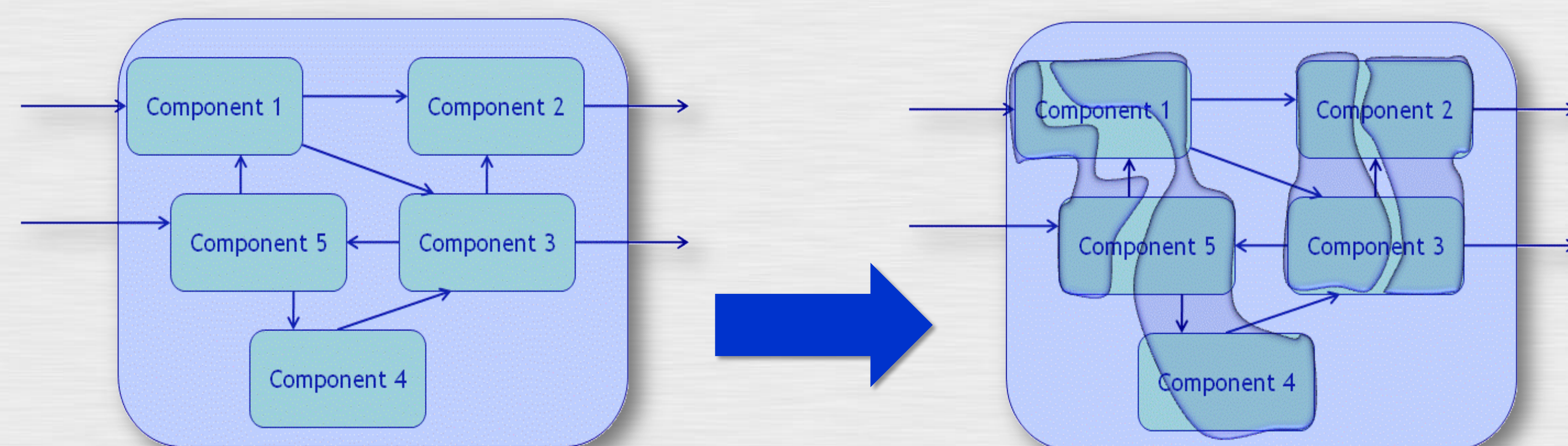


Data in models can be used to determine sensor types and locations in a wide array of systems

- Determine hot spots on turbine blades
- Locate high contaminant concentrations in gasifiers
- Hydrodynamics in CFB Boilers
- Gas concentrations in various locations

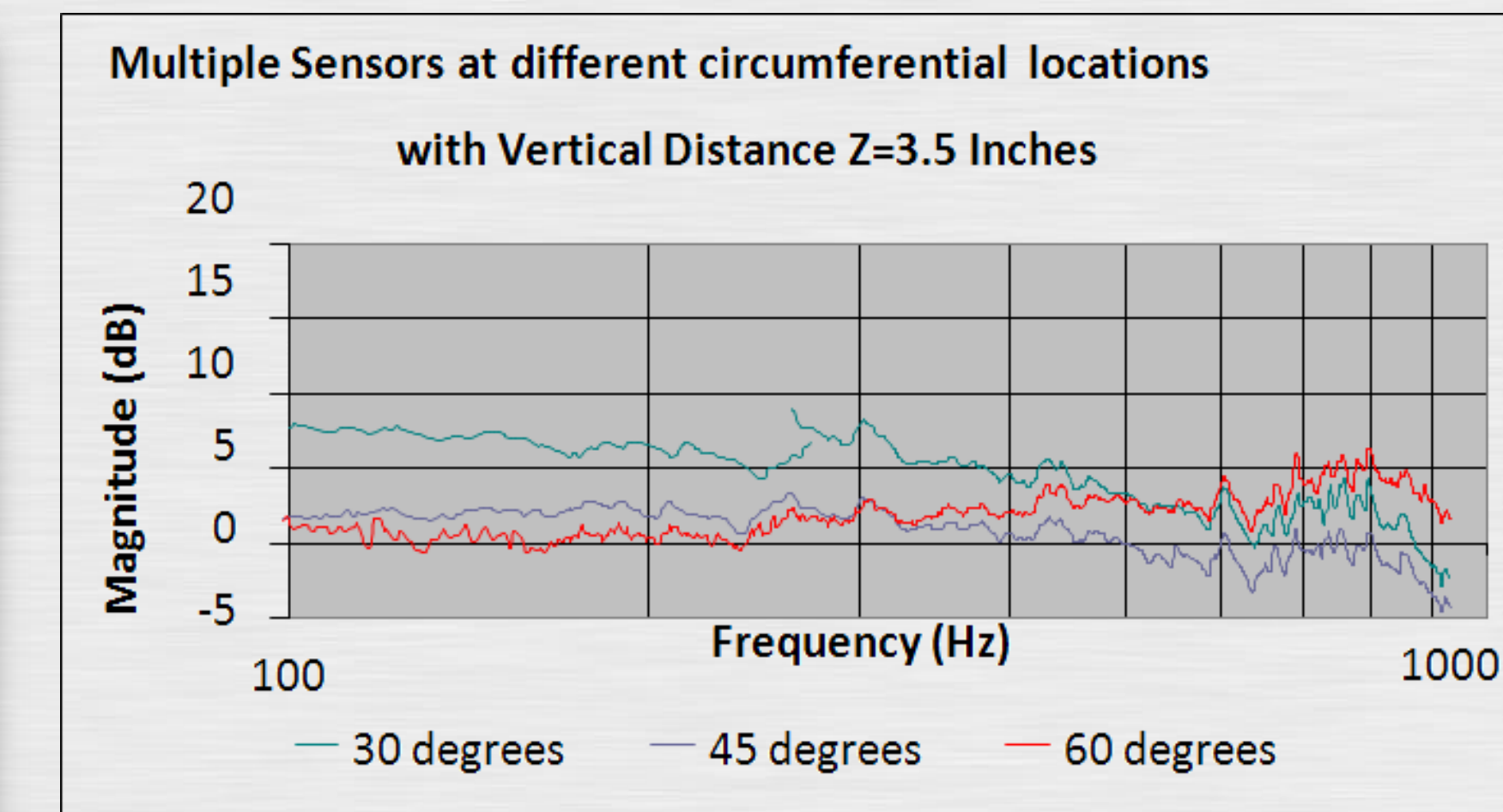
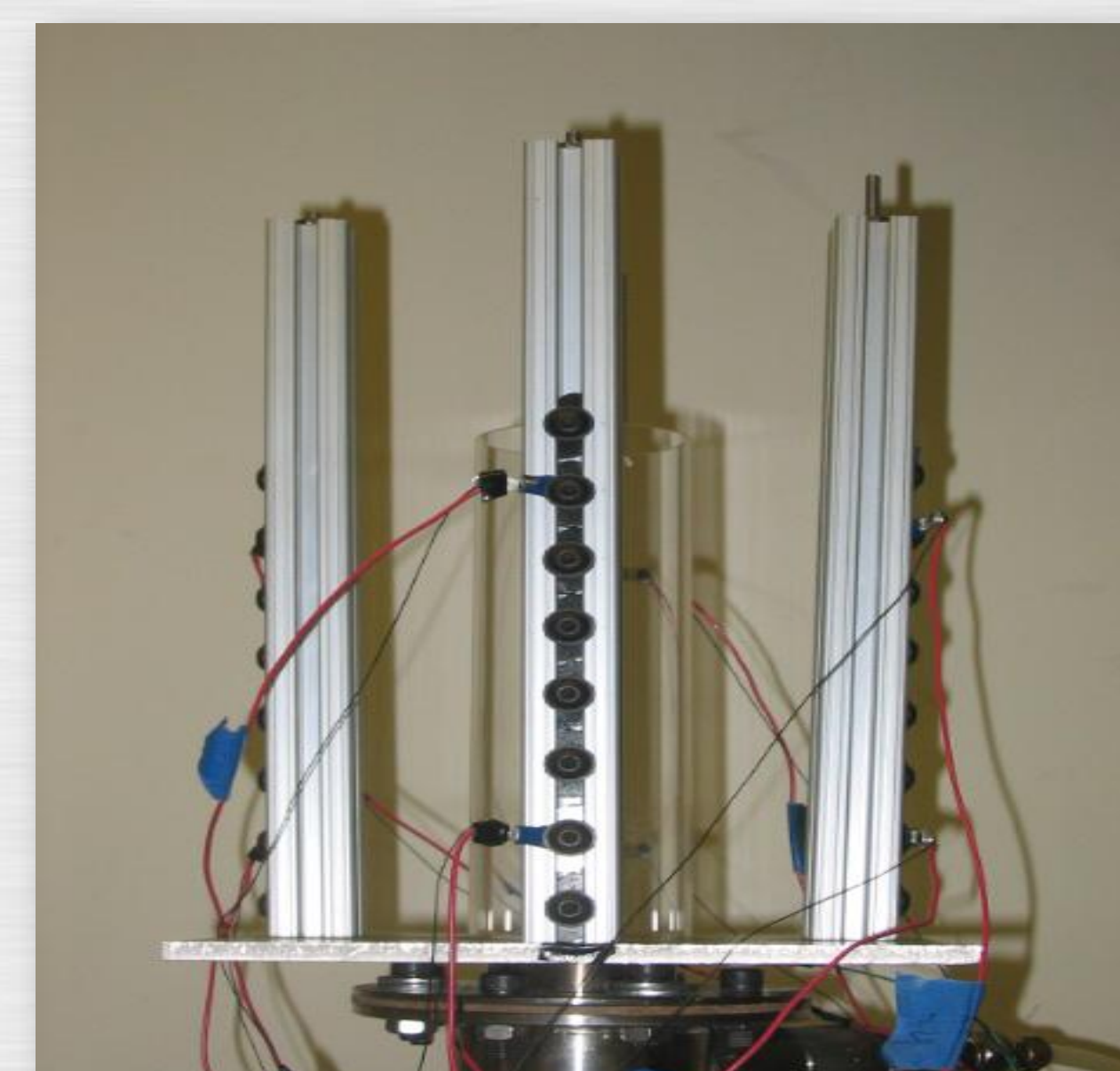
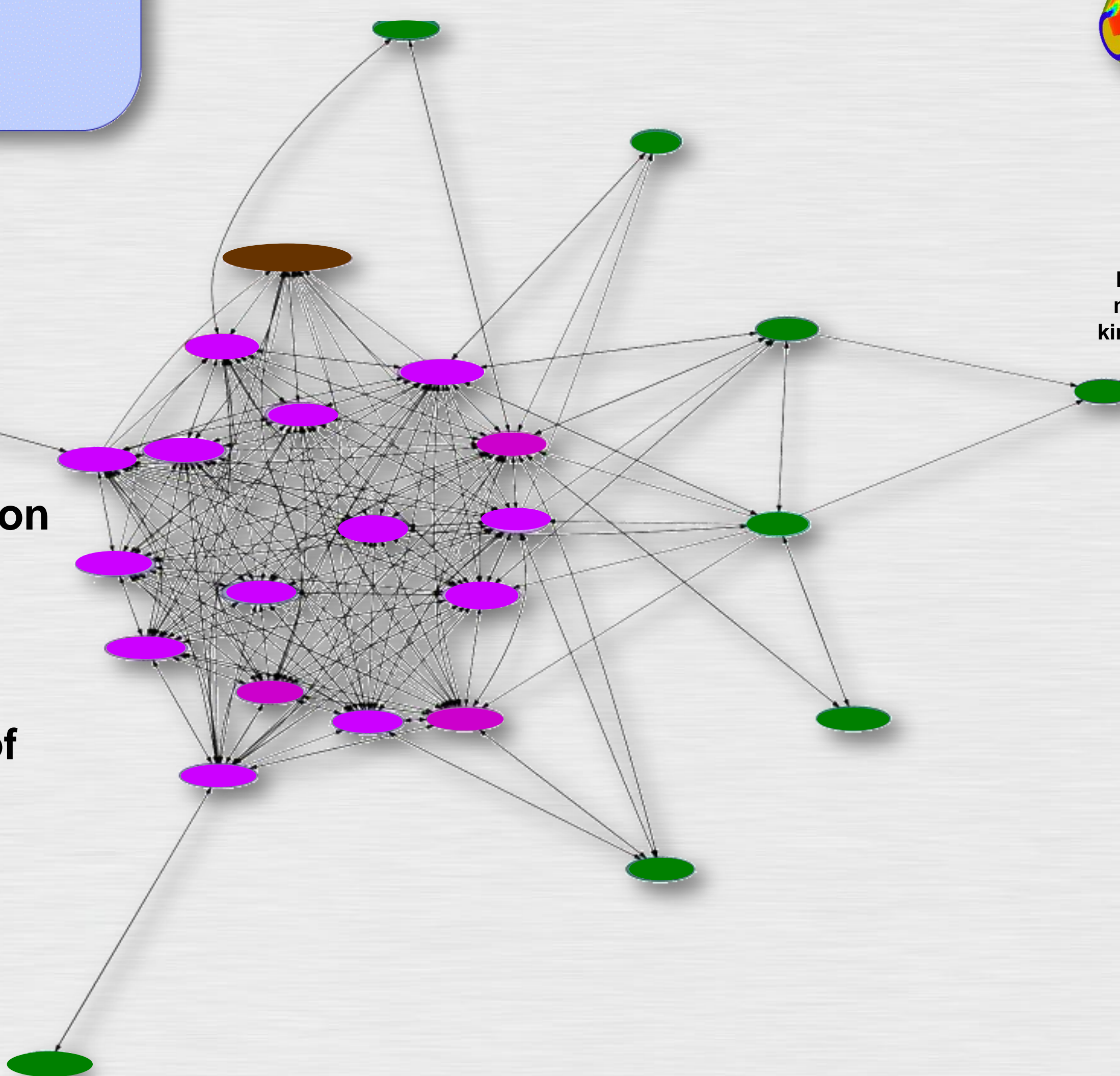
Sensors will be used more efficiently and provide only the necessary data needed to run an effective power system

High resolution MFX E-E simulation (10M cells) commercial scale transport gasifier, 2009 DOE Office of Science INCITE Award 13M CPU hours (Syamlal et al. "Advanced Coal Gasifier Designs Using Large-Scale Simulations," *Journal of Physics: Conference Series* 180 (2009))



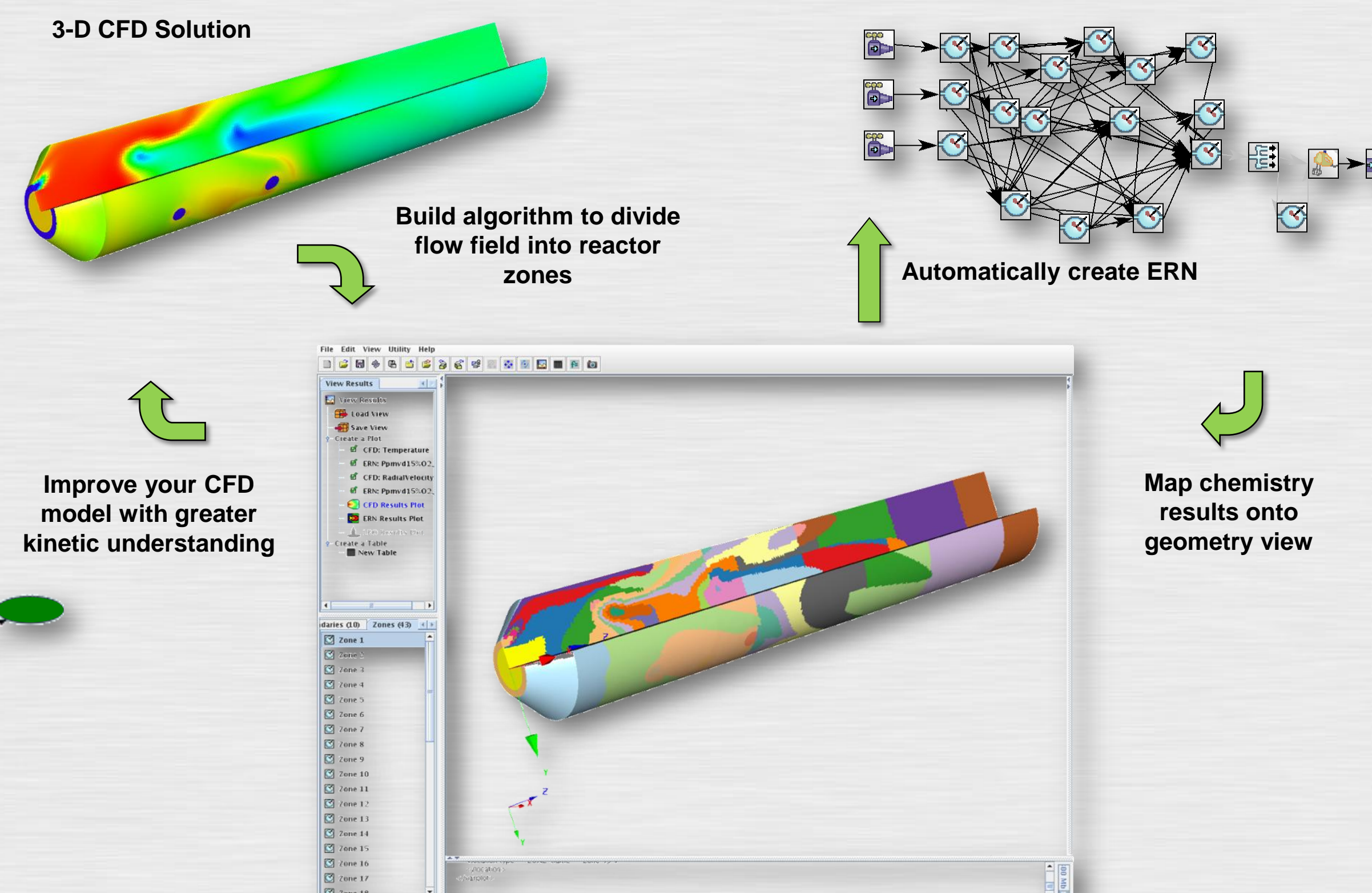
Oregon State University

- Derive criteria for assessing sensor effectiveness and system impact
 - Quantify sensor configuration effectiveness
 - Allow trade-offs in communication, computation and sensing requirements
 - Develop new objective functions for sensors/sensor sets
- Demonstrate effectiveness and re-configurability of sensors to changing performance criteria
 - Response to changes in systems
 - Response to sensor failures
 - Response to changing system level criteria



University of Maryland / Iowa State University

- Develop an overall network architecture that can effectively accommodate the heterogeneity of a large number of sensors
- Determine how many sensors are sufficient and where the sensors should be placed to ensure a defined degree of convergence and confidence
- Define self-organization subsystems to handle complex adaptive systems with limited external direction and determine how the sensors in each subsystem interact with each other



Reaction Design

- Use ERN concept to generate "reduced order model" or ROM within a plant simulation
- Build the ERN automatically from CFD results
 - Account for multi-phase flow effects
 - Identify dominant flow characteristics