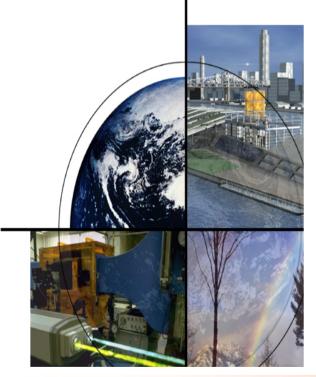
## **Collaboratory for Multiphase Flow Research**



#### Workshop on Multiphase Flow Research

June 7, 2006

William Rogers Director Computational Science Division

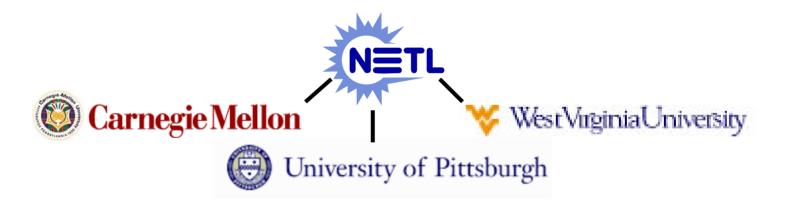
National Energy Technology Laboratory





# Goals

- Accelerate the development of multiphase simulation capability
- Promote use of multiphase simulation and experiments to enhance the success of NETL's R&D investments
- Extend these capabilities to other applications of national interest



#### **Collaboratory for Multiphase Flow Research**



## **Justification**

- Solids flow occur in many energy conversion processes central to NETL's mission
  - gasification processes
  - coal combustion systems
  - carbon capture
- An estimated 40%, or \$61 billion, value added by the U.S. chemical industry is related to particle technology [1]
  - solids-based processes often have scale-up and operational problems
  - Multiphase flow simulation offers a cost effective tool to analyze and solve such problems



## Justification

#### • Multiphase CFD modeling is a tool with much potential

 Single phase CFD models are routinely used in aerospace and automobile industries and increasingly being used by the chemical industry

#### • Tremendous intellectual capital at the local universities

- Carnegie Mellon University
- University of Pittsburgh
- West Virginia University
- Universities are part of the NETL site support contract
- NETL and Universities have the ability to reach out nationwide
  - NETL external research programs
  - Academic and industrial projects



## Approach

- Establish Collaboratory for Multiphase Flow Research –NETL, UP, CMU, WVU are initial participants
- NETL will provide initial funding
- Fund a set of projects critical to NETL mission to start
  - -High resolution discretization schemes for multiphase flow
  - -Open-FOAM block solver development
  - -Benchmarking the ARCHES code
  - -Effect of inlet configuration on CFB riser dispersion
  - -Discrete particle dynamics simulation and measurement
  - -Coal particle partitioning in coal gasification
- NETL-University team will organize into the collaboratory structure
- Start Date: June 2006
- Year-1 Funding: ~\$1 million



# Approach

#### NETL Lead Collaborator

 Madhava Syamlal, Research Group Leader, Multiphase Flow Research Group, Office of Research & Development, NETL

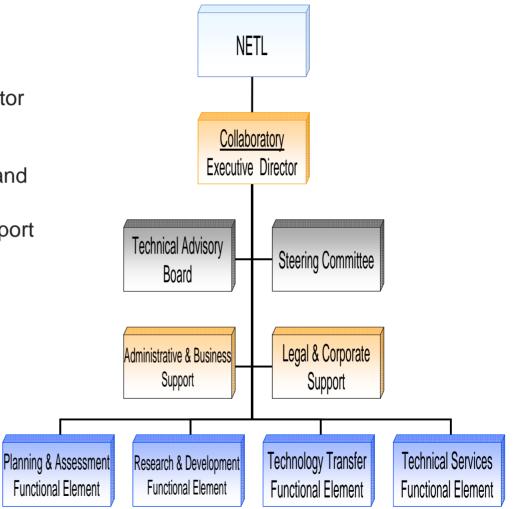
#### • University Investigators for initial project set

- Richard Bajura, Director, National Research Center for Coal & Energy, WVU (Collaboratory)
- -Joseph McCarthy (UP, ChE)
- -C. Fred Higgs (CMU, ME)
- -Mary Ann Clarke (WVU, Math)
- -Eric Johnson (WVU, ME)
- -Richard Turton (WVU, ChE)



## **Approach** Collaboratory Organizational Structure

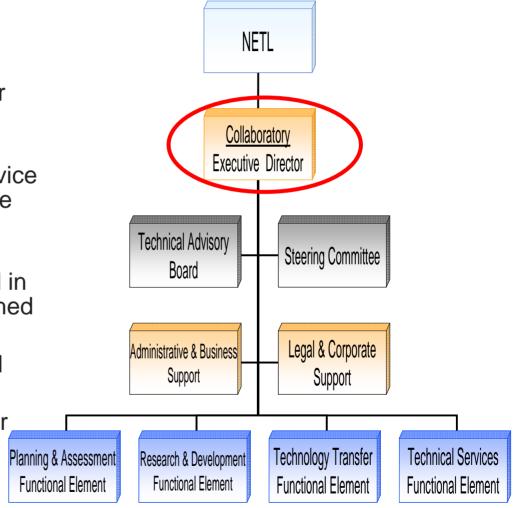
- NETL
  - Host organization and owner of Collaboratory
  - Collaboratory reports to NETL Director through the Office of Research and Development
- Executive Director, Admin & Business, and Legal & Corporate Support
  - Management and infrastructure support
- Steering Committee and Technical Advisory Board
  - Guide the Executive Director / NETL in achieving success
- Planning & Assessment, Research & Development, Technology Transfer, and Technical Services
  - Functional elements under which technical work will be accomplished





## Collaboratory Organizational Structure Executive Director

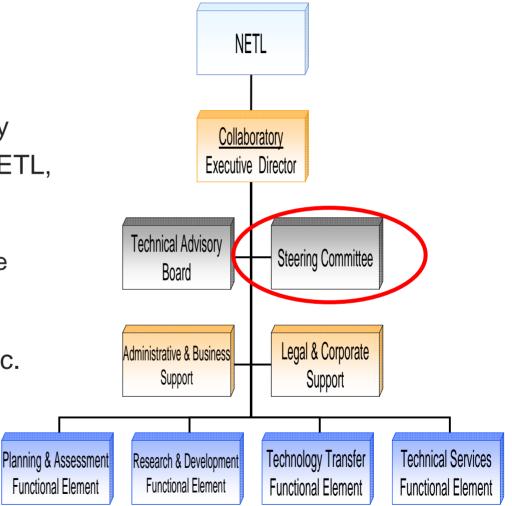
- Appointed by NETL
- Technical and administrative qualifications
- Is the overall Collaboratory manager and reports to ORD Management at NETL
- Receives recommendations and advice from the Steering Committee and the Technical Advisory Board
- Makes major decisions on matters affecting Collaboratory as described in the bylaws and procedures established for the operation
- May establish other committees and functional elements as needed
- Invites and approves applications for membership in the Collaboratory





## Collaboratory Organizational Structure Steering Committee

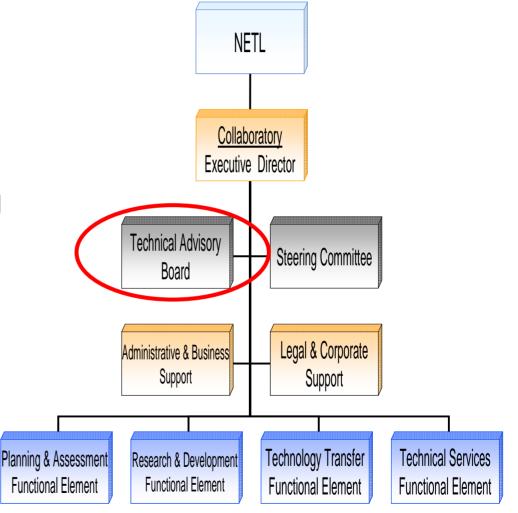
- Chaired by the Collaboratory Executive Director
- Help guide the formation and operation of the Collaboratory
- Consists of members from NETL, CMU, UP, and WVU
  - expertise in multiphase flow technology and administrative experience
- Duties of members, terms of appointment, voting rights, etc. to be specified in bylaws and procedures manual to be developed





### Collaboratory Organizational Structure Technical Advisory Board

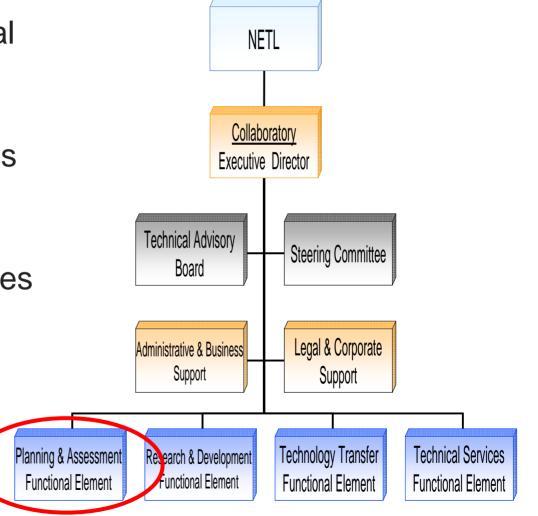
- Provides overall guidance to the Executive Director and Steering Committee
- Reviews the program on an annual basis, including R&D projects
- Recommends members for the Collaboratory
- Broad mix membership
  - Industry
  - Academia
  - National Lab





## Collaboratory Organizational Structure Planning & Assessment

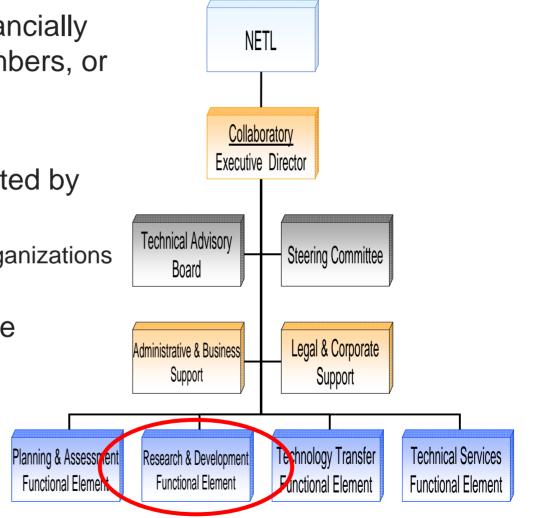
- Identifies barrier technical issues
- Identifies specific R&D, methods, and tools needs required to develop technology solutions
- Recommends and updates a strategic plan for the Collaboratory technical programs





#### Collaboratory Organizational Structure Research & Development

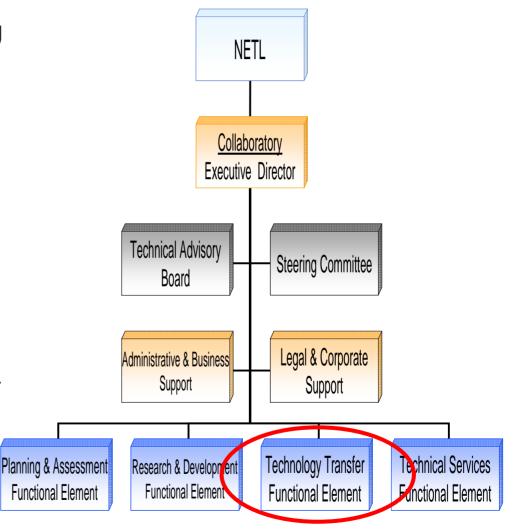
- R&D projects may be financially supported by NETL, members, or outside sponsors
  - support vision and mission
- R&D projects are completed by Collaboratory members
  - oversight from their host organizations and project sponsors
- R&D project results will be reviewed by Planning & Assessment to aid in determining future programs





## Collaboratory Organizational Structure Technology Transfer

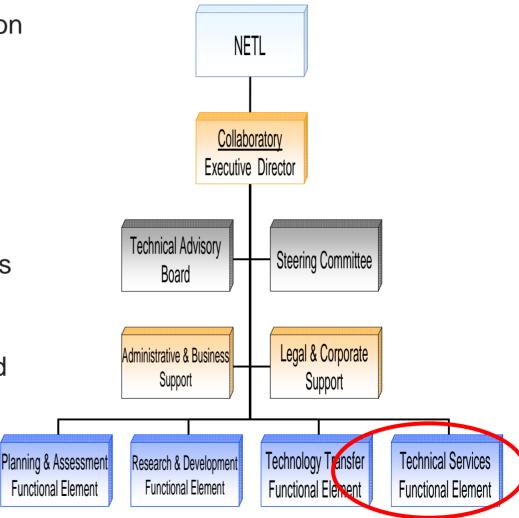
- Responsible for promulgating technology developments of the Collaboratory
- Activities include:
  - workshops, technical conferences, and other programs to promote the exchange of ideas among researchers in the field
  - training and developing courses
  - Developing procedures for managing intellectual property





### Collaboratory Organizational Structure Technical Services

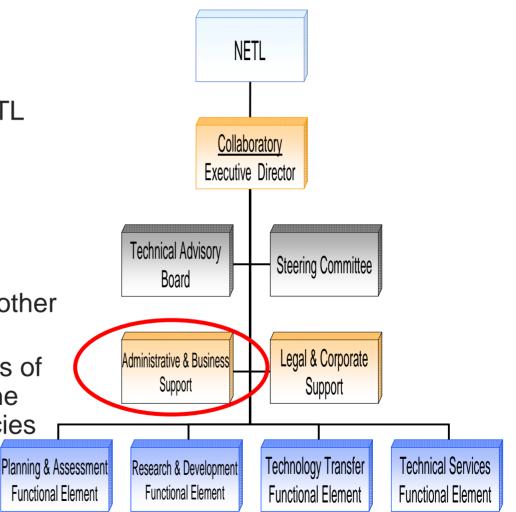
- Performs services for others on a contractual basis
  - applying methods and tools rather than performing R&D
- Services may be provided by any of the members
- In accordance with the intellectual property provisions of the Collaboratory
- Income earned from these service activities may be used to support additional R&D





## **Collaboratory Organizational Structure** *Administrative & Business Support*

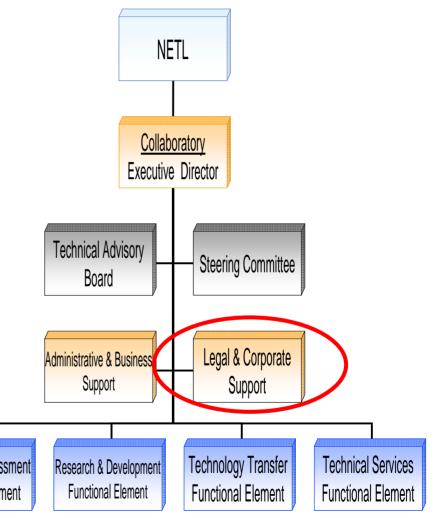
- Provides the administrative and business office support for the Collaboratory
- Staffing may be provided by NETL personnel, NETL site support contractors or similar units
- Activities include:
  - support for meetings and conferences
  - Maintaining the web site and other communications functions
  - Managing business operations of the Collaboratory, including the bylaws, procedures, and policies





## Collaboratory Organizational Structure Legal & Corporate Support

- Provides the legal and corporate support for the Collaboratory
- Activities include
  - Reviewing intellectual property provisions proposed for the Collaboratory
  - Ensuring that appropriate business practices are followed
  - Providing legal opinions to NETL management to ensure consistency with federal guidelines for an activity managed by NETL
  - Other activities related to legal and corporate interests of NETL and member organizations to ensure compliance with applicable laws





## **Collaboratory Status**

 UP, CMU, WVU were invited to propose research projects and collaboratory concepts under NETL site support contract

-pre-proposal workshop (2/16/06)

- University proposals submitted (3/17/06)
- Proposal selection announcement (5/1/06)
- Contractual arrangements are being negotiated
- Project technical kickoff meetings being held (6/06)
- Begin formation of the collaboratory (6/06)
  - -Proposed structure has been developed
  - -Identification of key personnel
  - -By-laws to be developed

