

Collaboratory for Multiphase Flow Research

Workshop on Multiphase Flow Research

June 7, 2006

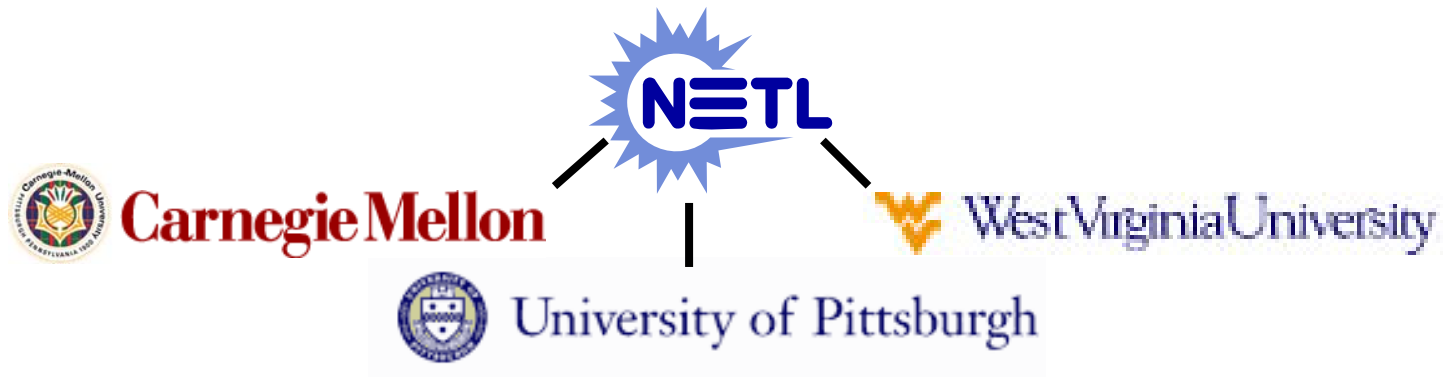
William Rogers
Director
Computational Science Division

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



1 B.J. Ennis, J. Green, R. Davies, "The Legacy of Neglect in the U.S.," *Chemical Eng. Progress*, 32-43, April 1994

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**

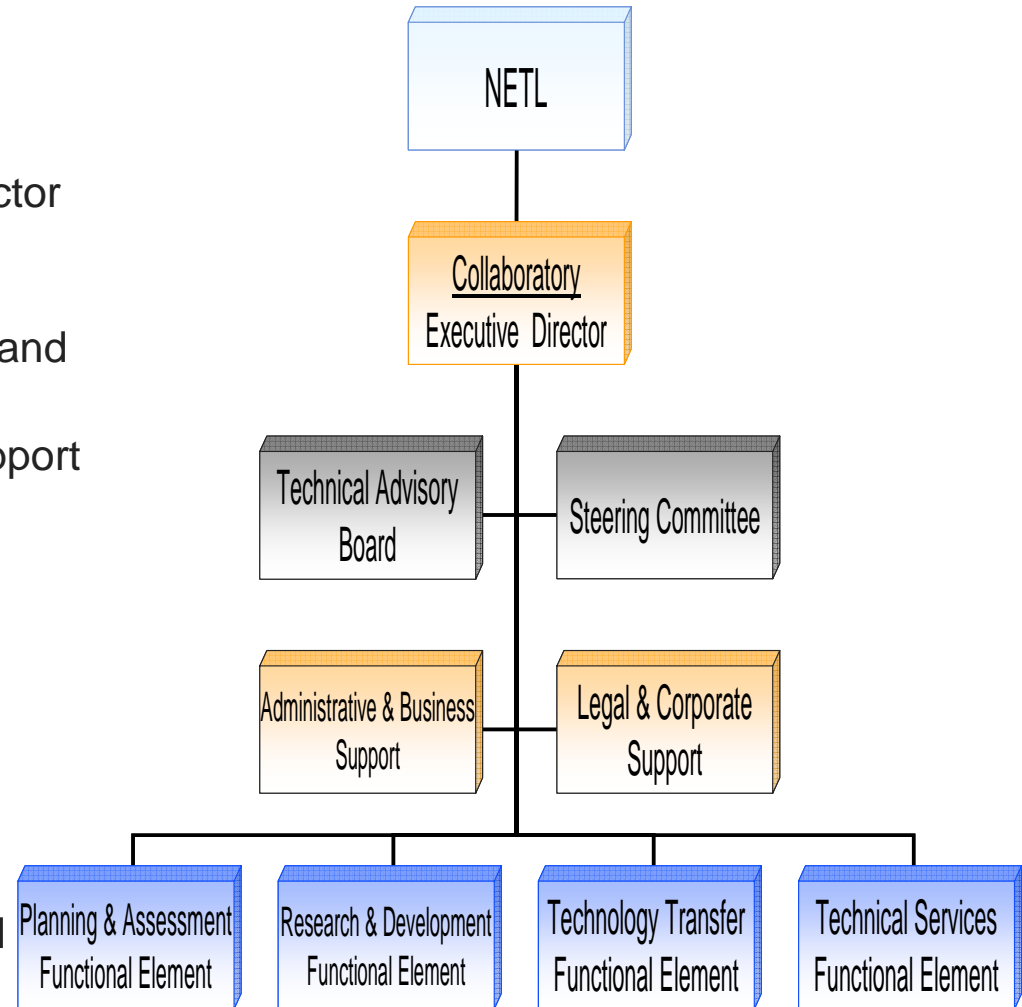
- Richard Bajura, Director, National Research Center for Coal & Energy, WVU (Collaboratory)
- Joseph McCarthy (UP, ChE)
- C. Fred Higgs (CMU, ME)
- Mary Ann Clarke (WVU, Math)
- Eric Johnson (WVU, ME)
- Richard Turton (WVU, ChE)



Approach

Collaboratory Organizational Structure

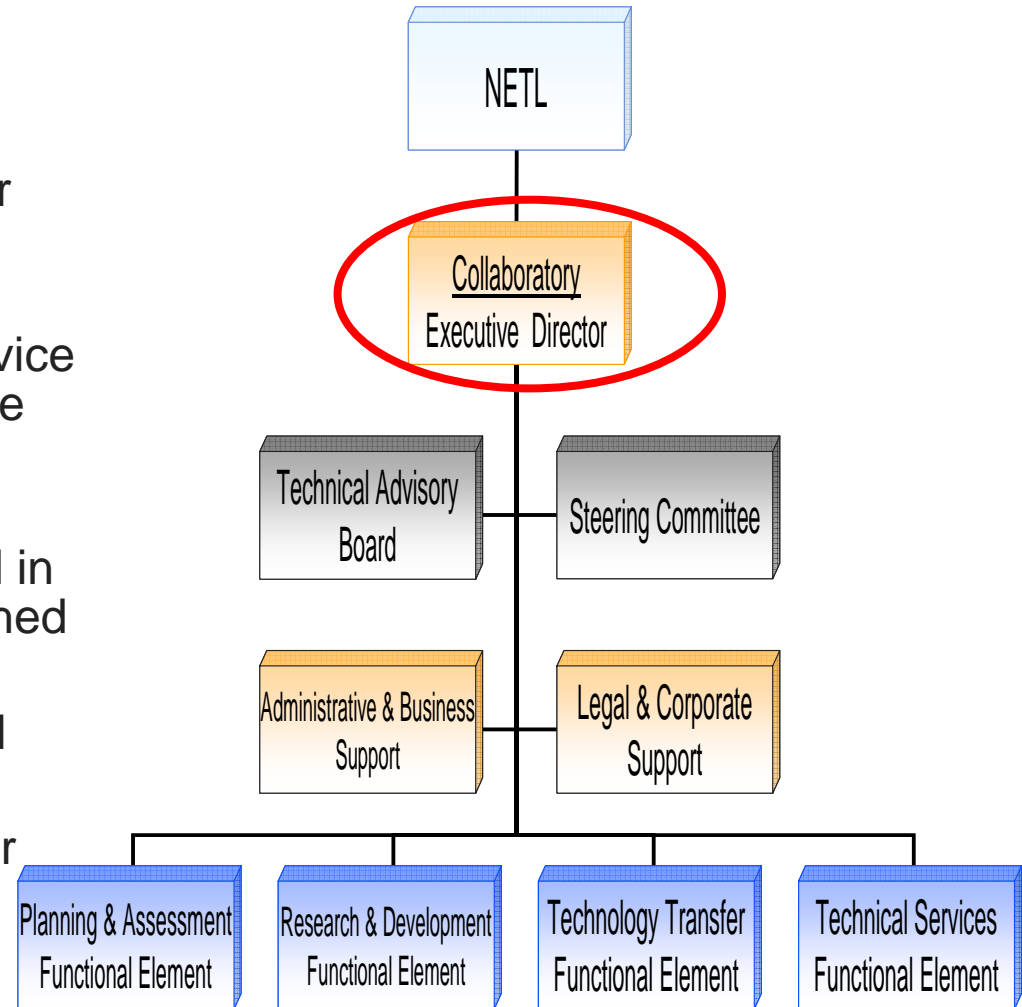
- NETL
 - Host organization and owner of Collaboratory
 - Collaboratory reports to NETL Director through the Office of Research and Development
- Executive Director, Admin & Business, and Legal & Corporate Support
 - Management and infrastructure support
- Steering Committee and Technical Advisory Board
 - 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

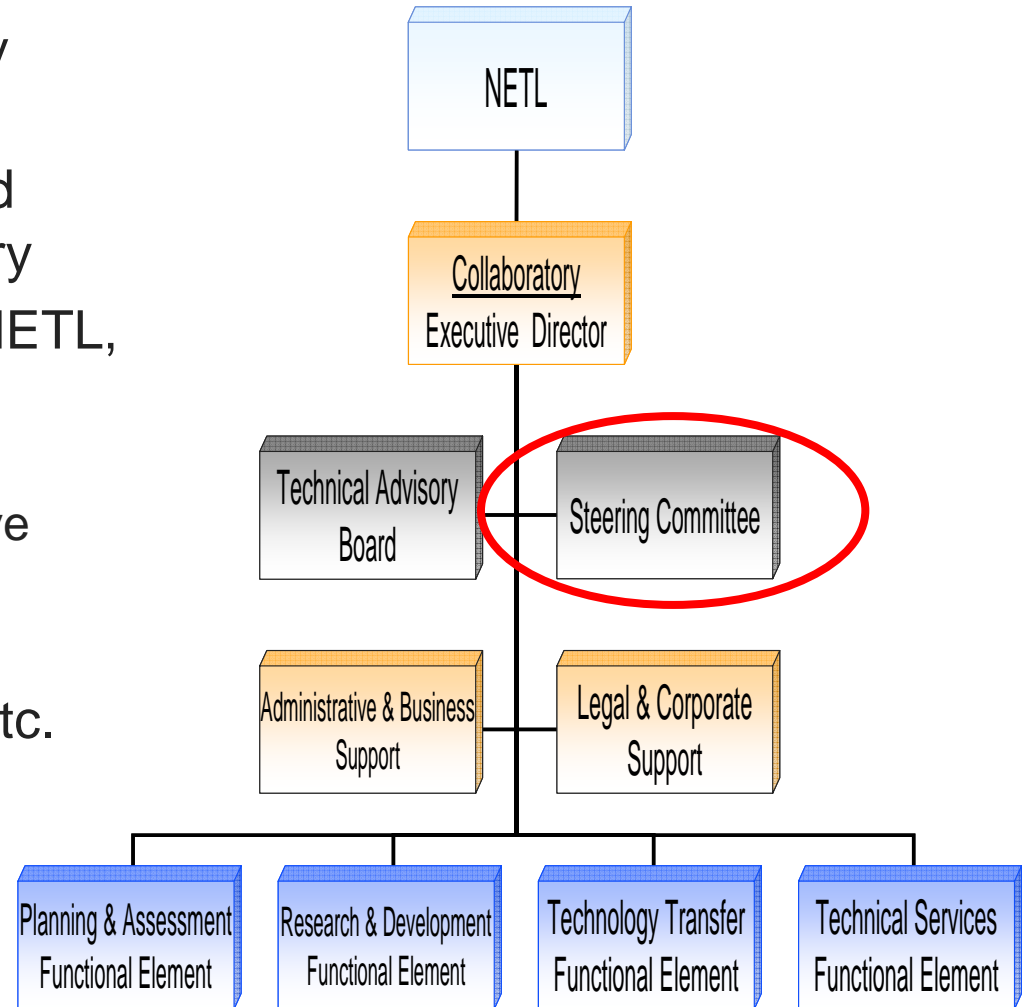
- Appointed by NETL
- Technical and administrative qualifications
- Is the overall Collaboratory manager and reports to ORD Management at NETL
- Receives recommendations and advice from the Steering Committee and the Technical Advisory Board
- Makes major decisions on matters affecting Collaboratory 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

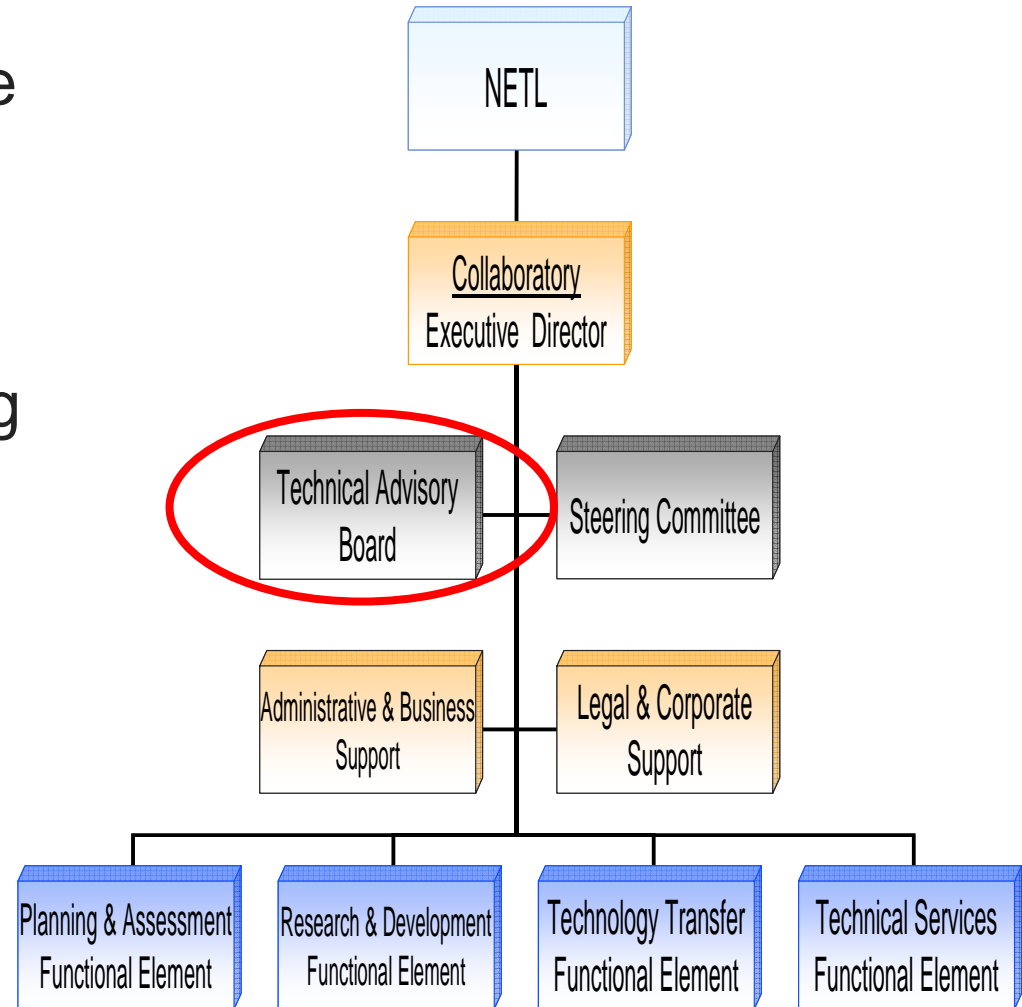
- Chaired by the Collaboratory Executive Director
- Help guide the formation and operation of the Collaboratory
- Consists of members from NETL, CMU, UP, and WVU
 - expertise in multiphase flow technology and administrative experience
- Duties of members, terms of appointment, voting rights, etc. to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



Collaboratory Organizational Structure

Technical Advisory Board

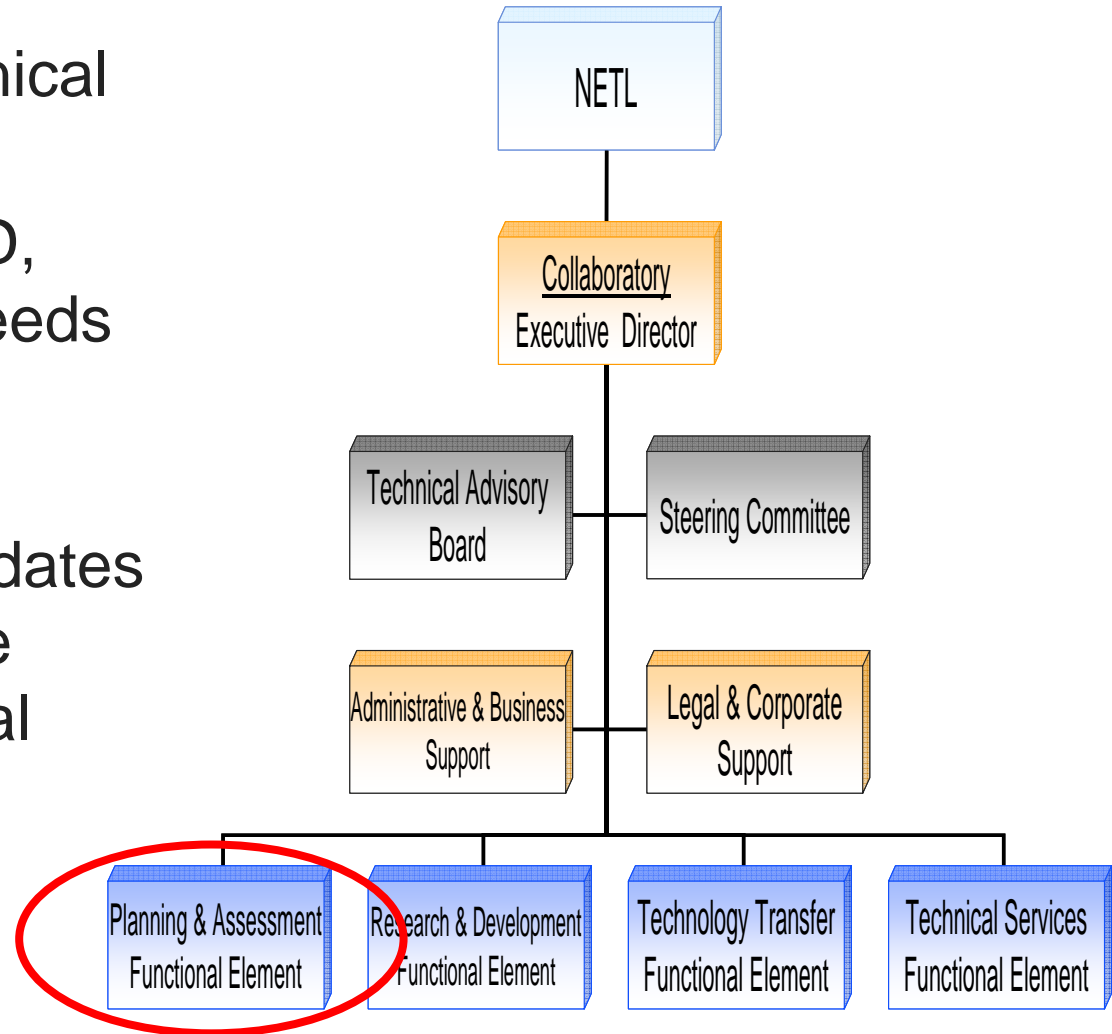
- Provides overall guidance to the Executive Director and Steering Committee
- Reviews the program on an annual basis, including R&D projects
- Recommends members for the Collaboratory
- Broad mix membership
 - Industry
 - Academia
 - National Lab



Collaboratory Organizational Structure

Planning & Assessment

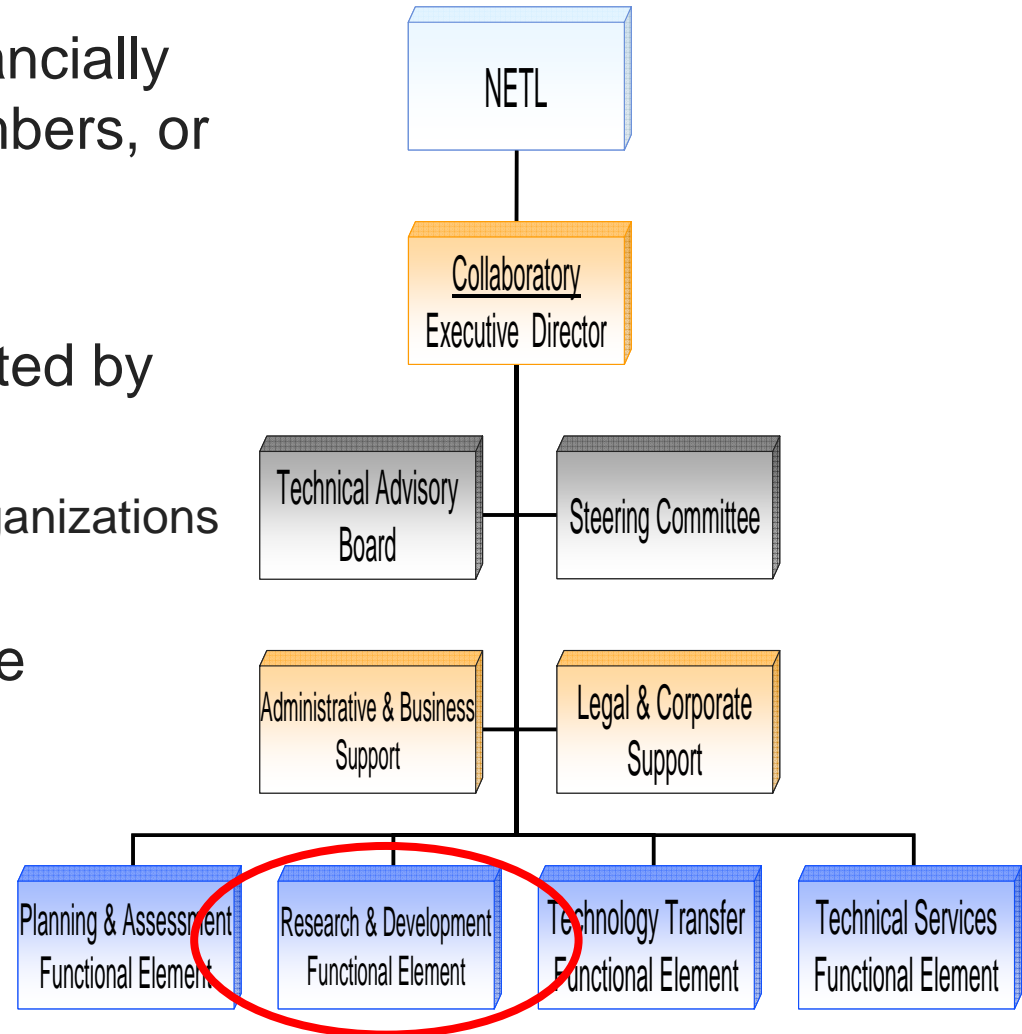
- Identifies barrier technical issues
- Identifies specific R&D, methods, and tools needs required to develop technology solutions
- Recommends and updates a strategic plan for the Collaboratory technical programs



Collaboratory Organizational Structure

Research & Development

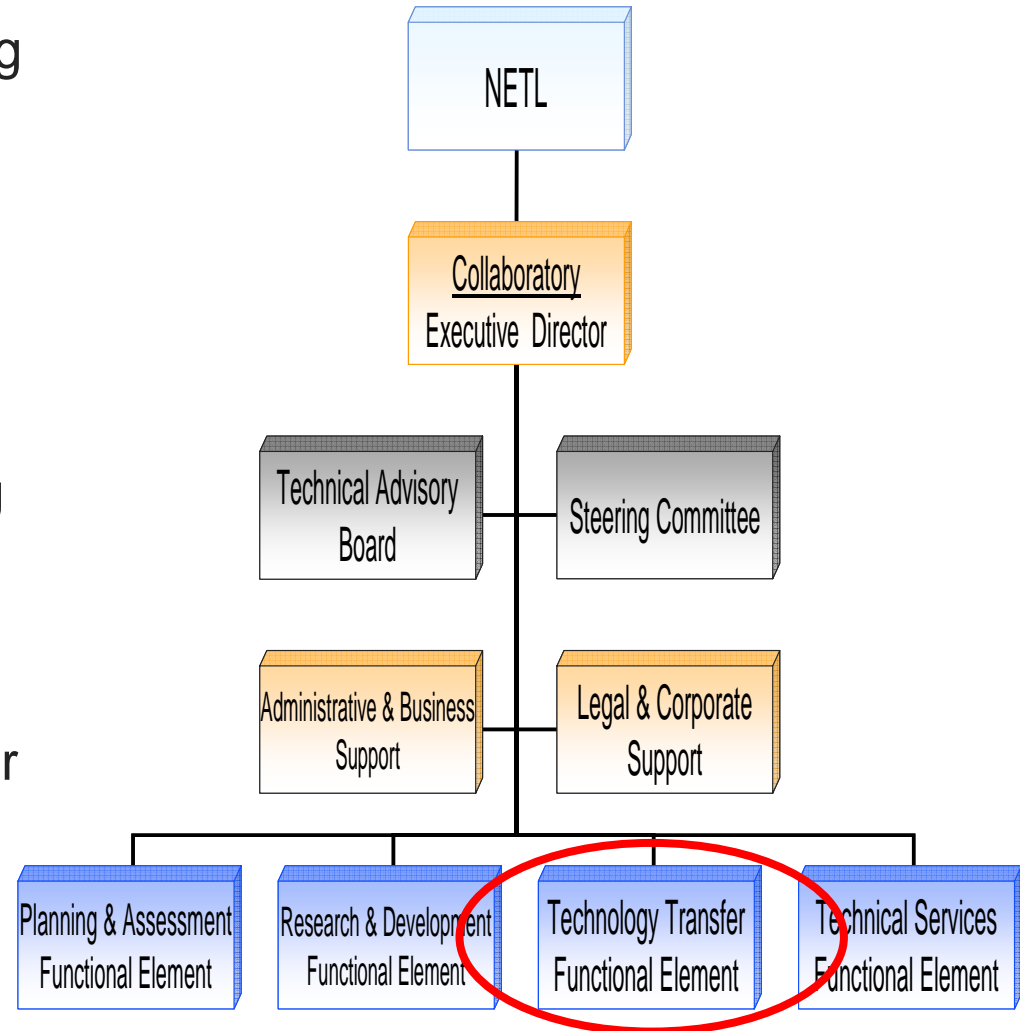
- R&D projects may be financially supported by NETL, members, or outside sponsors
 - support vision and mission
- R&D projects are completed by Collaboratory members
 - oversight from their host organizations and project sponsors
- R&D project results will be reviewed by Planning & Assessment to aid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



Collaboratory Organizational Structure

Technology Transfer

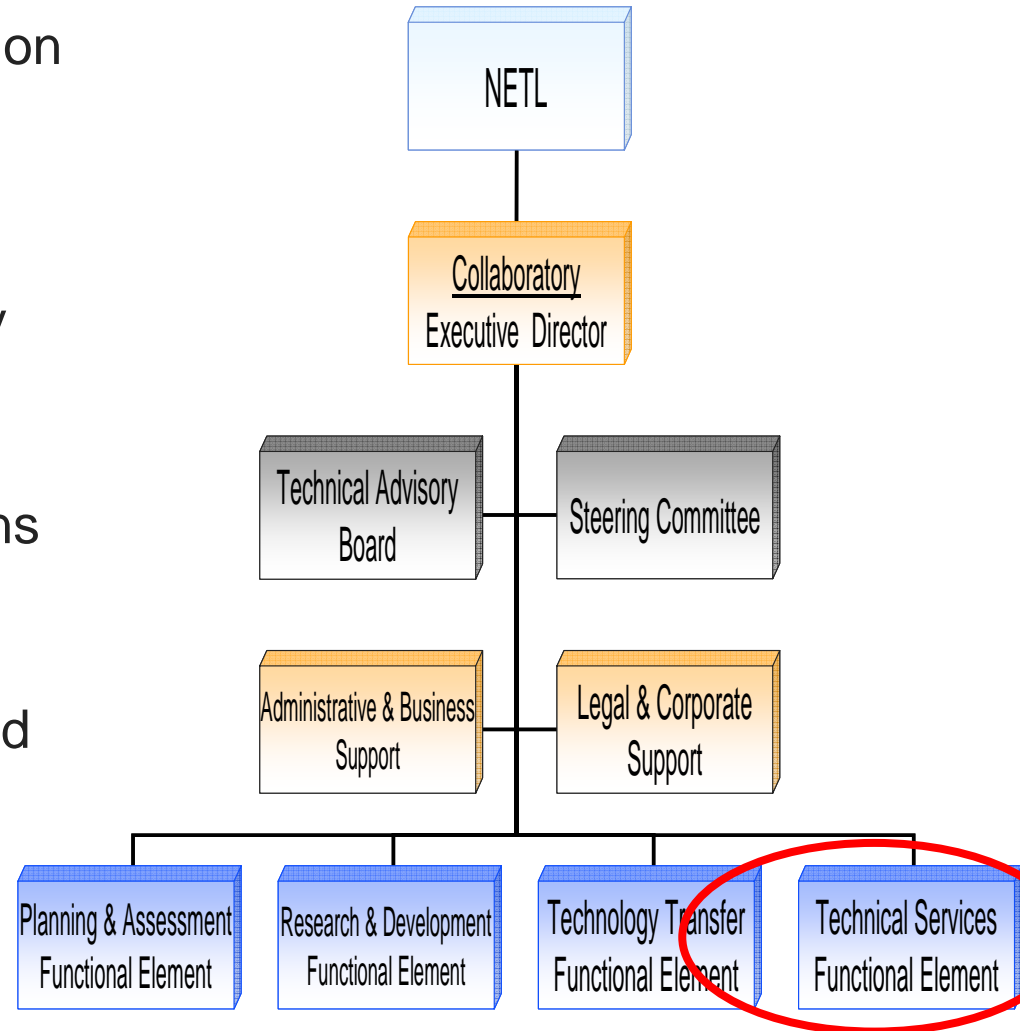
- Responsible for promulgating technology developments of the Collaboratory
- Activities include:
 - workshops, technical conferences, and other programs to promote the exchange of ideas among researchers in the field
 - training and developing courses
 - Developing procedures for managing intellectual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



Collaboratory Organizational Structure

Technical Services

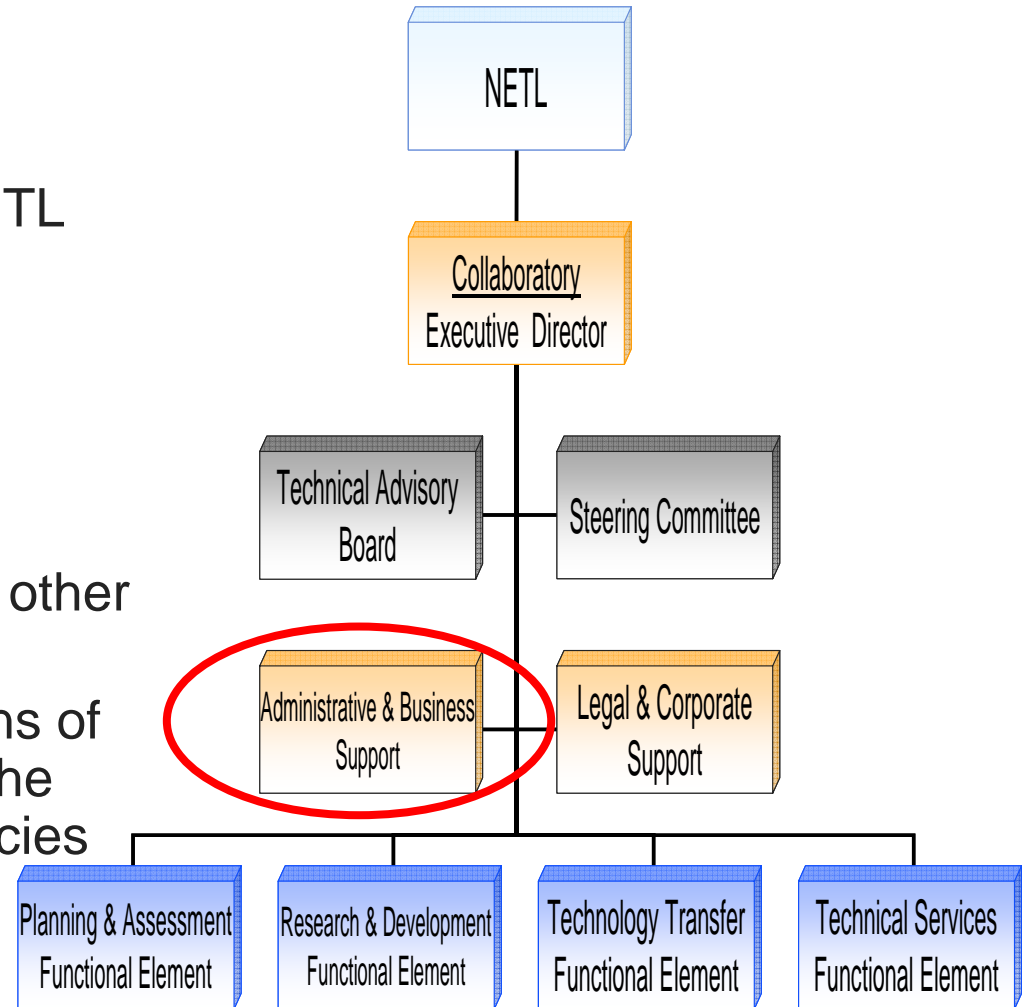
- Performs services for others on a contractual basis
 - applying methods and tools rather than performing R&D
- Services may be provided by any of the members
- In accordance with the intellectual property provisions of the Collaboratory
- Income earned from these service activities may be used to support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



Collaboratory Organizational Structure

Administrative & Business Support

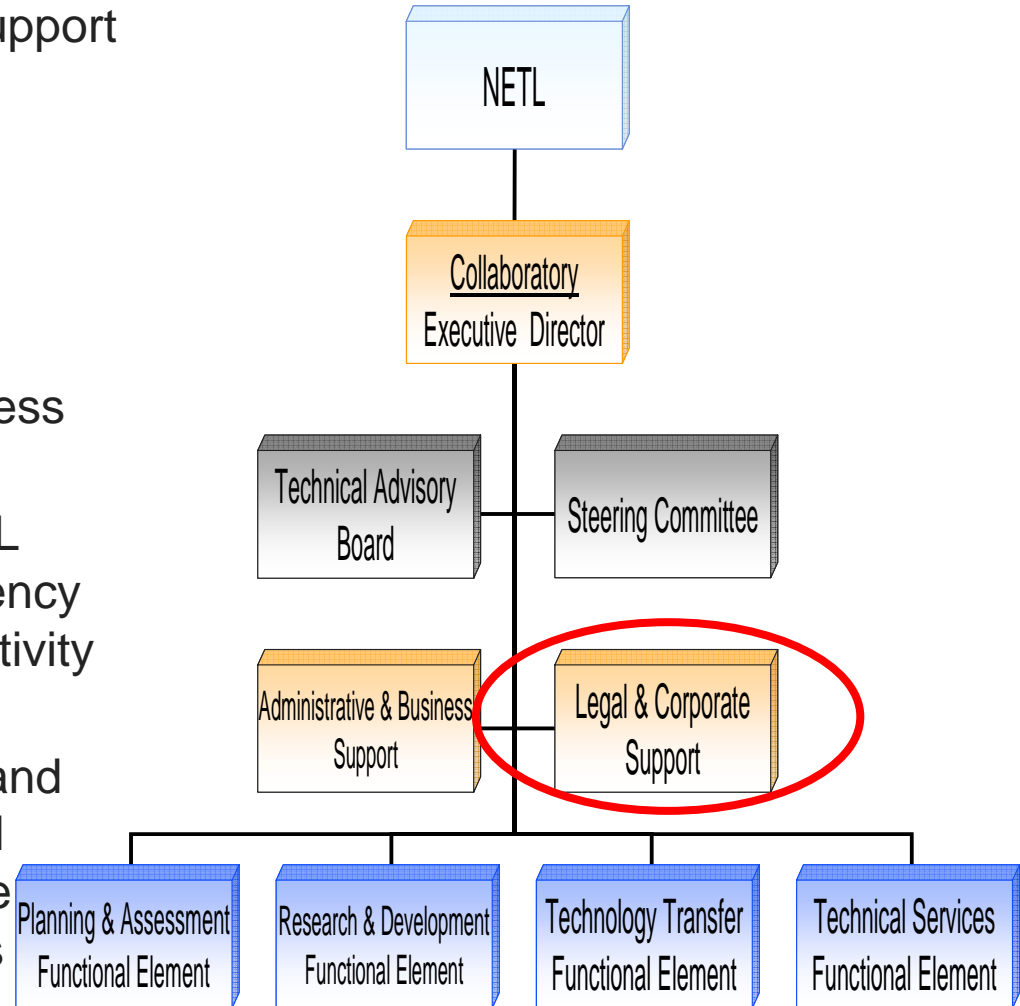
- Provides the administrative and business office support for the Collaboratory
- Staffing may be provided by NETL personnel, NETL site support contractors or similar units
- Activities include:
 - support for meetings and conferences
 - Maintaining the web site and other communications functions
 -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

