



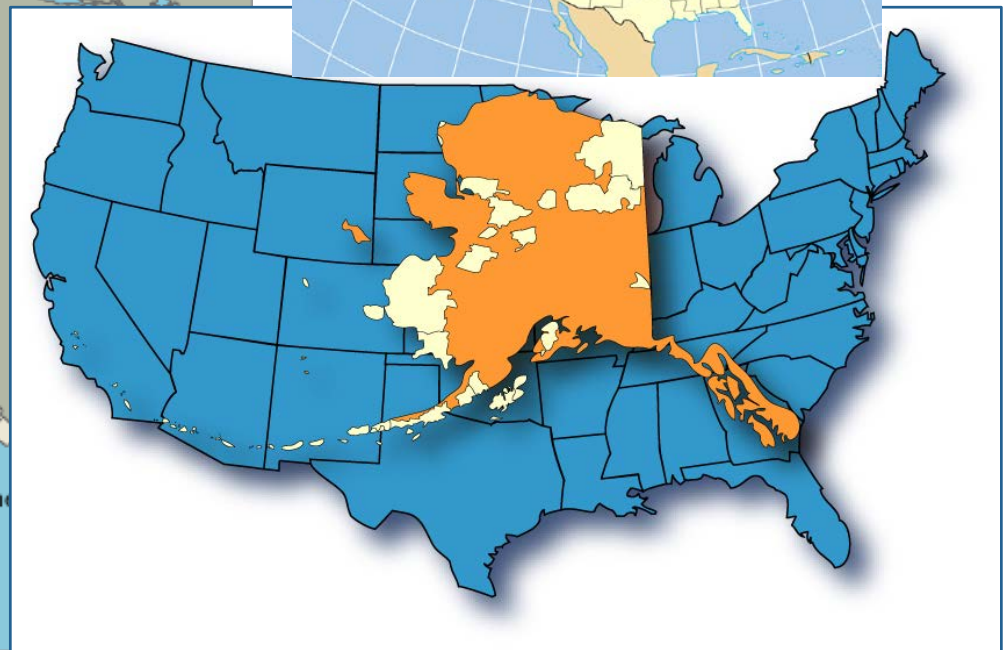
Modular Gasification for
Syngas/Engine Combine Heat and Power Applications in
Challenging Environments
(Funding by DOE/NETL Contract DE-FE0031446)

MAKING COAL RELEVANT FOR SMALL SCALE APPLICATIONS

UAF is an AA/EO employer and educational institution and prohibits illegal discrimination against any individual: www.alaska.edu/nondiscrimination/.



WHERE IS FAIRBANKS?





PROJECT PARTNERS



UAF:
Plant & Expertise
Diesel Generator

GASIFIER



HMI:
Intellectual Property
Decades Experience



WorleyParsons:
Detailed Engineering
Cost Estimating Service



Cost Share: Sotacarbo, HMI, UAF, GVEA,
Aurora Energy



PROJECT OBJECTIVE

Demonstrate small scale coal gasification to fuel reciprocating engine generators

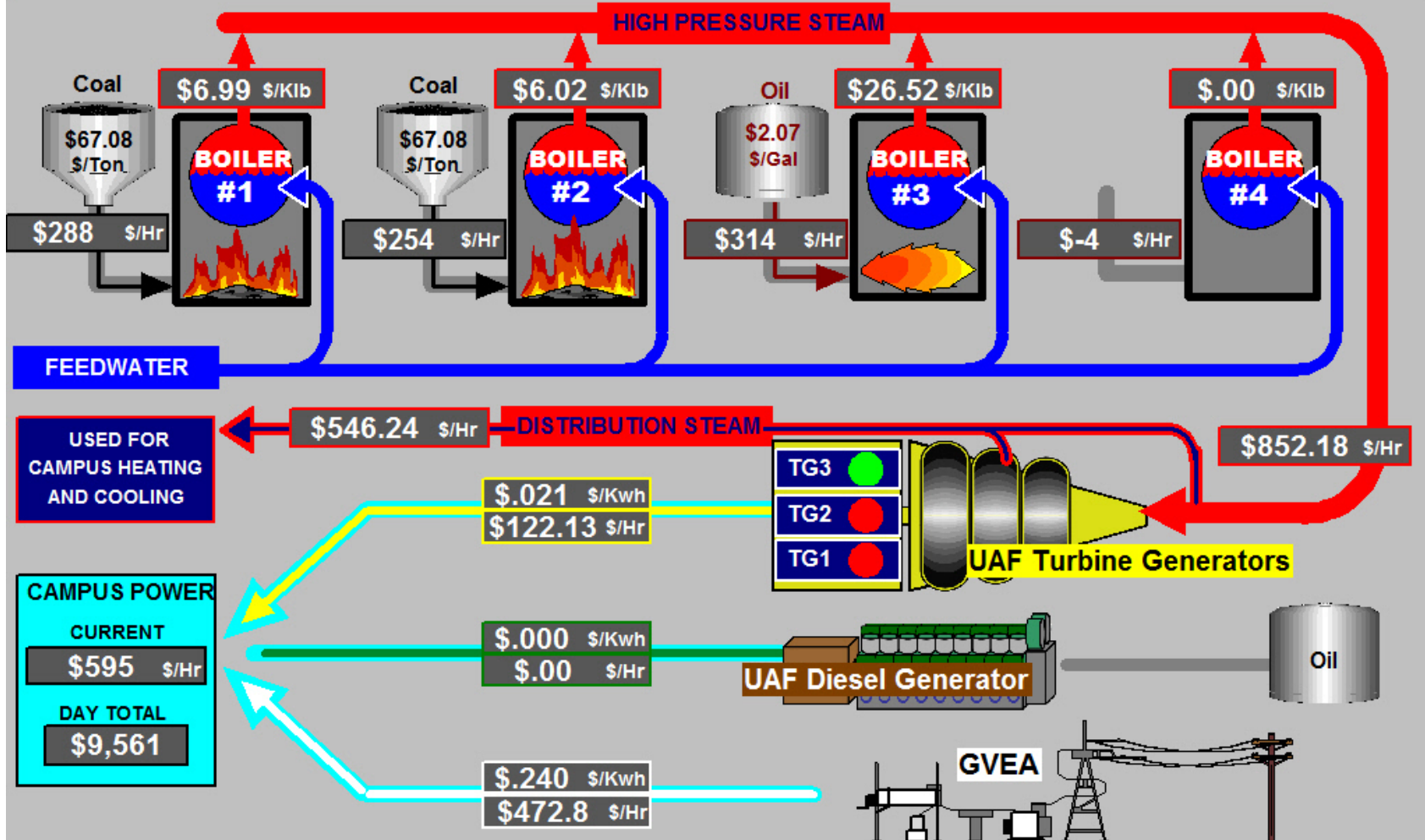
- Cost effective coal generating capacity for small applications
- Provides load following services
- Ideal for islanding systems
- Local jobs



UAF POWER PLANT

UAF Fuel Cost for Steam and Power

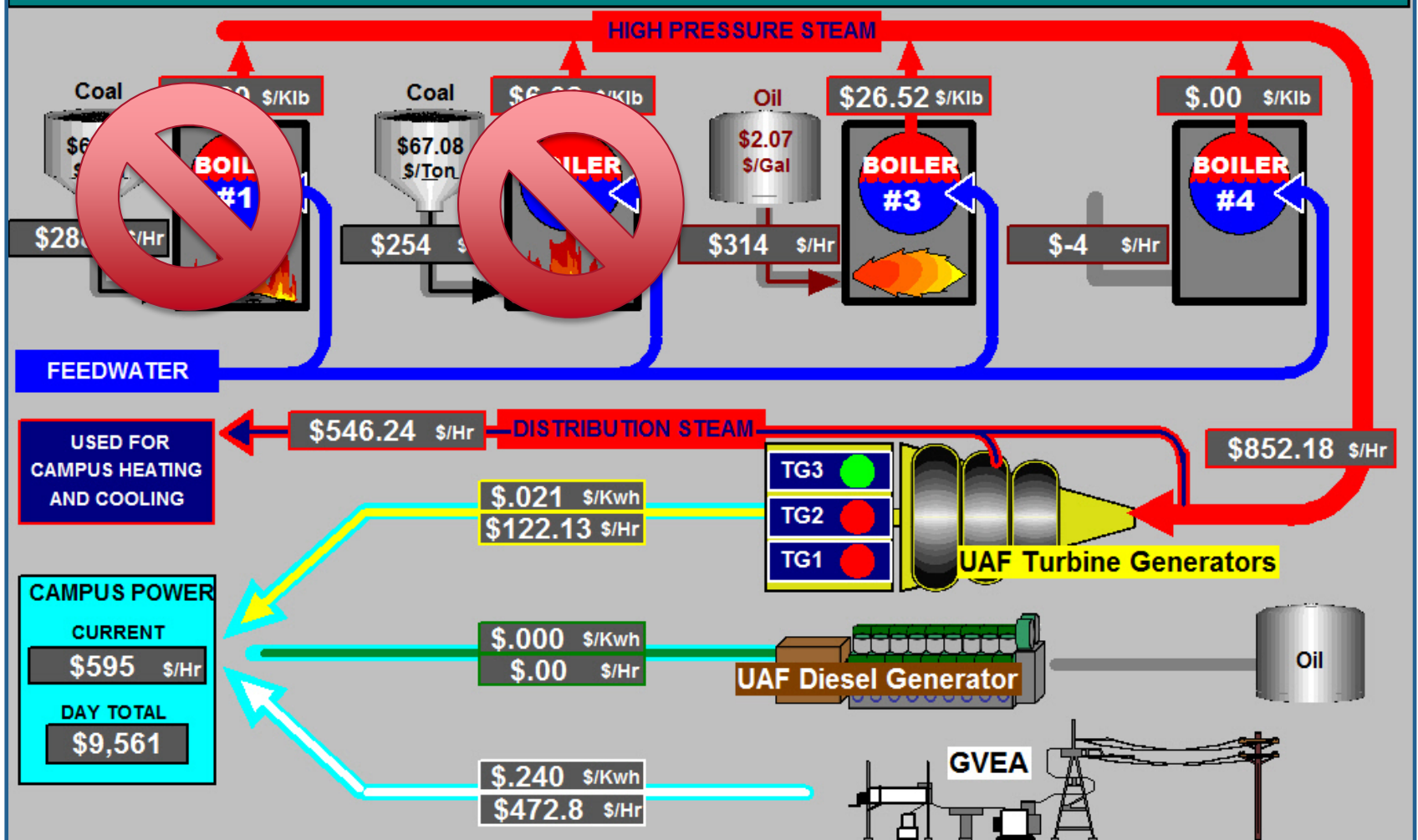
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UAF POWER PLANT

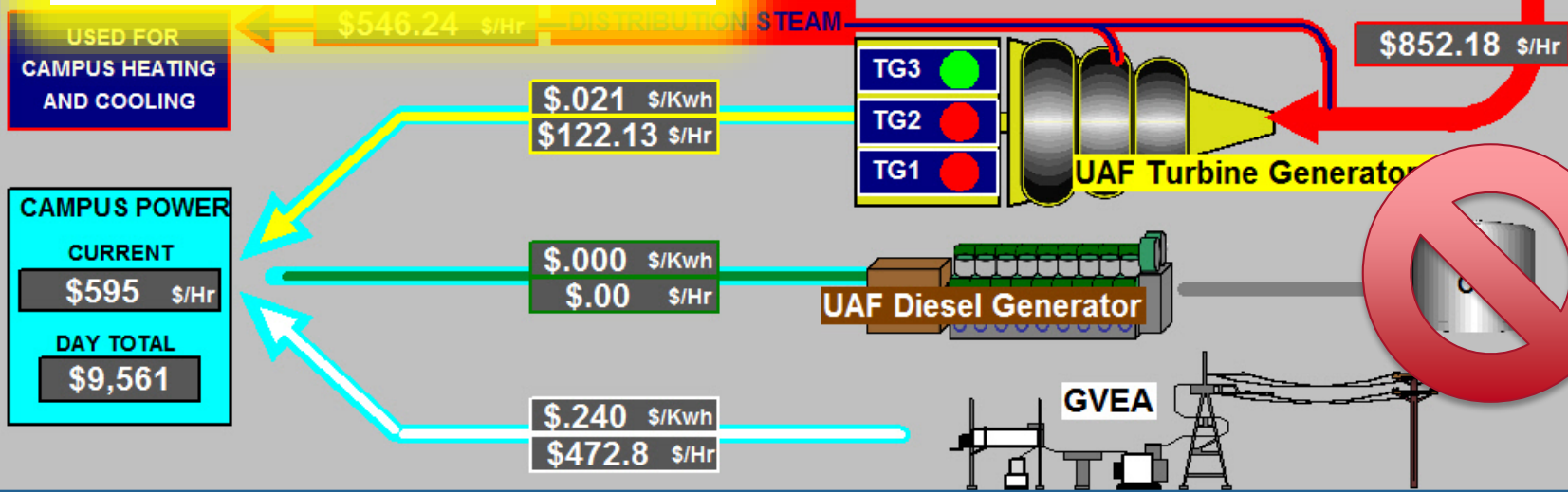
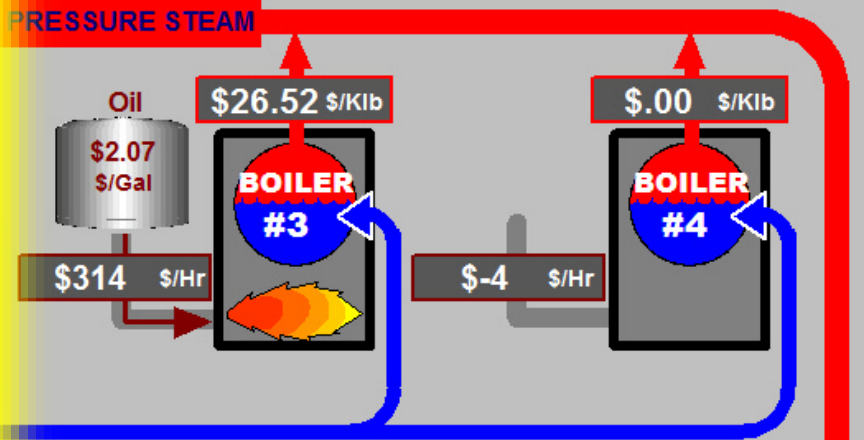
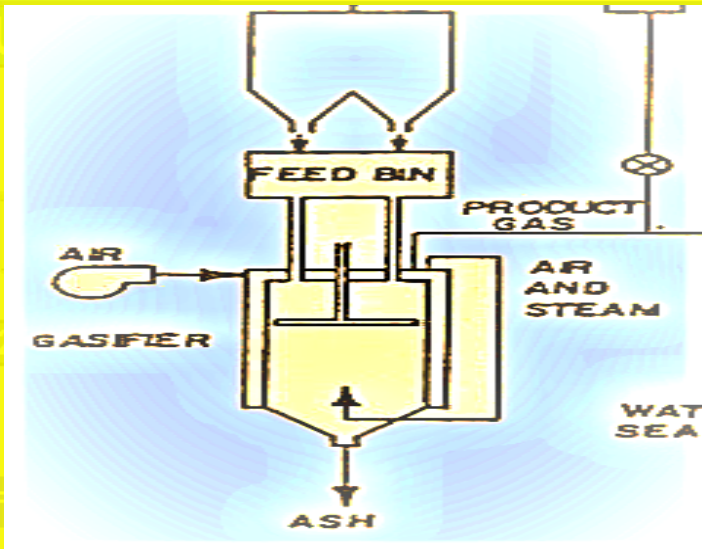
UAF Fuel Cost for Steam and Power

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UAF POWER PLANT

Power Jan 18, 2018 4:24 PM



USED FOR
CAMPUS HEATING
AND COOLING

CAMPUS POWER
CURRENT
\$595 \$/Hr
DAY TOTAL
\$9,561

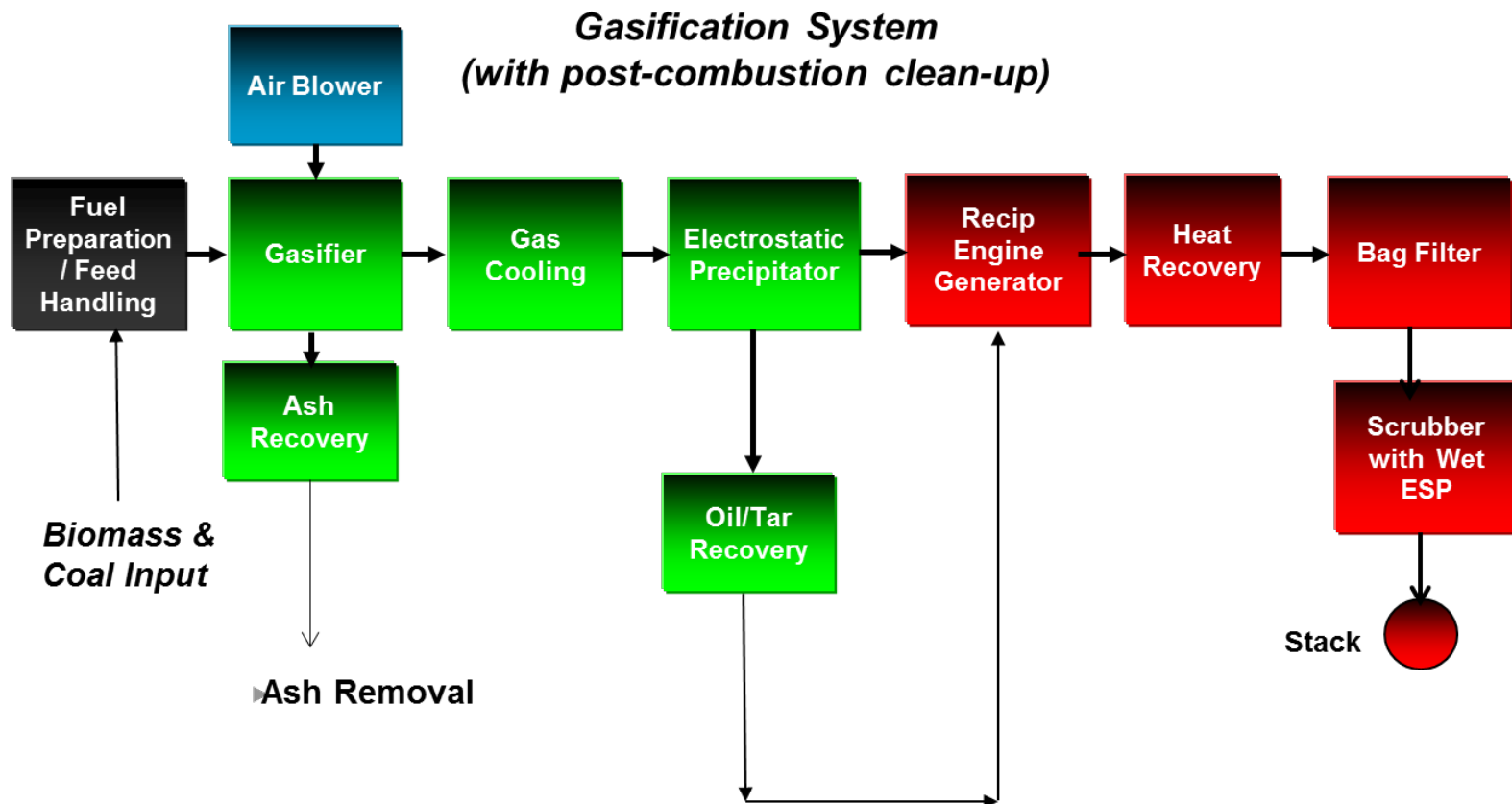
TG3 ●
TG2 ●
TG1 ●

UAF Turbine Generator

UAF Diesel Generator

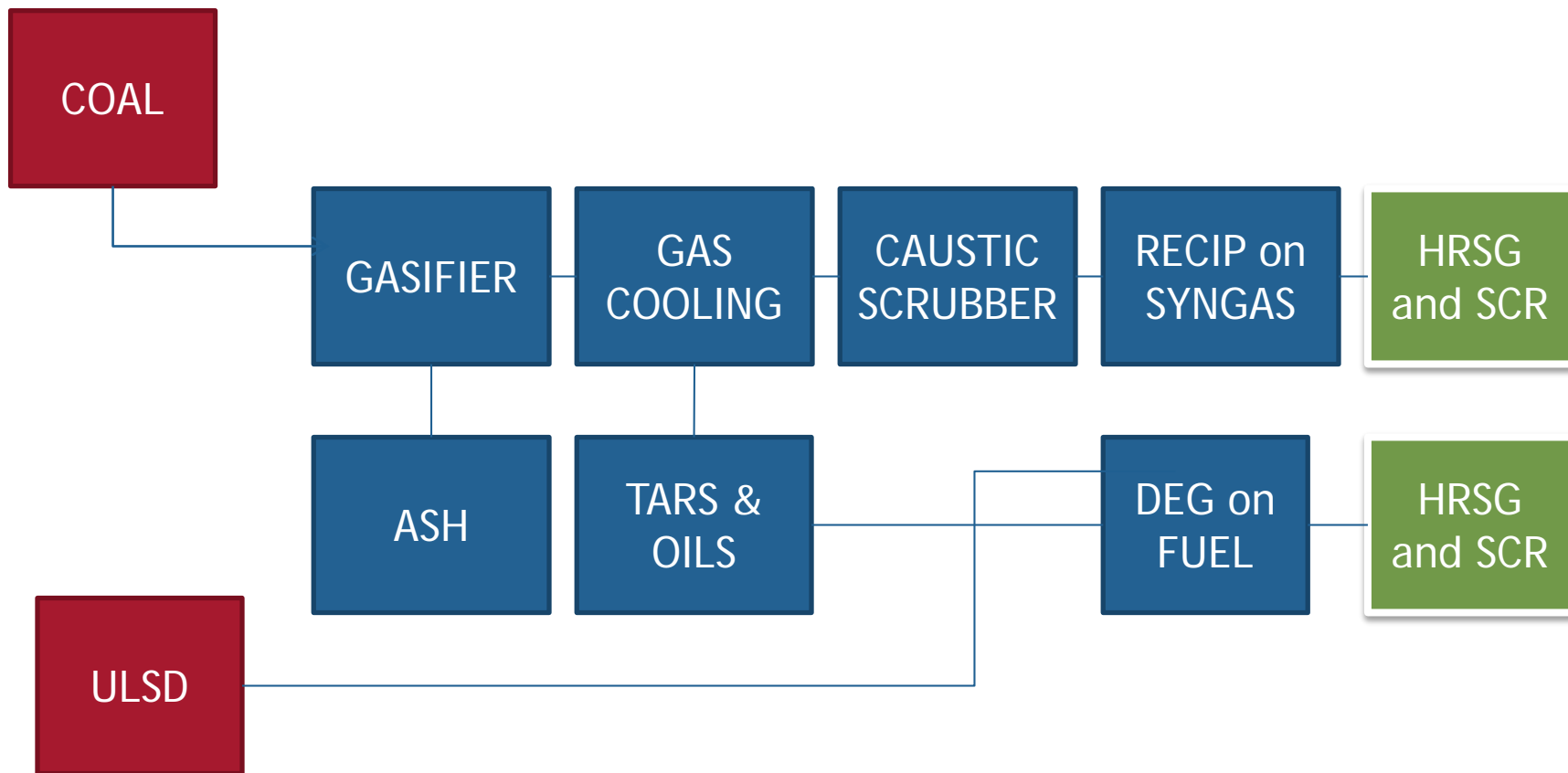
GVEA

UAF'S ORIGINAL DESIGN



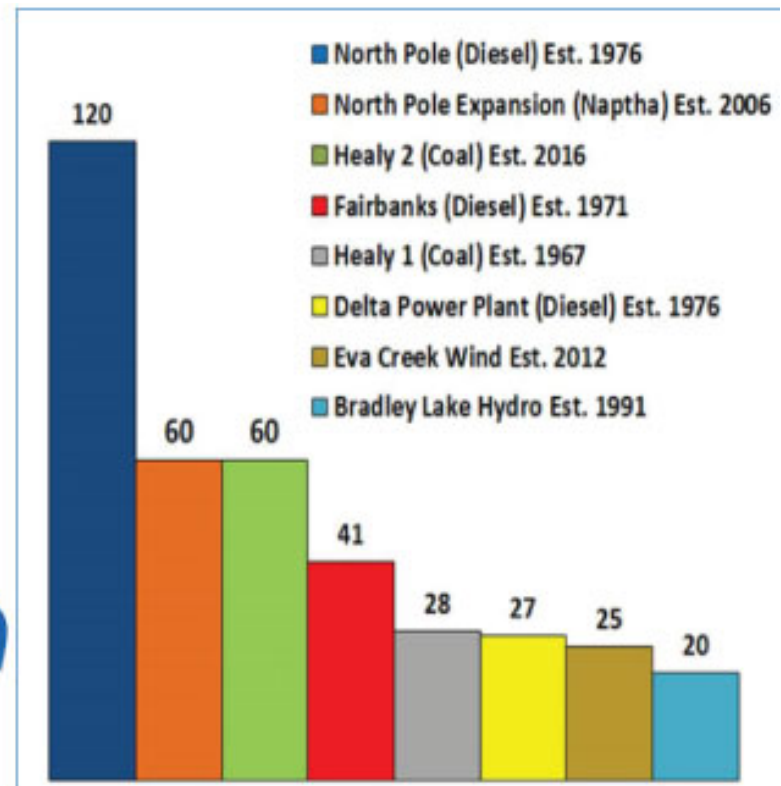


UAF'S MODIFIED DESIGN





WHERE DOES FAIRBANKS POWER COME FROM?





WHY COAL GASIFICATION?

COSTS FOR REGULATING 27 MWe OF WIND POWER

Fuel	Syngas Project (UAF)	Diesel (GVEA)	Natural Gas (not an option)
Capital Cost	\$46 million	--	--
Fuel Costs + other O&M	\$114.6/MWh \$8/MMBtu	\$161.5/MWh \$18/MMBtu	\$17/MMBtu (\$15.20-\$20.20)
Wind Regulation Costs (13.6 MW UAF capacity)	\$11.8M syngas/engine + tars/oils/DEG	\$23.7M (oil)	--
Efficiency, LHV	34%	17.9% (turbines)	--
Simple Payback	<4 years	Base Case	--

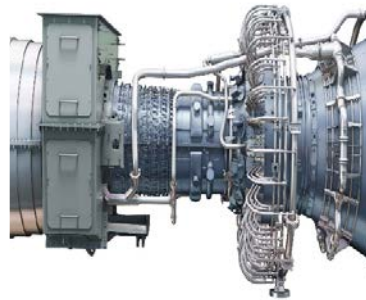
THE PROBLEM: INTERMITTENT GENERATION

Eva Creek



"Free"
Energy

Combustion
Turbine



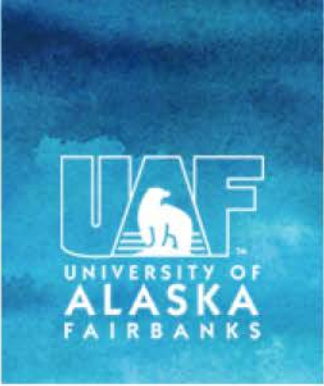
Expensive
Energy



Coal



Cheapest
Energy



THE SOLUTION: COAL ENABLING WIND

Eva Creek



"Free"
Energy

Recip.
Generator



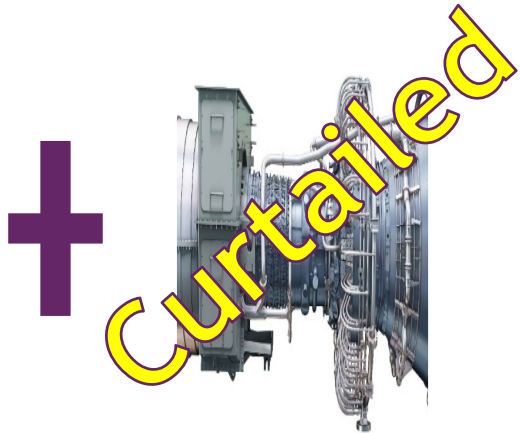
Cheapest
Energy

Coal



Cheapest
Energy

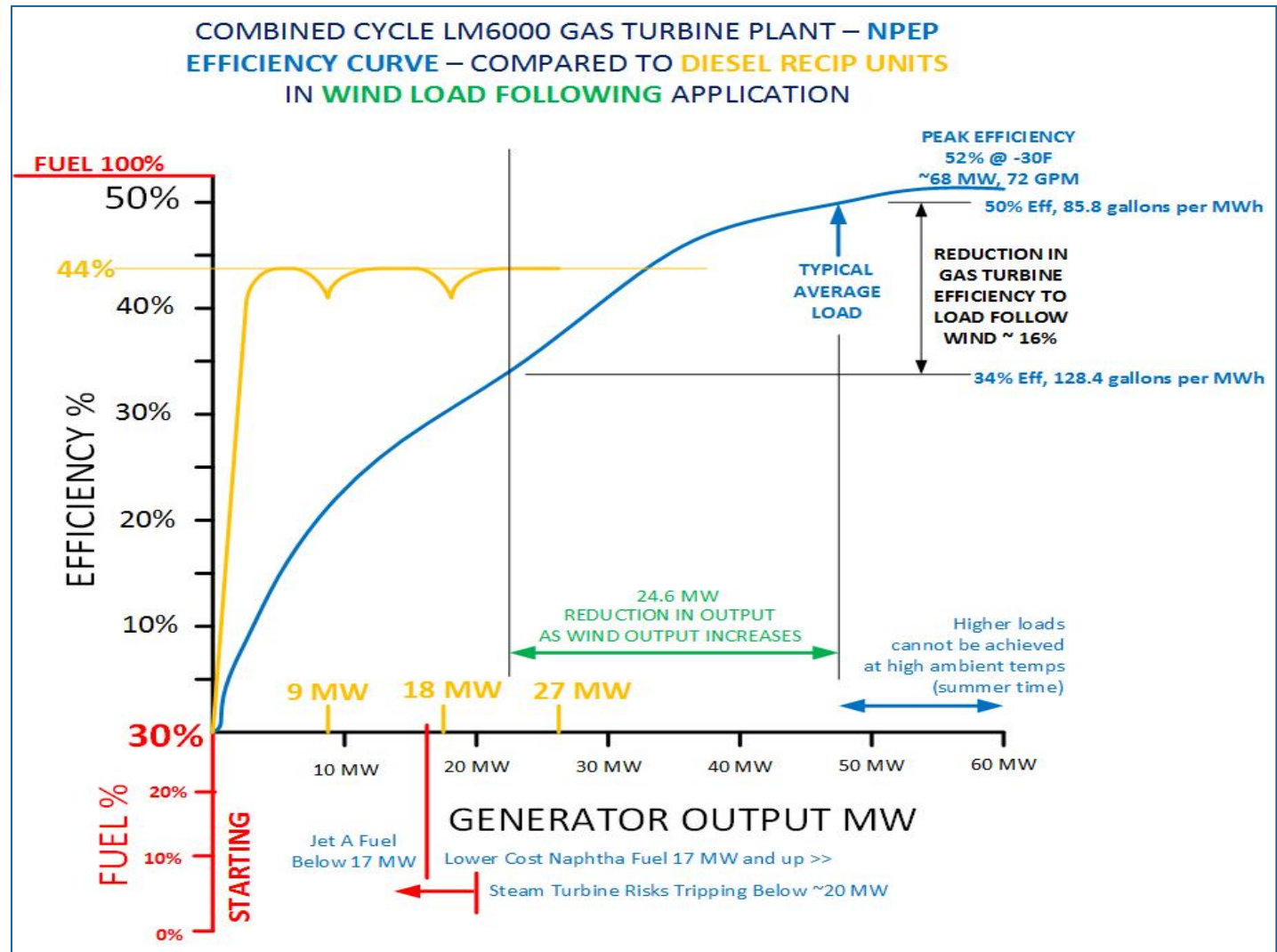
Combustion
Turbine



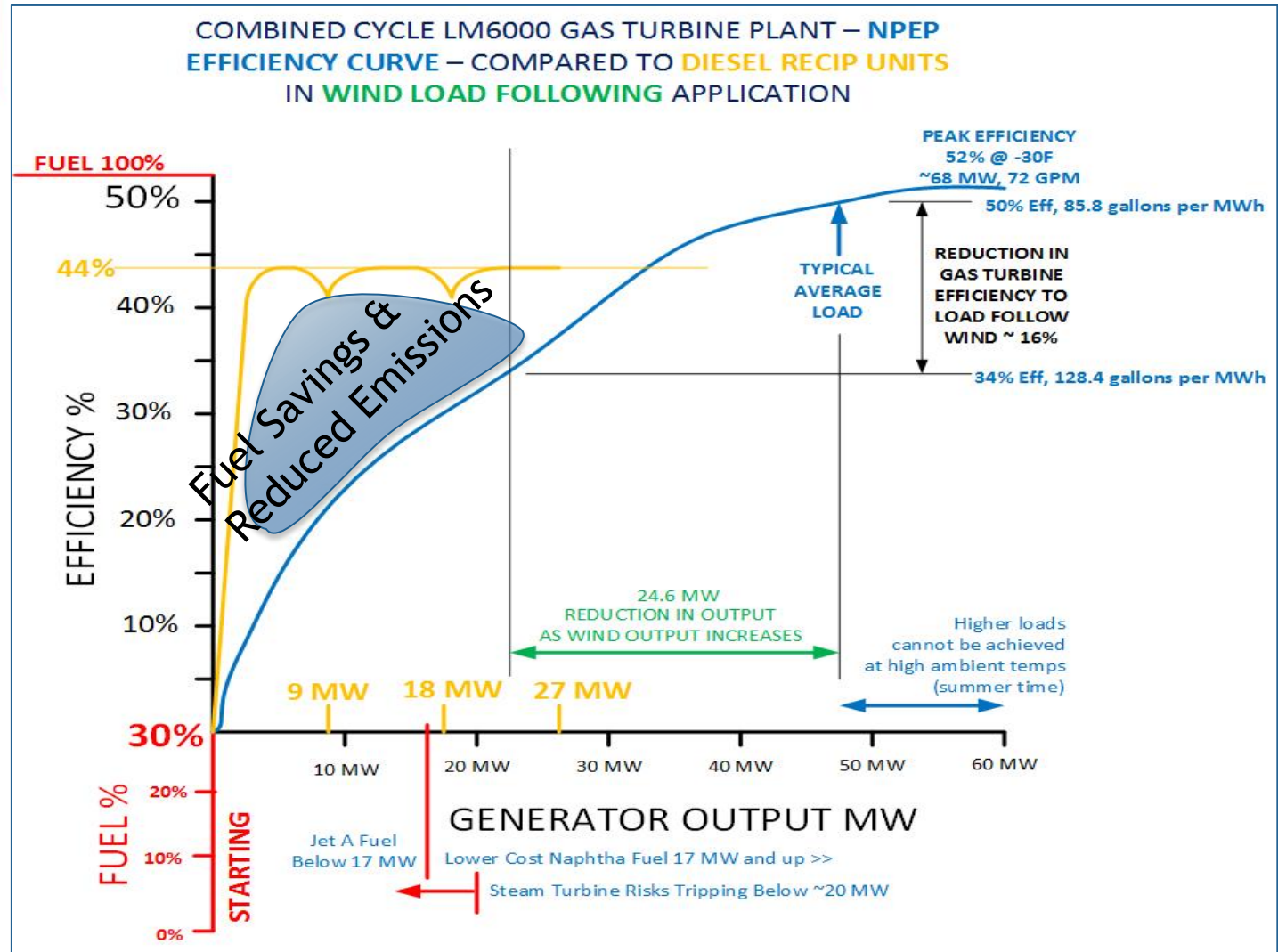
Expensive
Energy



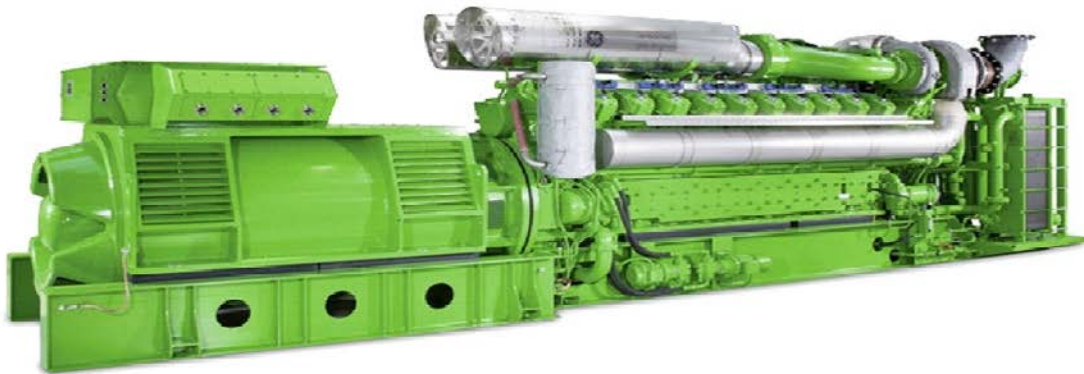
EFFICIENCY vs. LOAD



EFFICIENCY vs. LOAD



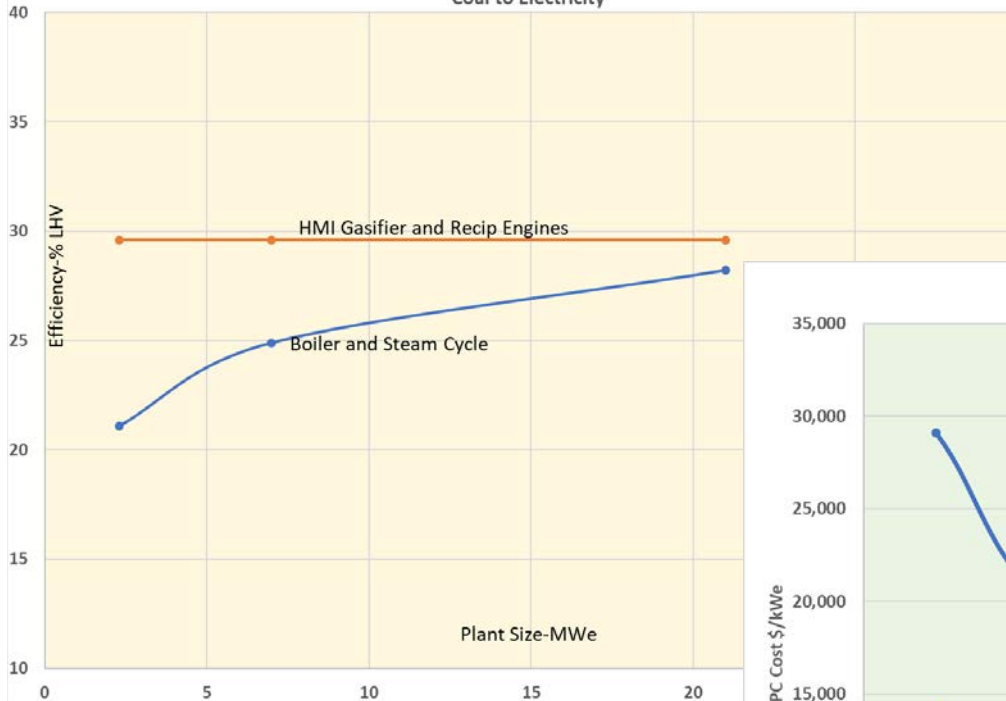
THE EQUIPMENT





MODULARITY and SCALING

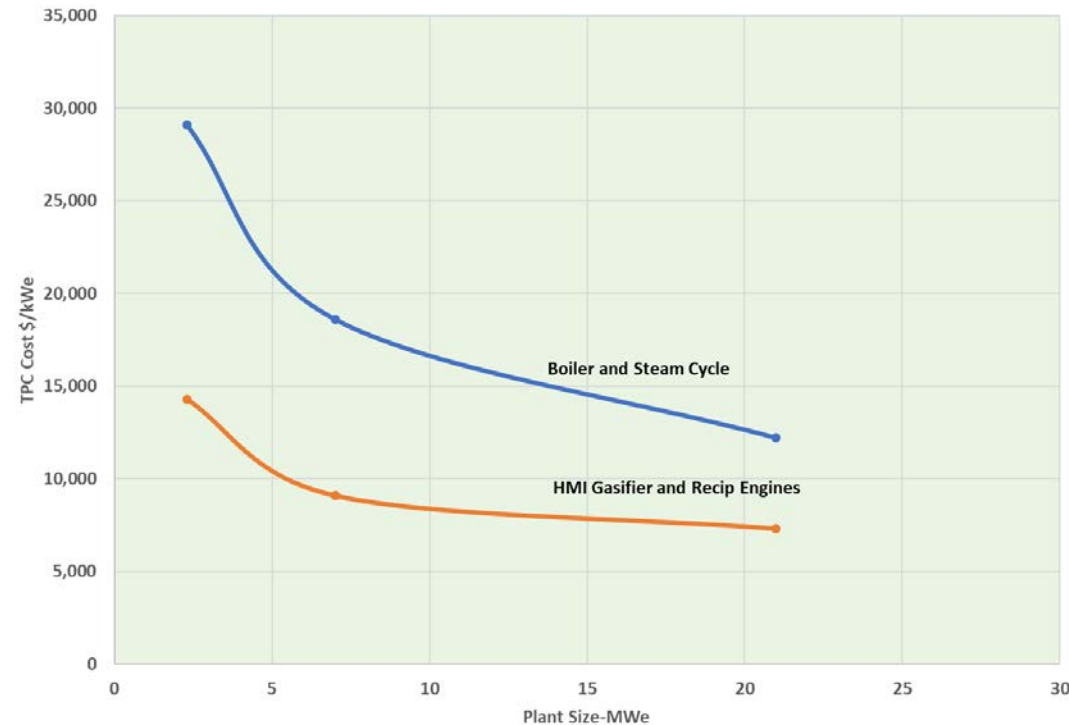
Electric Efficiency Comparison vs. Plant Size
Coal to Electricity



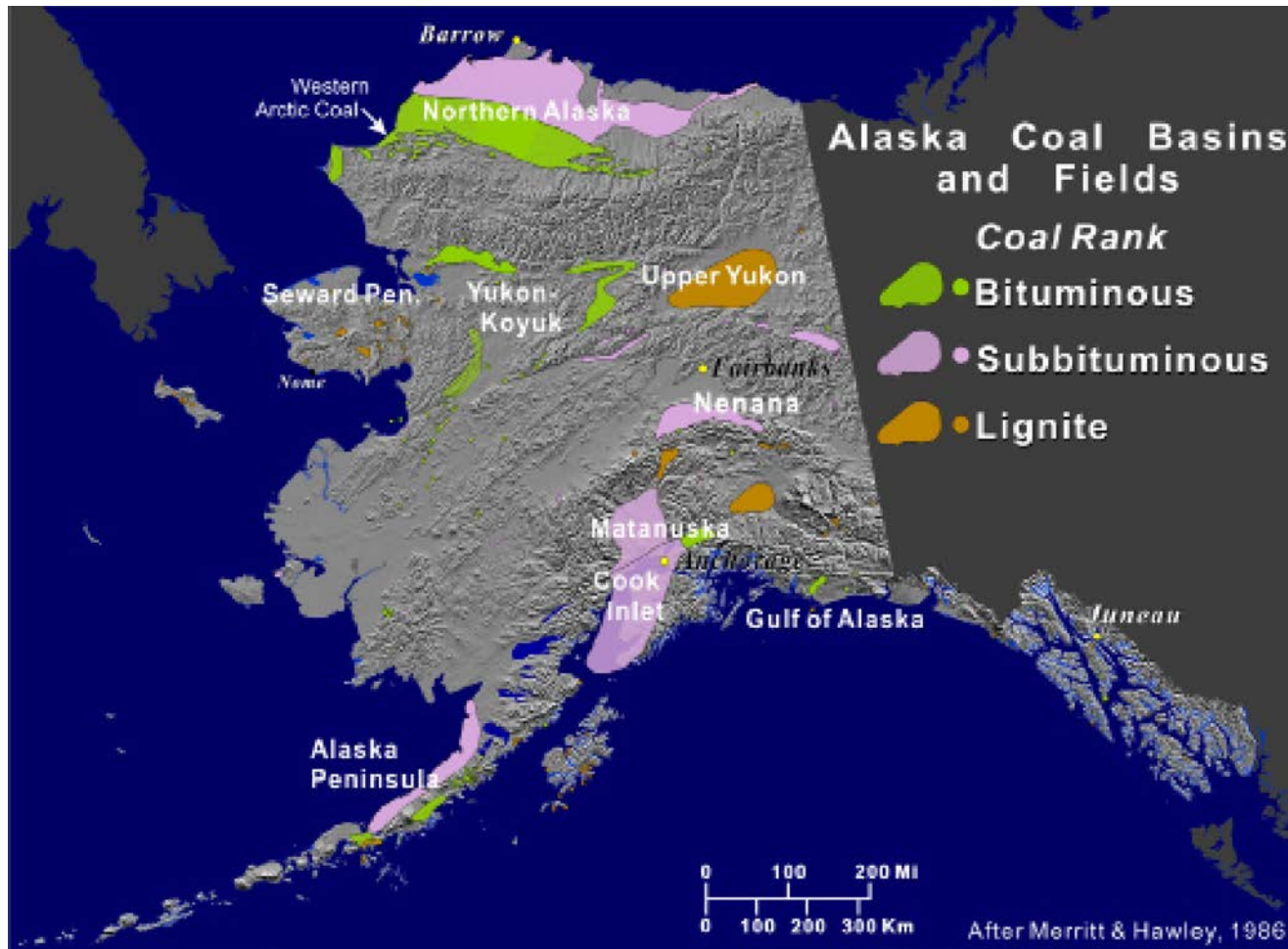
Gasifier/Engine System is Modular and Scalable

Multiple gasifier trains and engines can create powerplants from 1 MWe to 30 MWe+

Total Plant Cost 2018 Fairbanks, Alaska



AK-DGGS IDENTIFIED 37 VILLAGES WITH COAL NEARBY



RADICALLY ENGINEERED SYSTEM



- Make it work at 5 to 10MWe
 - Economies of Scale working against us
- Make it work at village scale <2MWe
- Integrate with diesel infrastructure

USEFUL IN LOWER-48, TOO!



- Coal plants are best suited for baseload operation because it requires a long period to ramp up and to ramp down
- Syngas/Engine combinations has the potential for making coal a cost competitive resource meeting flexible energy demand and fluctuating generation



BUT MOST IMPORTANTLY ...POWER ALASKA'S INTERIOR





NEXT STEP: COMPETE FOR CONSTRUCTION FUNDING

(DE-FE00031601)

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Phases:

I. Team Formation

- \$1M maximum award per team
- 4-10 awards
- UAF team already counts

II. Prepare FEED & Environmental

- \$3M maximum award per team
- 4-5 awards anticipated
- UAF's project has FEED already

III. Detailed Design, Construction, and Commence Operation

- \$80M maximum award per team
- 2 awards
- UAF's project needs to compete



"Does 'high-rise' refer to the building or the budget?"



RISK FACTORS

- Except for the HMI Gasifier, all components are available commercially
 - HMI gasifier components are well understood and documented
- Emission controls could be *the* key factor to be addressed
 - Fairbanks is in an EPA designated “Serious non-attainment area for PM 2.5”

MEET THE TEAM

- Diane Revay Madden, NETL
- Brent J Sheets, UAF
- Rolf Maurer & Team, HMI
- Harvey Goldstein & Team, WorleyParsons
- Chilkoot Ward, UAF
- Frances Isgrigg, UAF
- Russ Steiger, UAF
- Trish Winners, UAF
- Paul Morgan, GVEA
- Pete Saurer, GVEA
- Randy Hobbs, Hobbs Industries
- Alberto Pettinau, Sotacarbo





CALL ME SOMETIME



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