



NETL - Penn State



PennState

University Coalition for Fossil Energy Research

2018 Crosscutting Research Project Review

University Coalition for Fossil Energy Research

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Period of Performance: 10/01/2015-09/30/2021

Presentation Outline

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Project Goals and Objectives

- Advance university-based fossil energy research (basic & applied)
- Promote and facilitate strong collaboration between UCFER programs and coalition-affiliated faculty with U.S. Department of Energy National Energy Technology Laboratory (NETL) administration on coal, natural gas & oil research focusing NETL core competencies
 - Geologic & Environmental Systems
 - Materials Engineering & Manufacturing
 - Energy Conversion Engineering
 - Systems Engineering & Analysis
 - Computational Science & Engineering
- UCFER will identify, select, execute, review and disseminate knowledge from university-based research to improve the efficiency of production and use of fossil energy resources while minimizing environmental impacts and reducing greenhouse gas emissions including carbon capture, storage and utilization.

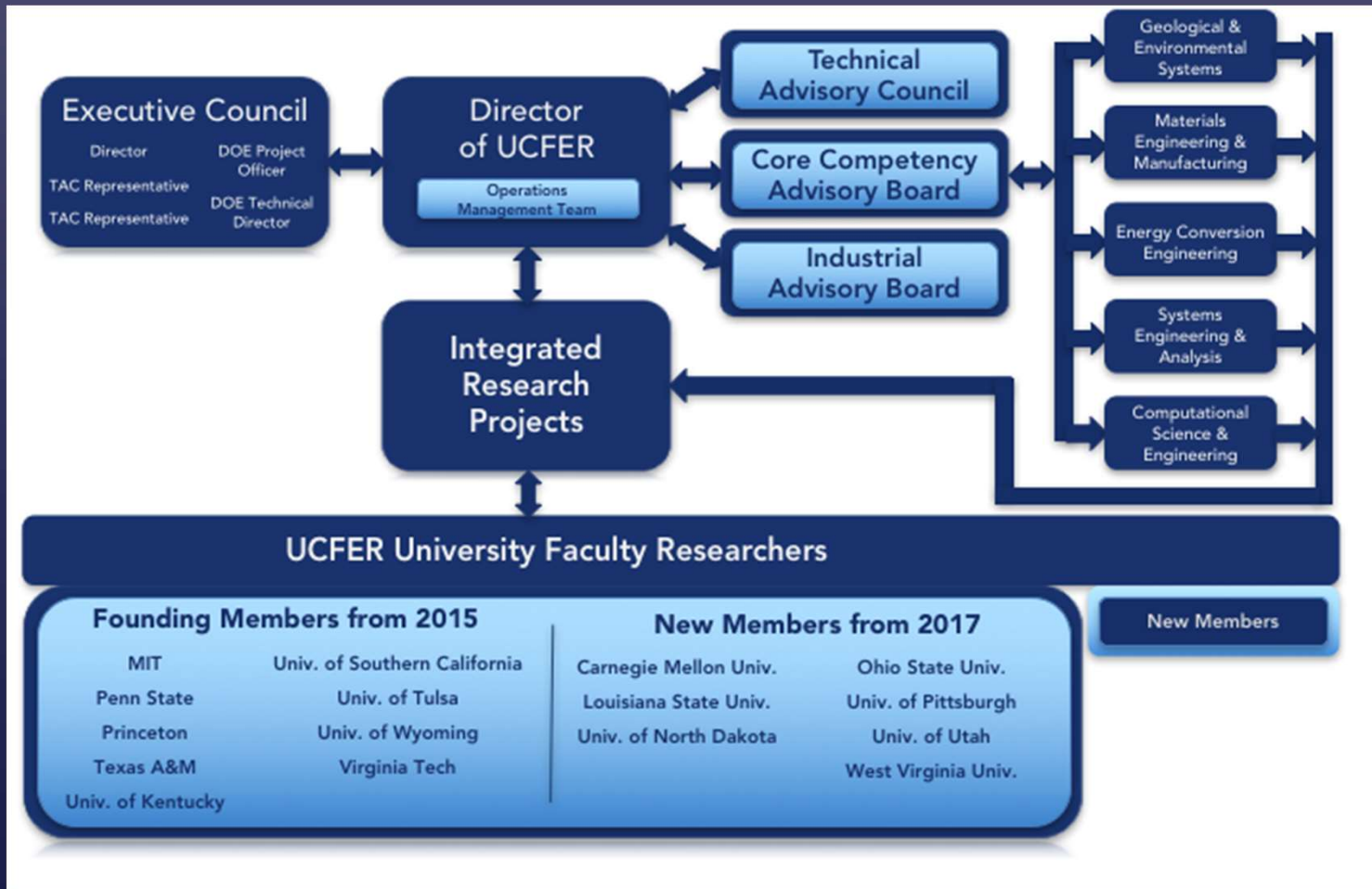
UCFER Organization

- UCFER By-laws are its guiding principles
 - Reviewed by all member universities and NETL
 - Approved by DOE and become binding agreement among the member universities and NETL

- Member universities and NETL
 - NETL Technical Director & Project Officer, and Penn State UCFER Director
 - Executive Council
 - Technical Advisory Council representatives from member universities
 - Core Competency Advisory Board representatives from member universities
 - Industrial Advisory Board
 - Operations Management Team at PSU



Organization Chart



How is it Managed? – Daily Management

- NETL provides overall program guidance and base funding
- Penn State provides the day-to-day program administration
 - EMS Energy Institute formed Operations Management Team (OMT)
 - Develop governing documents and various program plans
 - Release UCFER request-for-proposals in collaboration with NETL
 - Compile results from proposal reviews for TAC
 - Compile TAC recommendations and provide to EC
 - Compile EC recommendations and formally submit to NETL
 - Once NETL approves, work to get subcontracts in place
 - Oversee UCFER subcontract quarterly and final reporting and provide to NETL
 - Authorize payments to subcontractors
 - Develop & maintain database, web site, communications

How is it Managed? - Technical Advisory Council (TAC)

- Consists of one representative from each member university, the UCFER Director, and two DOE representatives appointed by NETL
- Proposes ideas for the UCFER and connects UCFER to researchers in member universities.
- Reviews proposals and provides review results to the Executive Council; assists the Executive Council in making selection recommendations, and in developing and implementing technology transfer plans.

How is it Managed? - Executive Council (EC)

- A DOE Project Officer appointed by NETL (**Dr. Sydni Credle**);
- A DOE Technical Director appointed by NETL (**Dr. Madhava Syamlal**);
- UCFER Director (**Dr. Chunshan Song**), who shall preside over the Council; and
- Two representatives from the Technical Advisory Council (TAC) elected annually – current representatives are **Drs. Richard Horner** and **Roe-Hoan Yoon**.

Establishes an overall research and development plan for the UCFER; issues requests for proposals in research areas identified by DOE; establishes review procedures for research proposals; and makes selection recommendations to DOE regarding such proposals based on technical merit and alignment with the goals and objectives of UCFER.

How is it Managed? - Core Competency Advisory Board (CCAB)

- Consists of one representative from each member university with expertise in the five core competencies that are the focus of the Coalition's collaborative research on coal, natural gas, and oil.
- Advises the UCFER Director and principal investigators of projects selected for awards under UCFER solicitations.
- Regularly analyzes the R&D portfolio of active projects conducted by the Coalition and communicates deficiencies or opportunities to reinforce collaboration among Coalition members and NETL.
- Makes recommendations to the Director and Executive Council as to future research related to the core competency areas. Hosts technical webinars as a means to update Coalition members on the current status of core competency areas.
- Participates in Coalition meetings as directed by the UCFER Director and the Executive Council

Budget, Solicitations, & Funding Commitments – Year 1

DOE Award with \$20 M DOE funds for 6 years; Final (modified) contract (DE-FE0026825_0003) completed 4/8/2016

Yr. 1 Research Funds:

- \$4.005 M

Yr. 1 Research Topics:

- 4 Topics for RFP 2016-01 with \$1.925 M funds (Open: 04/22/16, Closed 06/17/16)
 - Carbon Use and Reuse at \$814 K, Carbon Storage at \$814 K, Crosscutting Research at \$134 K, and Rare Earth Elements at \$163 K)
- 3 Topics for RFP 2016-02 with \$2.08 M funds (Open: 07/22/16, Closed 09/16/16)
 - Carbon Capture at \$814 K, Oil and Gas at \$407 K, and Advanced Combustion at \$859 K)

UCFER Approved Projects (2016-01)

Area	PI	Title
Carbon Use & Reuse	Dr. Bruce E. Koel	Converting CO ₂ and Methane to Fuels by Enhanced Plasmonic Effects in a Nanotemplated Catalyst Plasma Reactor
Carbon Use & Reuse	Dr. Michael A. Hickner	Efficient Reduction of CO ₂ in a Bipolar Electrochemical Cell
Carbon Storage	Dr. Shunde Yin	A Low-cost Technique for In-situ Stresses and Geomechanical Properties Measurement Based on Leak-off Tests and Caliper Logs
Carbon Storage	Dr. Behnam Jafarpour	A Novel Point Process Filtering Paradigm for Modeling and Inversion of Microseismic Monitoring Data During CO ₂ Storage
Carbon Storage	Dr. Fred Aminzadeh	Integration of Geophysical and Geomechanical Modeling to Monitor Integrity of Carbon Storage
Crosscutting Research & Analysis	Dr. Ahmed F. Ghoniem	Grid Independence and Uncertainty Quantification in Gas-Solid Flow Simulations

UCFER Approved Projects (2016-02)

Area	PI	Title
Carbon Capture	Dr. Benjamin Wilhite	Layer-by-Layer Functional Thin Film Coatings for Enhanced Light Gas Separations
Carbon Capture	Dr. Michael A. Hickner	Designing Polymer/2D MOF Composite Membranes with Enhanced CO ₂ Transport for CO ₂ /N ₂ Separation
Oil & Gas	Dr. Nino Ripepi	Methane Emissions Quantification (MEQ) of Compressor Stations
Advanced Combustion	Dr. Eric Petersen	Validation of CFD Models for Turbulent, Supercritical CO ₂ Combustion
Advanced Combustion	Dr. Richard A. Yetter	Fundamental Studies on the Reaction Mechanisms of Oxygen Carriers for CLC/CLOU of Solid Fuels
Advanced Combustion	Dr. Sarma Pisupati	Evaluation of Agglomeration Potential of Oxygen Carriers for Chemical Looping Combustion (CLC) and Chemical Looping with Oxygen Uncoupling (CLOU)

UCFER Approved Projects (Year 1)

- From RFP 2016-01
 - Project start dates were December 2016 to March 2017 depending on contract negotiation
 - Periods of Performance: 12, 18, or 24 months
 - Several project are in final stages and final reports are under preparation
- From RFP 2016-02
 - Projects started November and December 2017
 - Periods of Performance: 18 or 24 months
 - Projects are in early stages of activity – little information to report

Budget, Solicitations, & Funding Commitments – Year 2



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Yr. 2 Funds Authorized:

- \$4.099 M

Yr. 2 Research Topics:

- 7 Topics for RFP 2017-03 (Advanced Combustion at \$424 K; Carbon Capture at \$848 K; Carbon Storage at \$543 K; Carbon Use & Reuse at \$848 K; Fuel Cell Technologies at \$848 K; Gasification at \$424 K; and Rare Earth Elements at \$163 K) released November 15, 2017 & closed January 10, 2018

Round 3 (RFP 2017-03) Information

- Mid-April 2018 TAC and EC project recommendations to NETL
- NETL project selection mid-May 2018
- Notification letters sent to all proposers end of May 2018
- NEPA approvals and sub-award processing in June 2018
- Approximately 15 awards anticipated
- Anticipated project start dates August 2018 (fall semester)
- Periods of Performance: 12, 18 or 24 months

Project Funding/Proposal Summary

	Year 1 (RFPs 2016-01 and 2016-02)	Year 2 (RFP 2017-03)
Funding available (\$)	4.005 M	4.099 M
Funding requested (\$)	15.825 M	20.196 M
No. of proposals submitted	64	81
No. of proposals funded	12	15 (estimated)
Proposal success rate	19%	19%

Year 1 Funded Topic Areas

- Advanced Combustion – 3 projects
- Carbon Capture – 2 projects
- Carbon Storage – 3 projects
- Carbon Use & Reuse – 2 projects
- Crosscutting Research & Analysis – 1 project
- Oil & Gas – 1 project

Anticipated Year 2 Funded Topic Areas

(based on available funding per topic area and maximum funding levels per project)

- Advanced Combustion – 1 project
- Carbon Capture – 4 projects
- Carbon Storage – 2 projects
- Carbon Use & Reuse – 2 projects
- Fuel Cell Technologies – 2 to 4 projects
- Gasification – 1 project
- Rare Earth Elements – 1 project

NETL-UCFER Project Collaboration (2016-01)

- Round 01 projects exhibited successful collaboration with NETL, ranging from regularly-scheduled discussions to hands-on testing, e.g.:
 - NETL provided field data and Marcellus core samples for testing
 - NETL provided NETL-synthesized catalysts for testing
 - Collaboration with NETL involved building a coupled flow and geomechanics model and stochastic model to relate rock failure to microseismic events; NETL assisted in refining model assumptions and input rock properties; NETL research team papers were used in developing the microseismic prediction approach

NETL-UCFER Project Collaboration (2016-01) (cont.)

- Additional Round 01 projects collaboration with NETL:
 - Site visits to NETL to conduct experiments on in-house facilities
 - Exchange of simulation and post-processing software
 - Collaboration pivotal towards the design of experiments at NETL that provided data for the MFiX code validation and scale-up
 - NETL provided hollow-fiber substrates used for testing layer-by-layer coating procedure and subsequent gas separation measurements
- Several journal articles prepared (and under preparation); several conferences attended and papers prepared/presentations given

How to Become Involved

- University membership requests are evaluated annually
- Applicants must have demonstrated experience and active faculty in UCFER's core competency areas
 - University/ College must be accredited
- UCFER-affiliated faculty strongly encouraged to publish in peer-reviewed journals, conference proceedings, participate in industry sponsored workshops & events. Check UCFER website (www.energy.psu.edu/ucfer) for more details.
- Send questions/ comments to UCFER OMT: ucfer-omt@ems.psu.edu

Upcoming Activities

- UCFER Technical Review meeting at NETL Morgantown campus April 16 & 17, 2018
 - State of the Coalition
 - Administrative update
 - Project (12) update presentations
 - Open feedback discussions
- RFP 2017-03 in final-stage of project selection

Acknowledgments

- DOE NETL Director **Dr. Sean Plasynski**, other NETL leaders, NETL's UCFER management team including **Dr. Sydni Credle**, **Dr. Madhava Syamlal**, **Amanda Lopez**, **Lisa Kuzniar**, and **Amanda Karki** (KeyLogic), NETL project points of contact.
- TAC Reps, Faculty participants, CCAB Reps, and Leaders of the 9 founding and 7 new member universities.
- Penn State **VPR Neil Sharkey**, **EMS Dean Lee Kump**, **PSIEE Director Tom Richard**, **EMS ADGER John Hellmann**, **Tim Stodart** of OSP, and **Ron Huss** of OTM.
- Operations Management Team at PSU includes **Jennifer Lear**, **Joel Morrison**, **Elizabeth Wood**, and **Kelly Rhoades**.