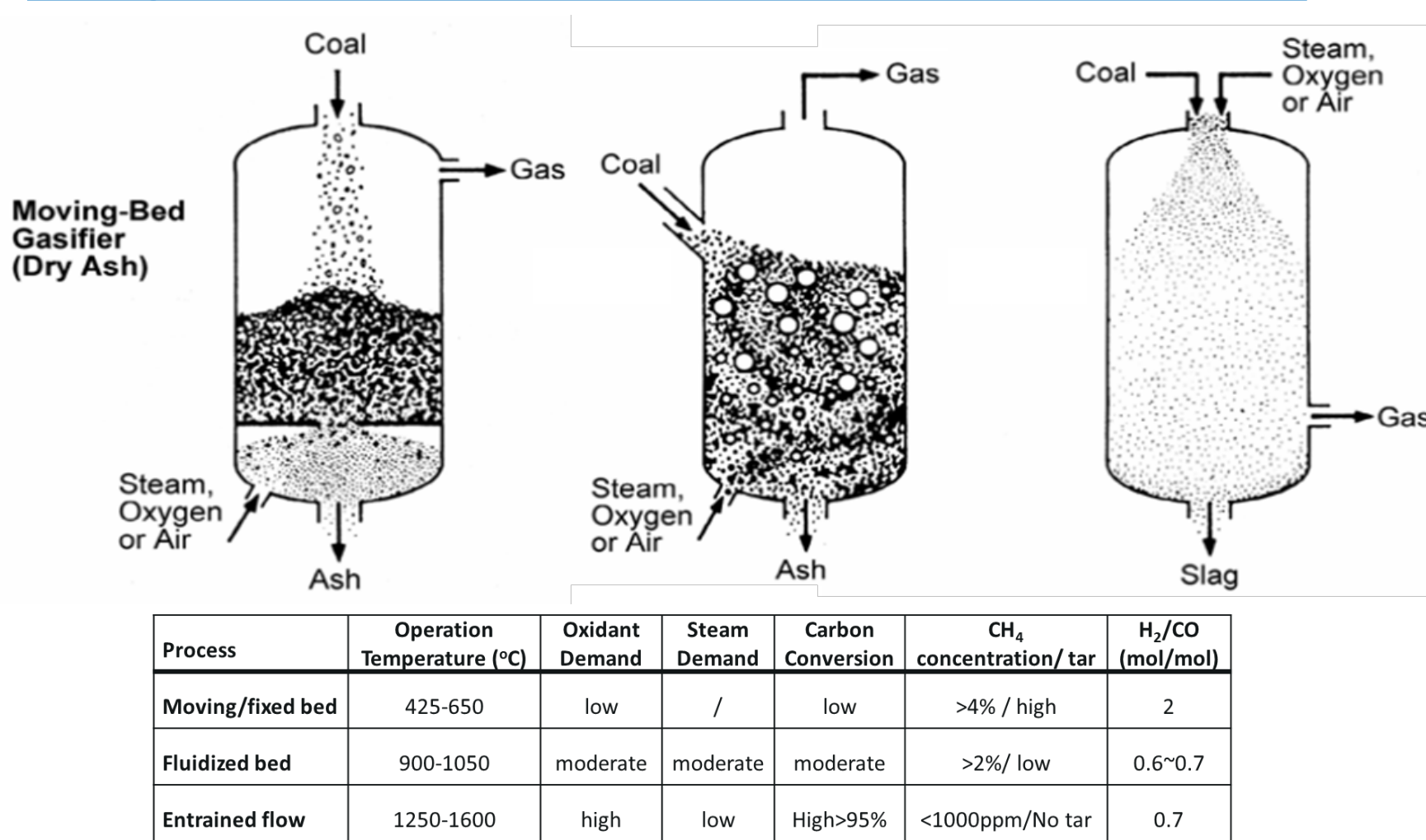


Modularization of Coal Gasification

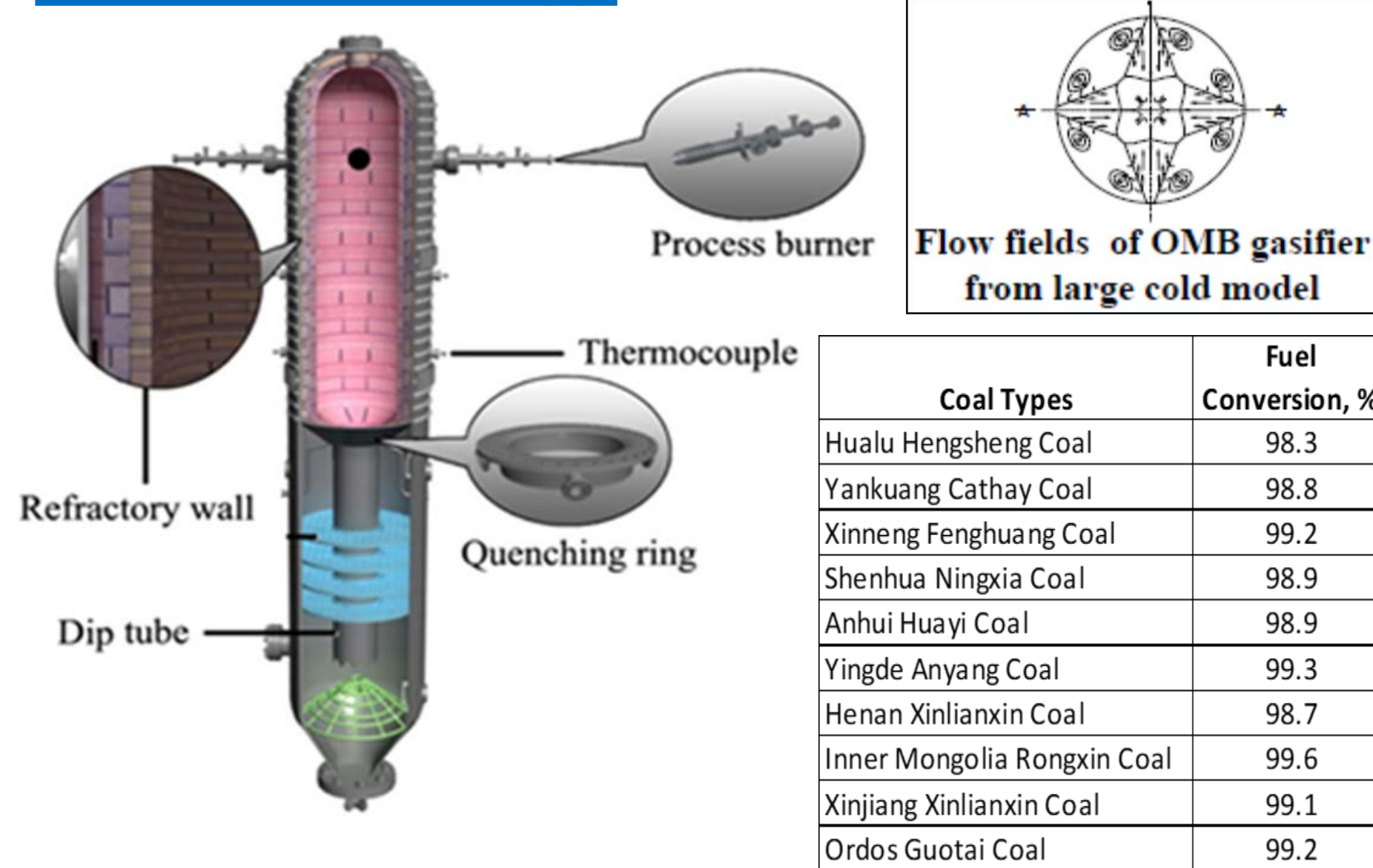
University of Kentucky Center for Applied Energy Research

Staged OMB for Modular Gasifier/Burner DE-FE0031506

Background Why Entrained Flow Gasification?

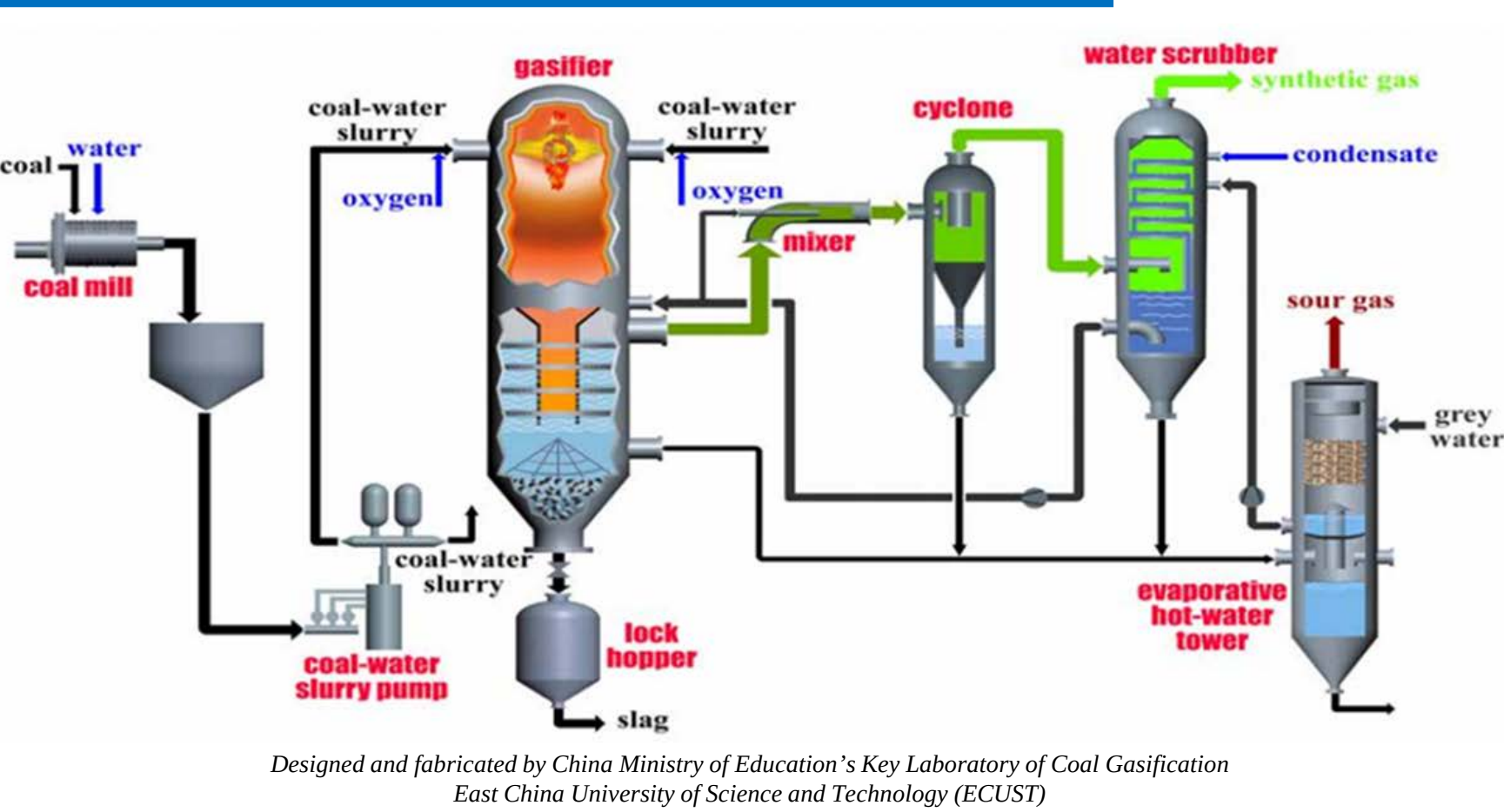


OMB Technology



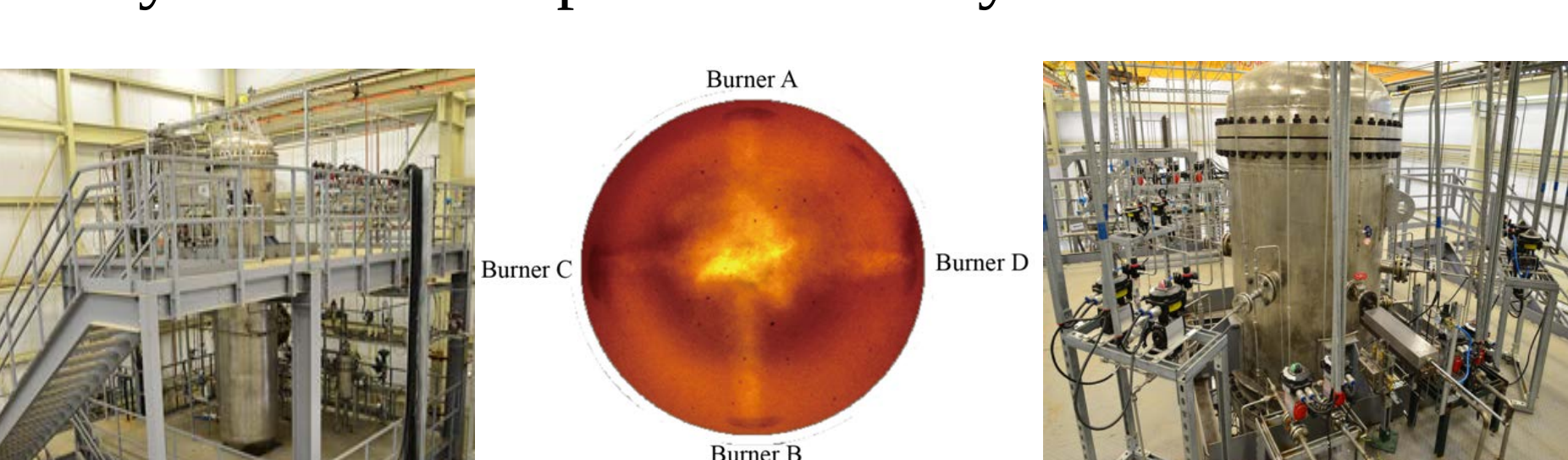
- o Residence time independent of the gasifier size
- o Especially suitable for small-scale modular application
- o Scale-up demonstrated but small scale modular study needed

UKy-CAER Gasification Unit



Designed and fabricated by China Ministry of Education's Key Laboratory of Coal Gasification East China University of Science and Technology (ECUST)

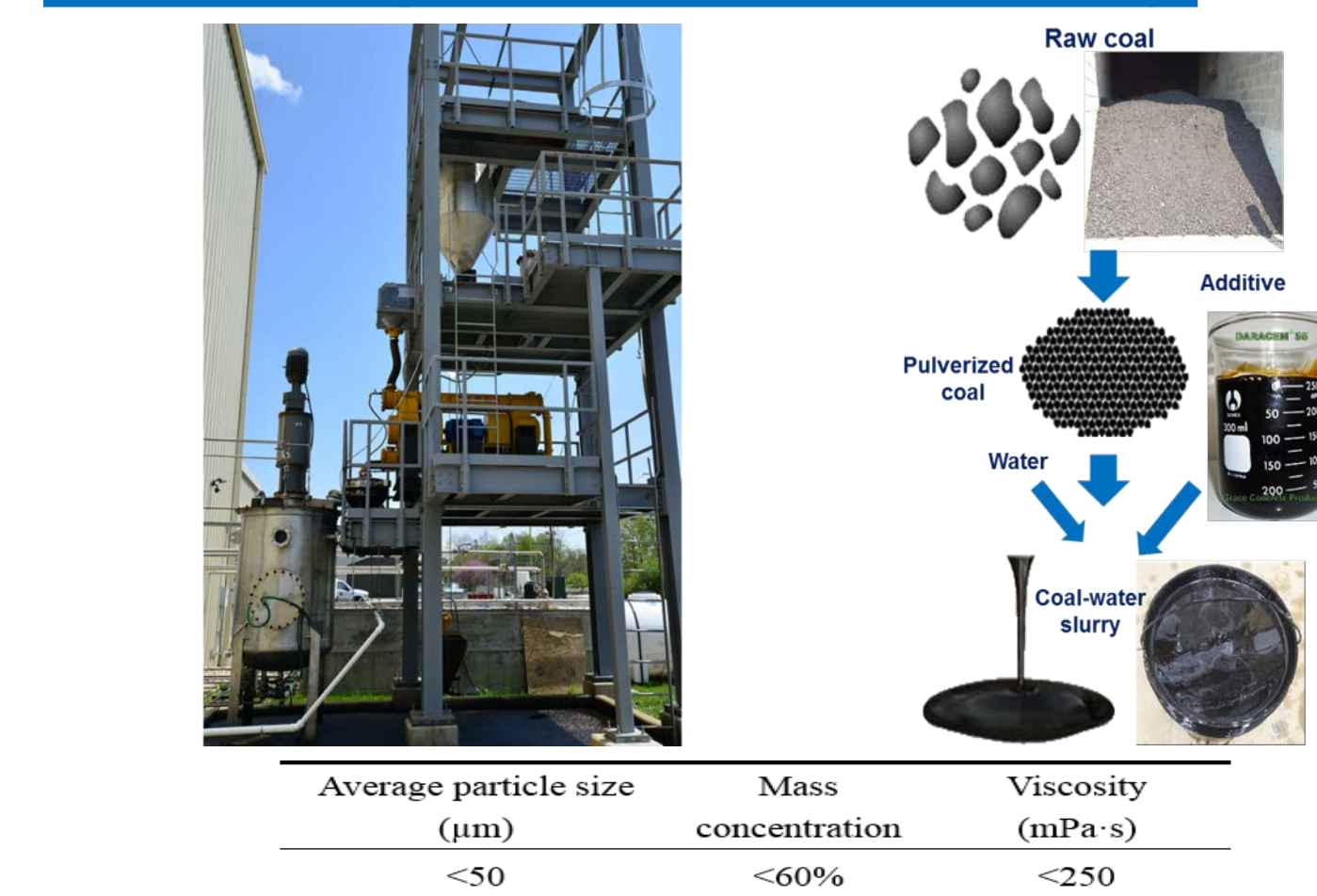
- o Gasification, quench chamber and water scrubber
- o Dry coal consumption: 1 ton/day
- o Syngas production: 179 lbs/hr
- o H₂/CO: ~0.75/1



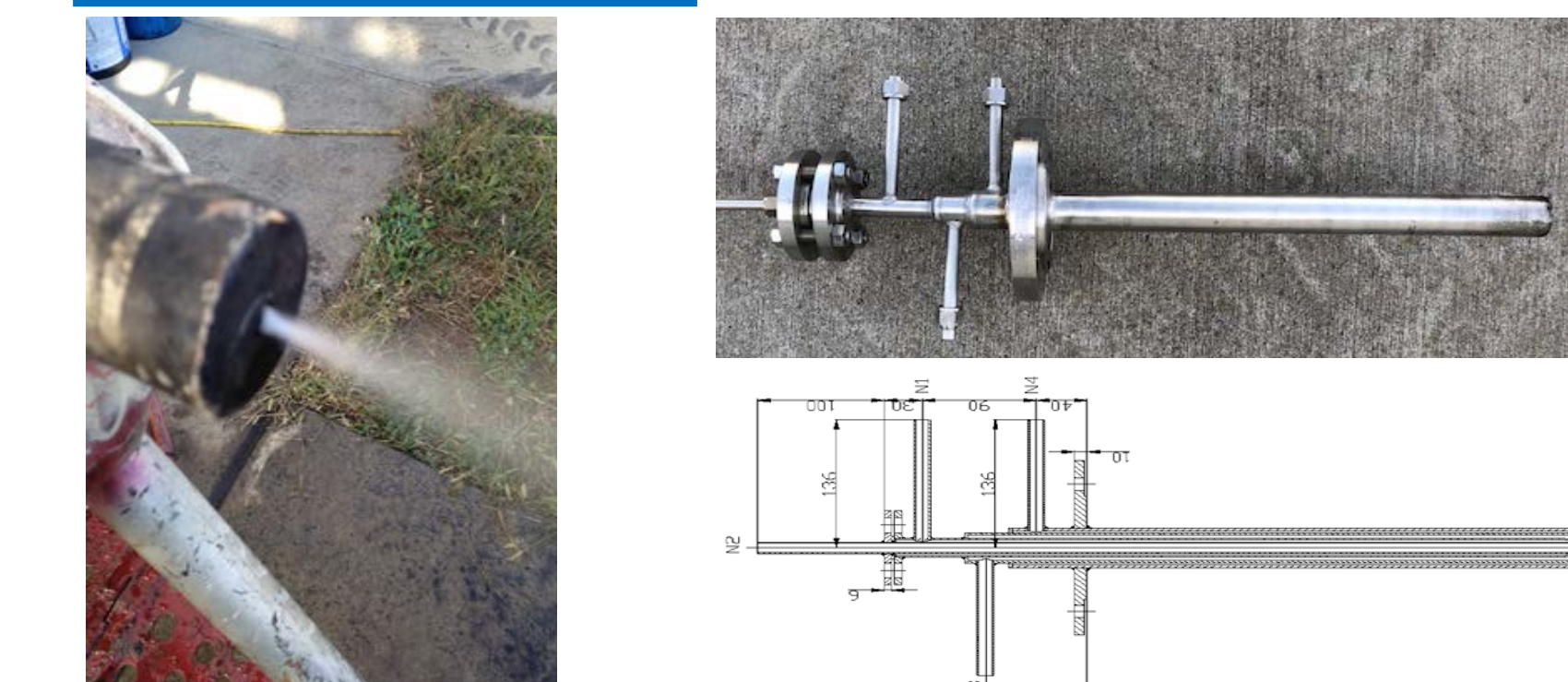
Objectives

1. Modify existing OMB unit to a staged OMB gasifier
 - Demonstrate flexibility in fuel/load
 - In-situ WGS and partial sulfur removal
 - Improved T profile
2. Standardization
 - Modularize burner design
 - Match ASU, burner and syngas turbine.
3. Techno-Economic Analysis

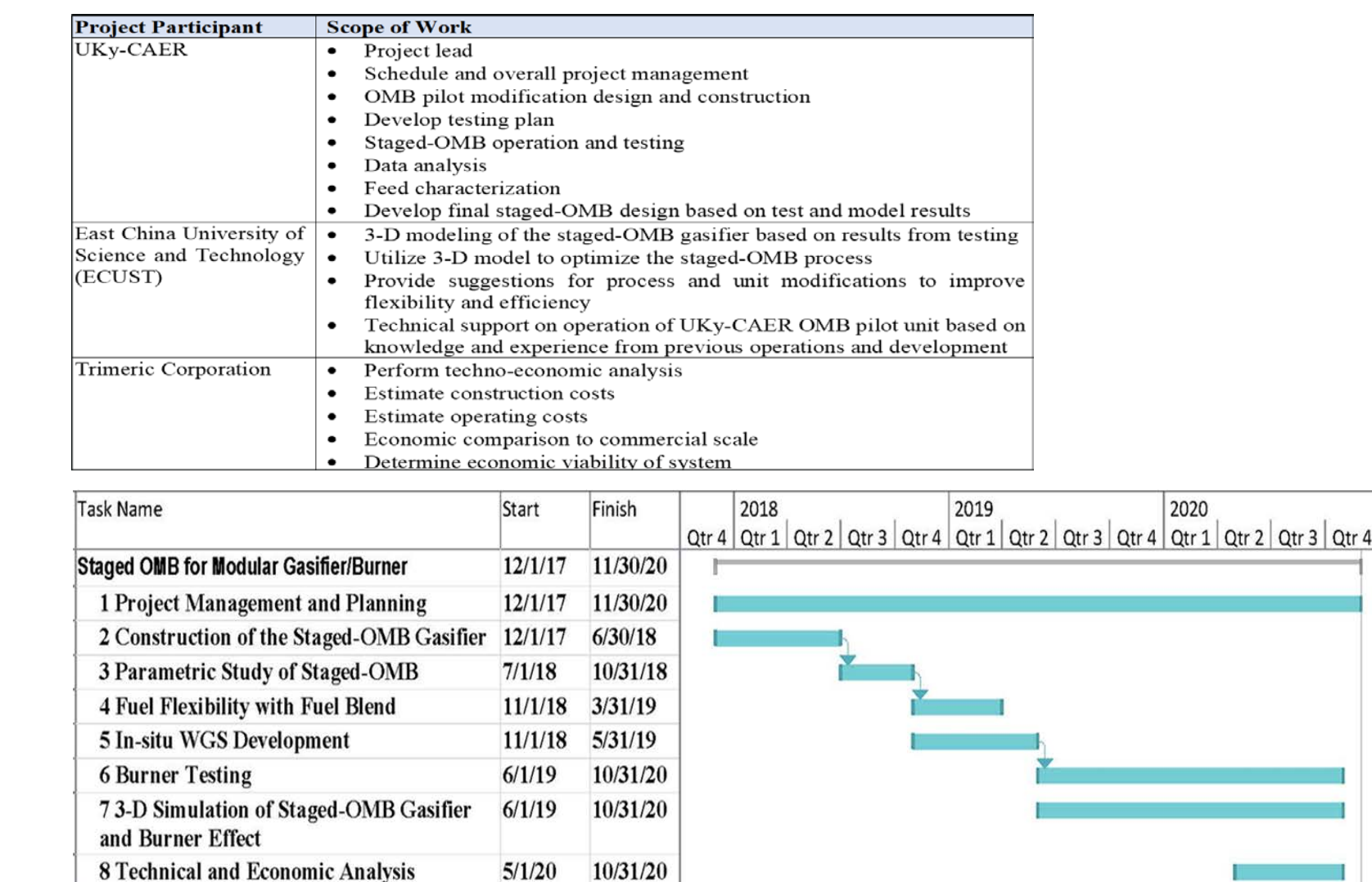
Technical Approach Fuel Preparation Flexibility



Burner Standardization and Modularization



Structure and Schedule



Acknowledgements

- o DOE-NETL: Arun Bose, K. David Lyons, Steve Markovich
- o UKy-CAER: Andy Placido and Don Challman
- o ECUST: Qinghua Guo
- o Trimeric: Andrew Sexton

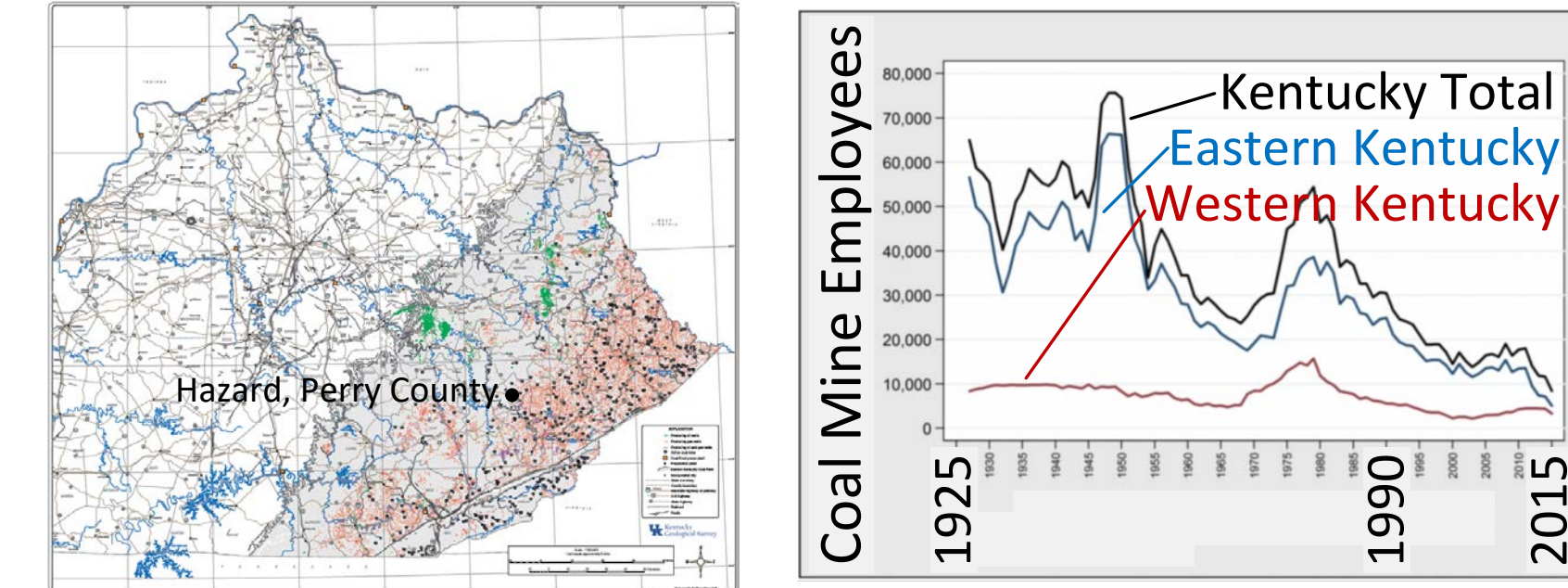
Gasification Combined Heat and Power from Coal Fines DE-FE0031520

Objectives

- FEED study for a 5 MWe equivalent polygenerating unit to be located at an Eastern KY utilizing nearby waste coal fines and biomass
- Identify technology selection and operating conditions

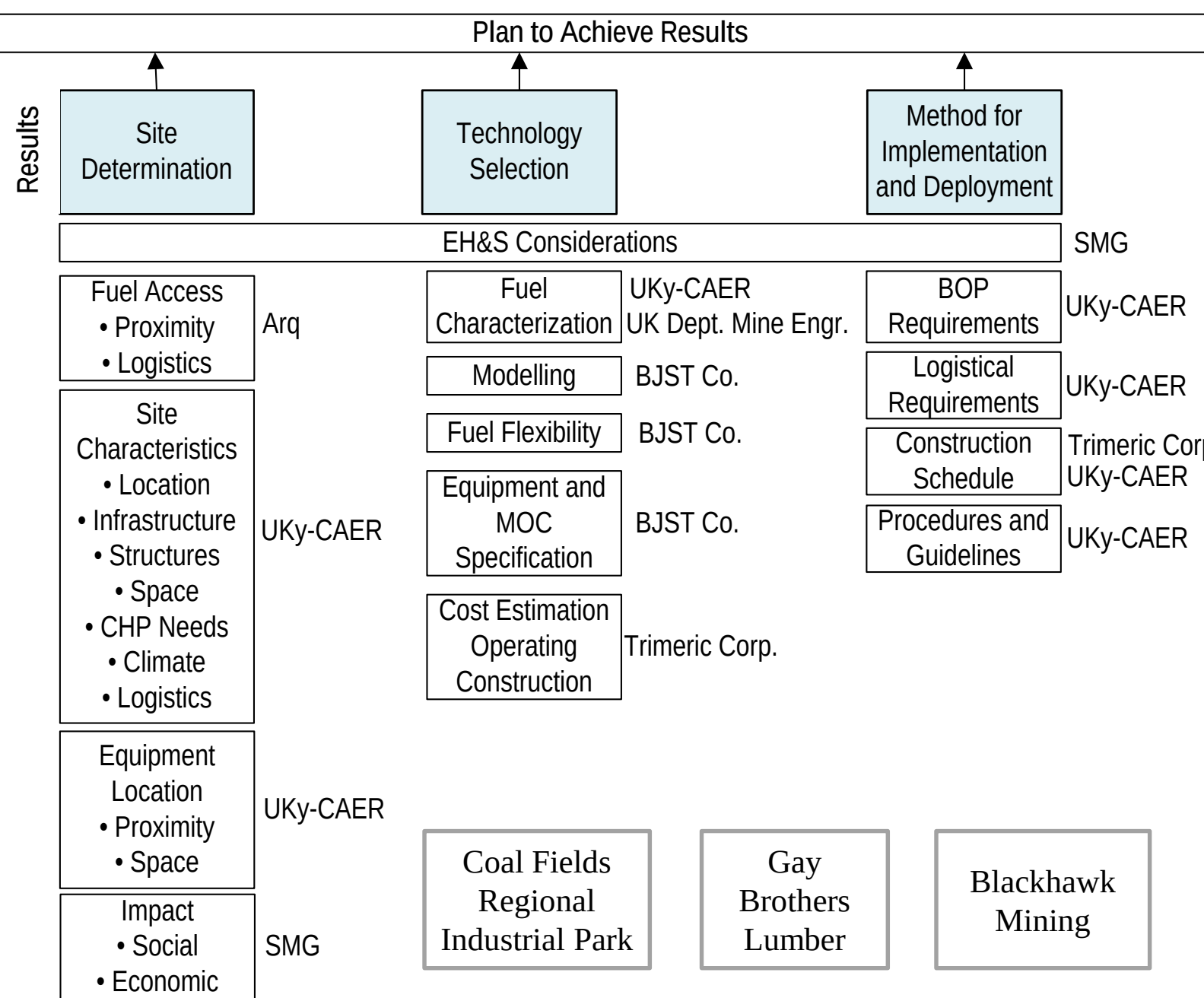
Background

- Refuse coal impoundments are throughout the entire Appalachian Region
- Would benefit from local polygeneration units
 - Encourage industry location in industrial parks
 - Economic development
 - Secondary environmental benefit of recovering coal fines
- Use local sites in Perry County as representative of sites throughout Appalachia

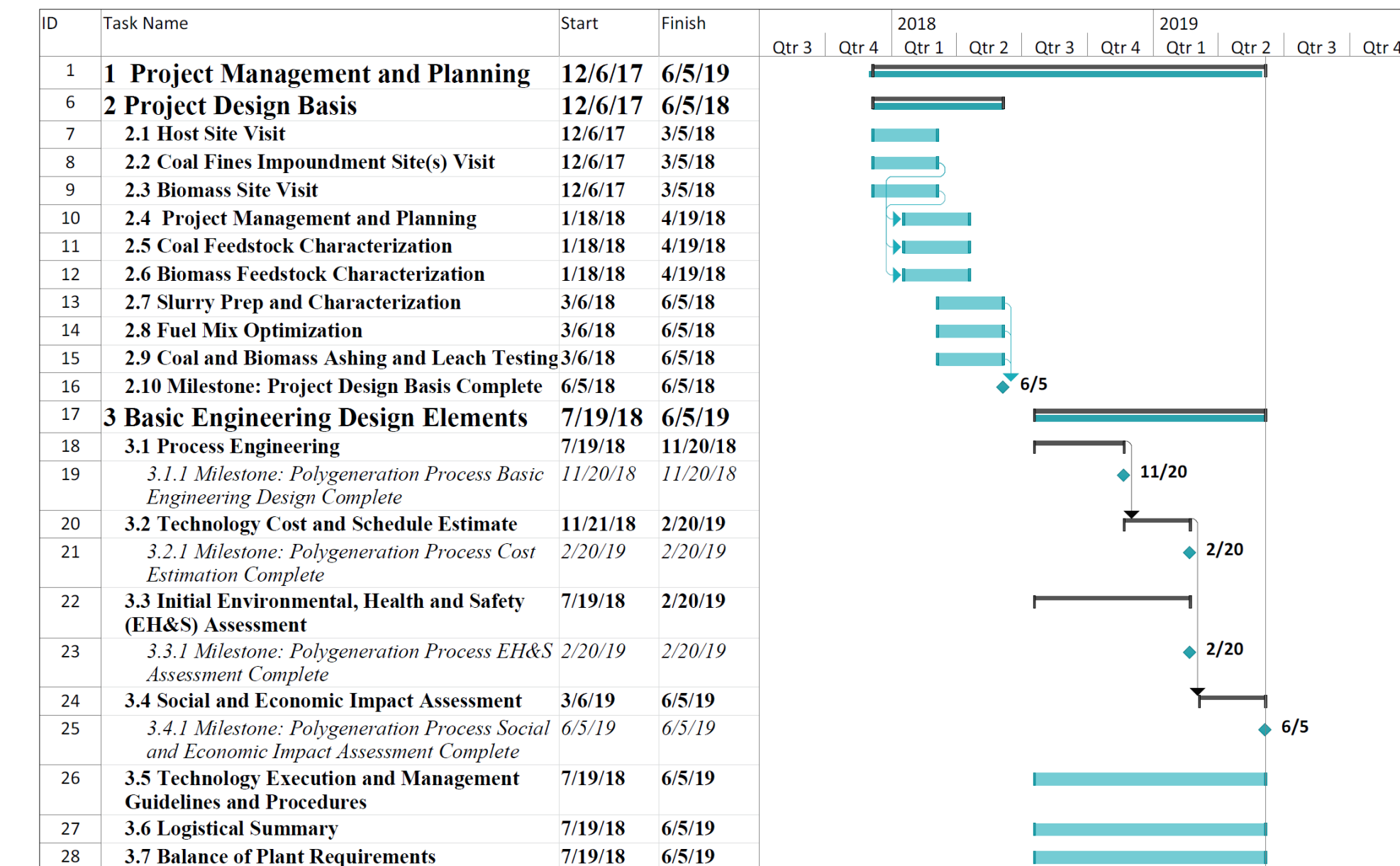


Perry County Preparation Plants.				
Company	Plant	Nearest Town	Capacity (tph)	Fine Coal Recovery Circuit
Whittaker/Perry Co/ICG	#4 Plant	Hazard	750/950	HM Cyclone, Spirals
KEM/Pads Branch	Plant #25	Hazard	400	HM Cyclone, Spirals
Blue Diamond/Blackhawk	Leatherwood	Leatherwood	800/1600	Concentrating Tables, Spirals, HM Cyclones
Lost Mountain	Harris Branch	Bulan	900	HM Cyclone
Kodak	Chester	Allock	350	Hydrocyclone
River Processing	Dunraven	Dunraven	350	Concentrating Tables, Hydrocyclone
Sunfire	#2 Plant	Combs	175	None
River Coal	Indian Head	Ned	180	None
Tesora	Wahoo	Bonneyman	420	None

Structure



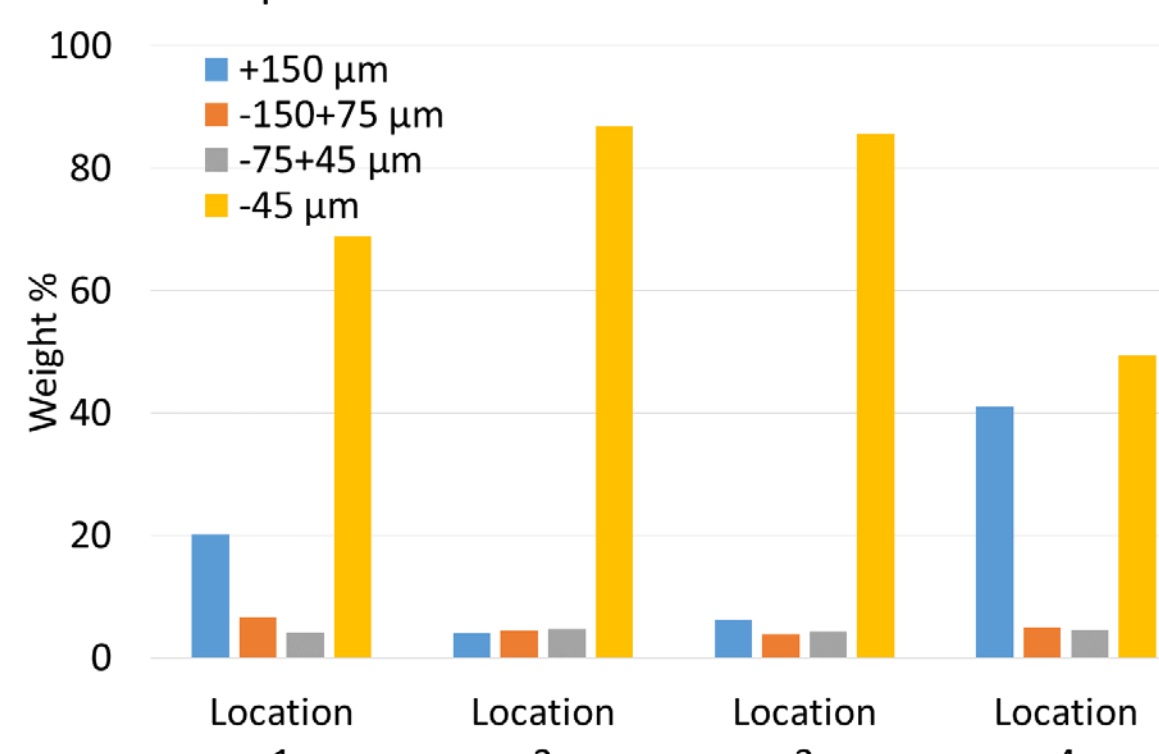
Schedule



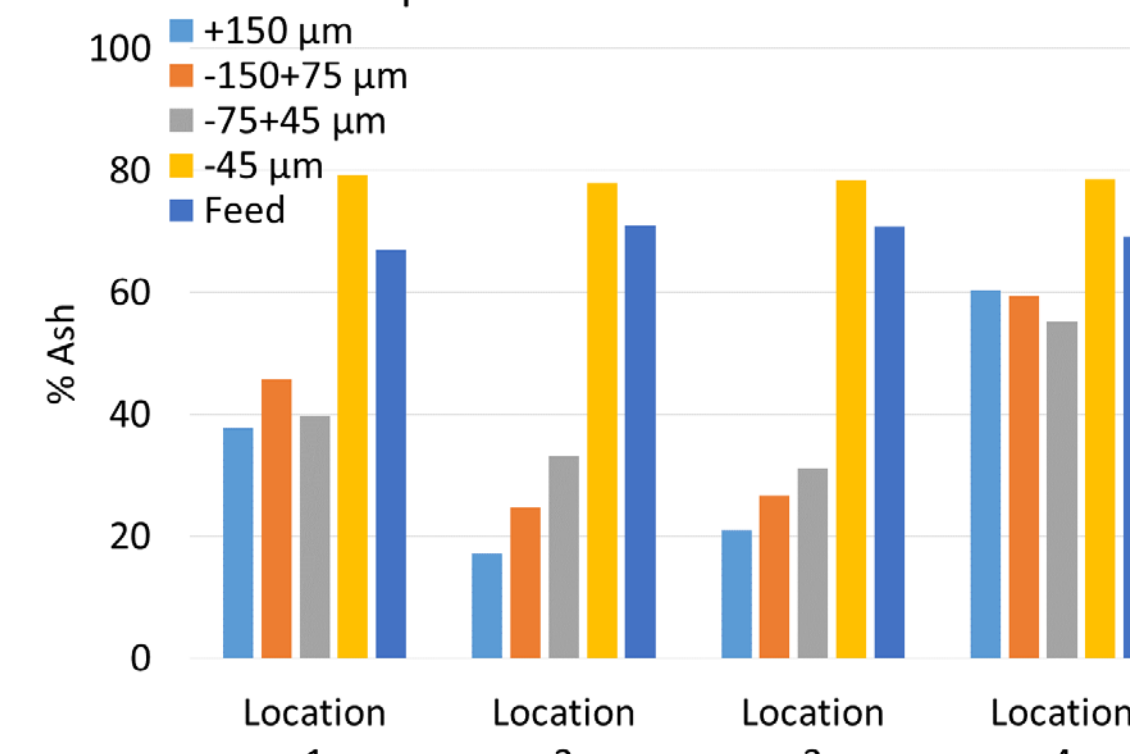
Preliminary Results

	Moisture (wt%)	VM (wt%)	FC (wt%)	Ash (wt%)	C (wt%)	H (wt%)	N (wt%)	O (wt%)	S (wt%)	GCV (Btu/lb)
Impoundment 1	2.07	14.5	14.36	69.06	22.44	2.16	0.31	5.47	0.56	1483
Impoundment 2	1.85	13.37	14.83	69.95	22.29	2.08	0.31	4.93	0.44	563
Impoundment 3	1.58	15.22	15.89	67.31	23.49	2.14	0.38	5.87	0.81	2294
Impoundment 4	1.86	16.7	16.66	64.79	25.45	2.27	0.35	6.63	0.52	1862
Sawdust	5.3	48.43	11.48	0.29	48.43	6.19	<0.01	45.06	0.03	7411

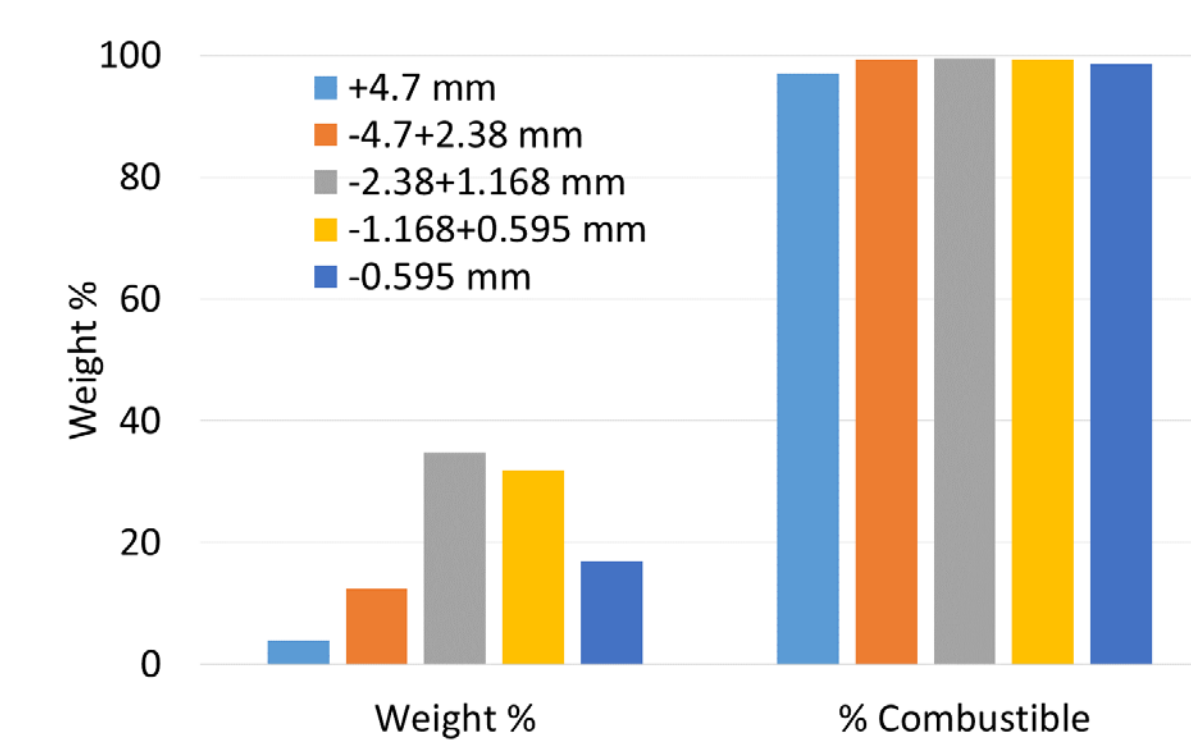
Impoundment Particle Size Distribution



Impoundment Ash Content



Red Oak Sawdust



Acknowledgements

- o DOE-NETL: David Lyons and Steve Markovich
- o UKy-CAER: Kunlei Liu, Jack Groppo, Heather Nikolic, Lisa Richburg