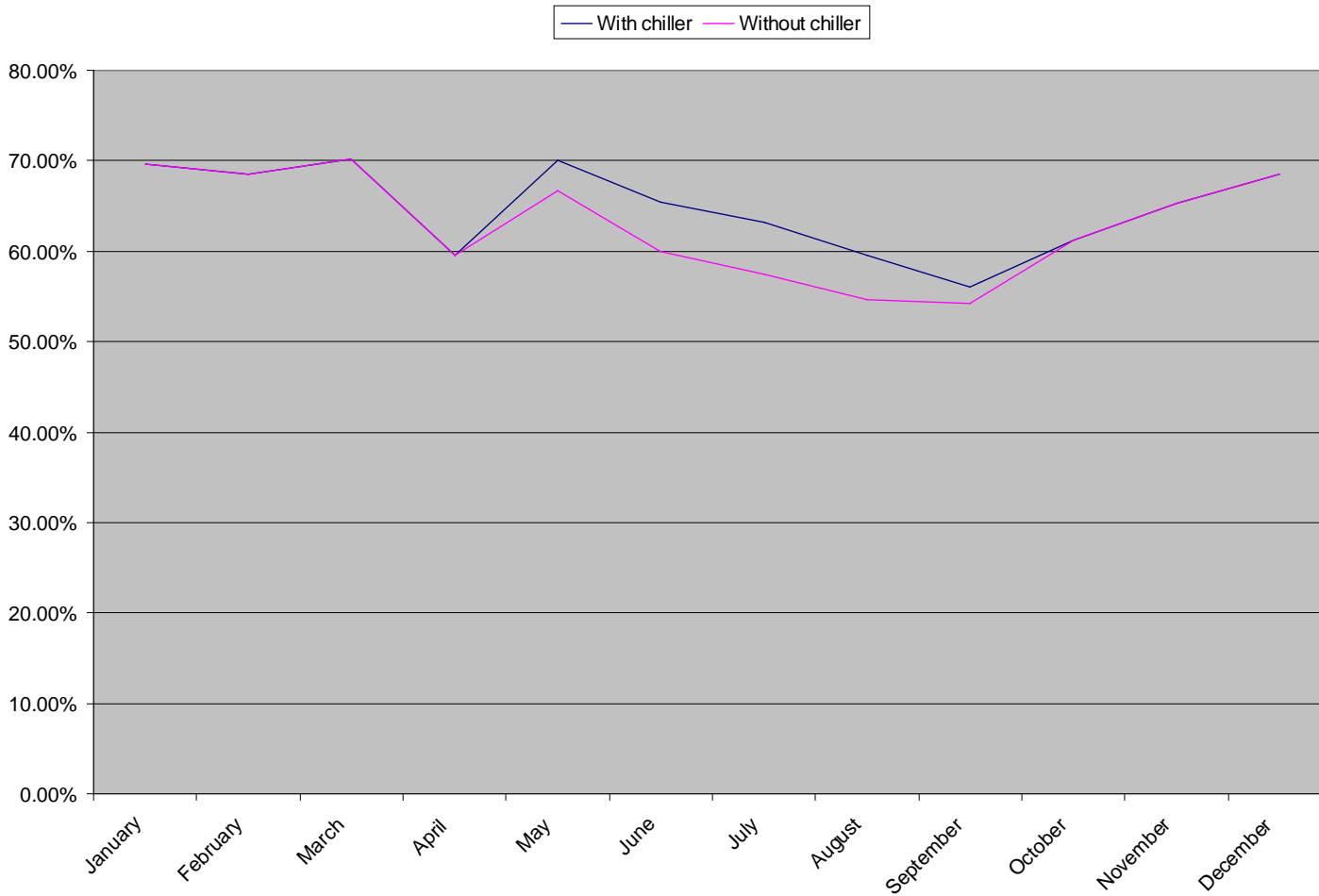
Efficiency vs. Load Comparison

6



Overall Efficiency

Combined heat and power efficiency

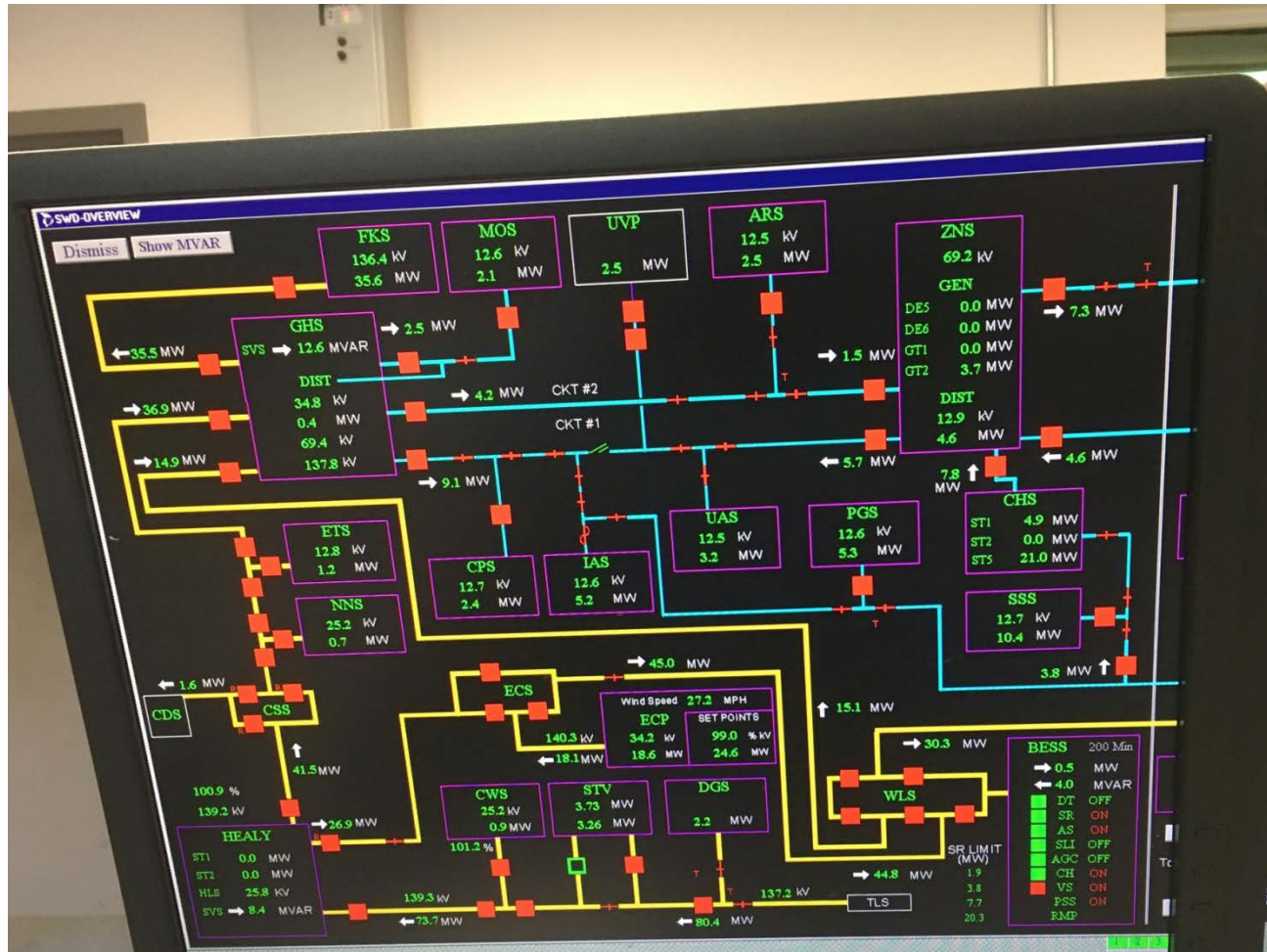


Work with your Utility

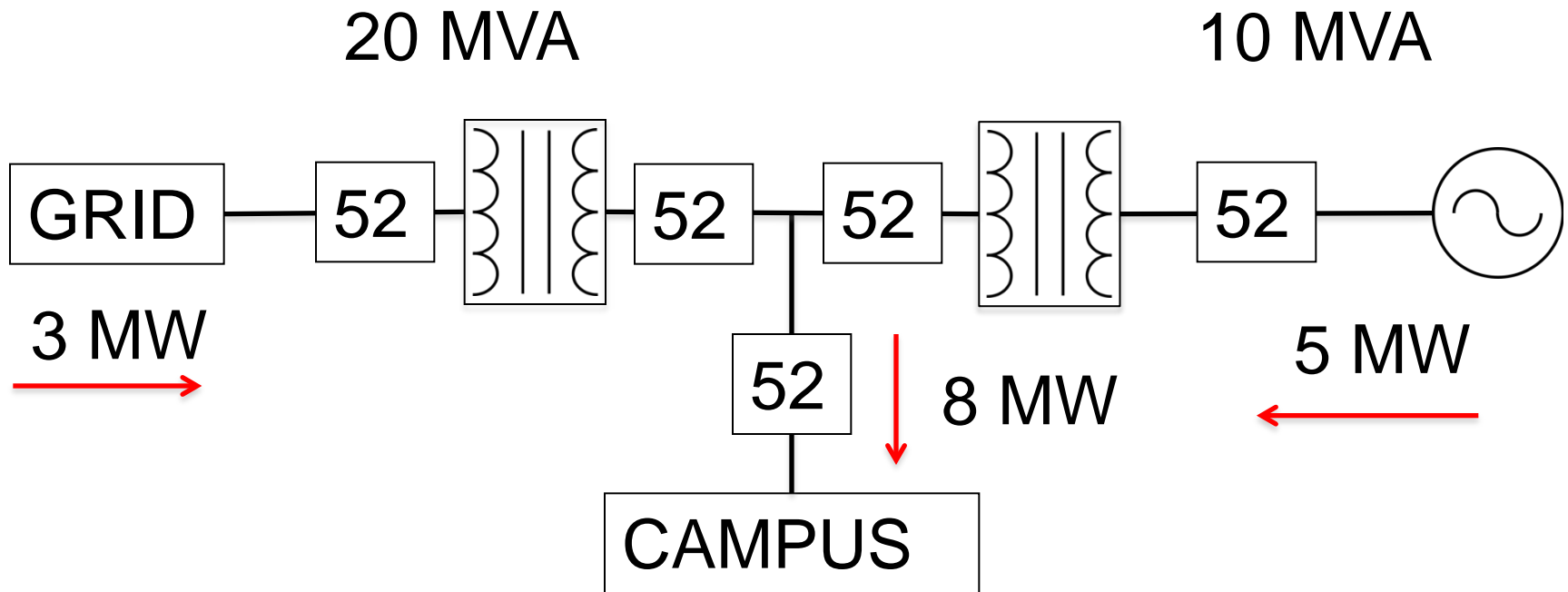
- Try to partner with them
- CHP lowers their revenue
- How can you help them?
- NERC, QF, PURPA



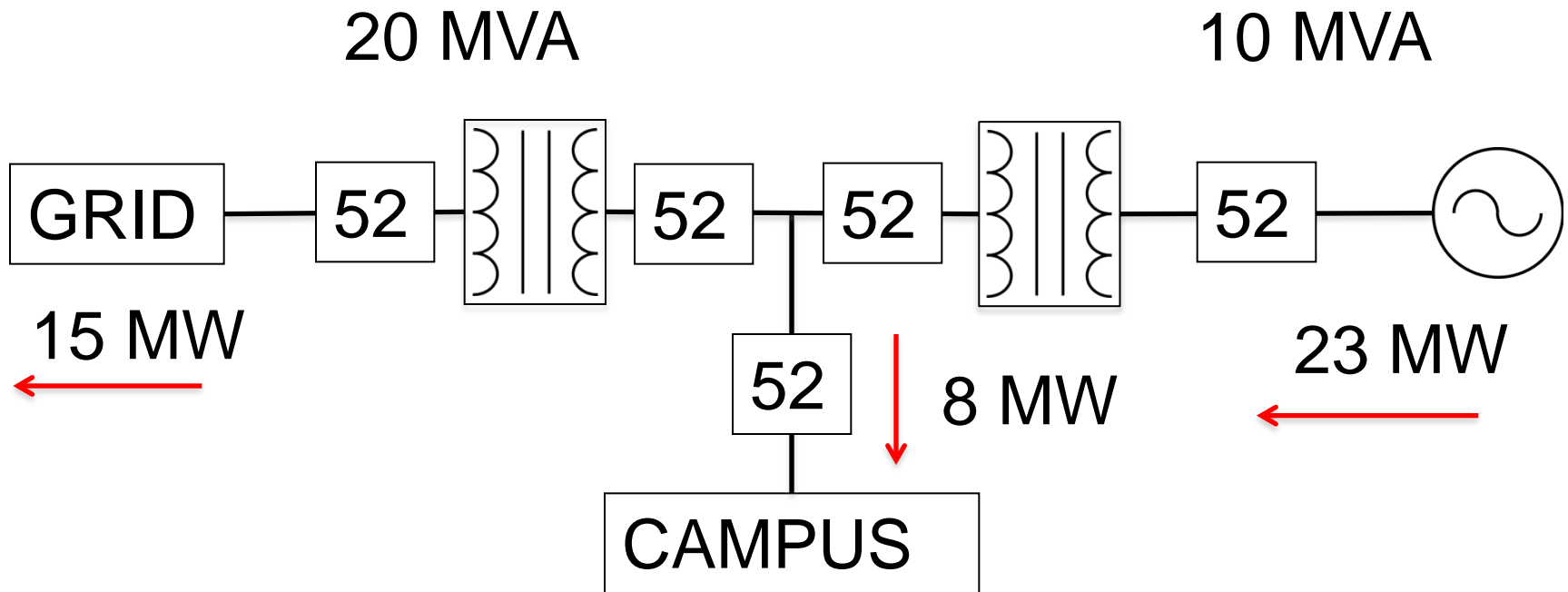
Your place in the Grid



Coordination

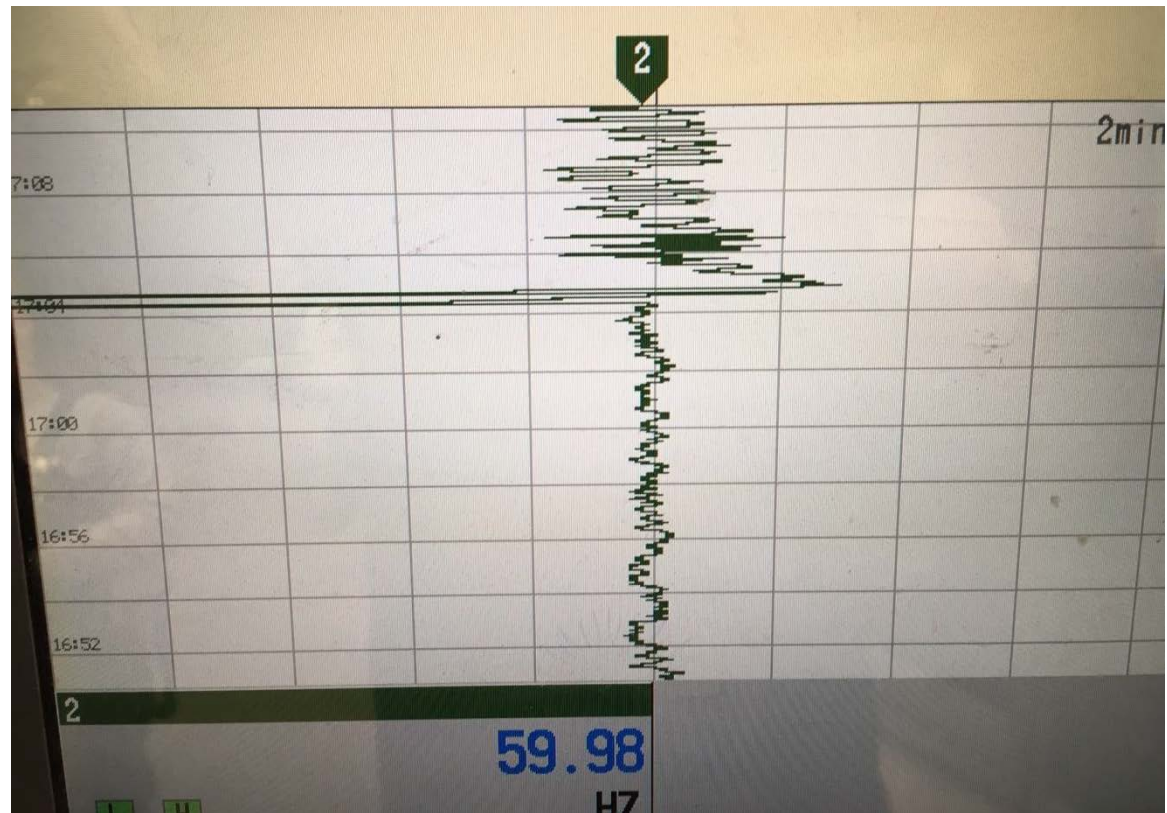


Coordination



Know your user's requirements

- Critical power users
- Frequency
- Voltage

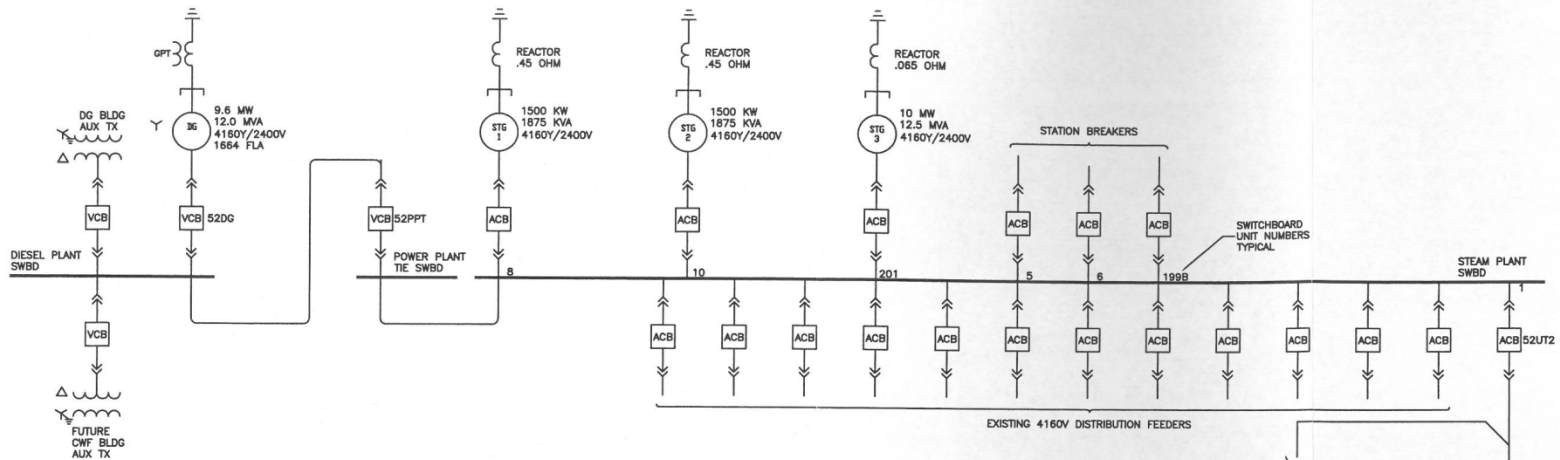


Islanding

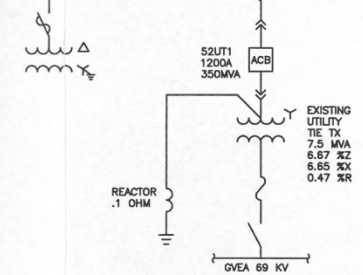
- Why Island?
- Need Frequency Control
- Distribution load characteristics
- Need a Load Management Plan. SILOS
- Might have to shed renewables



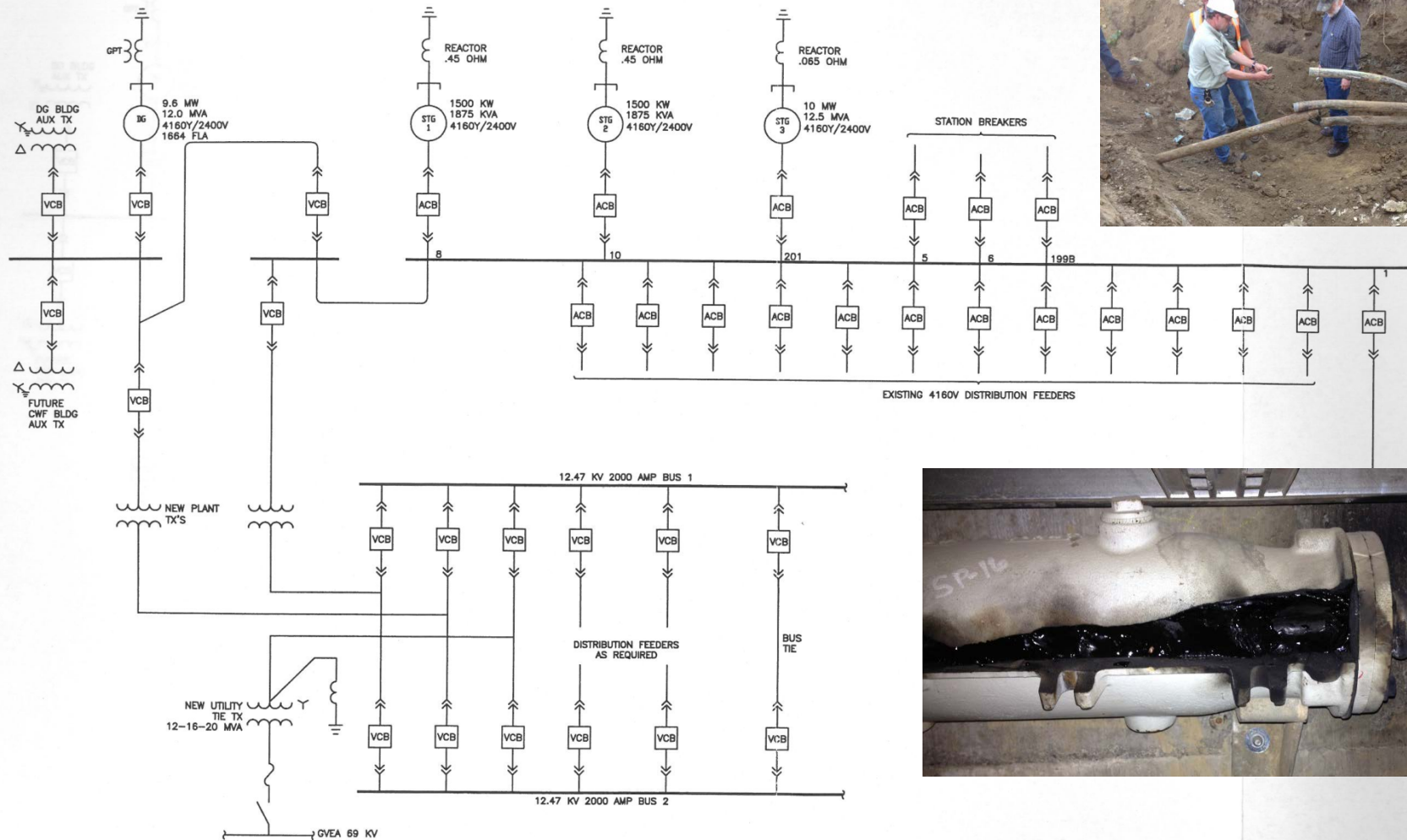
Need robust distribution system



EXISTING 4160 VOLT STEAM & DIESEL PLANT ONE-LINE



Need robust distribution system



12470 VOLT DISTRIBUTION WITH DUAL BUSES AND DOUBLE-BREAKERED SOURCES

Questions?

