

A blue-tinted photograph of a sunrise over the ocean. The sky is filled with soft, wispy clouds, and the sun is visible on the horizon, creating a bright glow. The word "SUNRISE" is overlaid in the center in a bold, yellow, sans-serif font with a black outline.

**SUNRISE**

Sustainable eNergy Research, Infrastructure and Supporting Education

## The **SUNRISE** Team

Dr. Michael Mann – Chemical Engineering – UND

Dr. Mark Hoffmann – Chemistry – UND

Dr. Wayne Seames – Chemical Engineering – UND

Dr. Irina Smoliakova – Chemistry - UND

Dr. John Hershberger – Chemistry – NDSU

Dr. Burton Johnson – Agriculture/Plant Science -  
NDSU

## The **SUNRISE** Goal

- Advance key areas of energy sustainability while producing an R&D continuum to increase the research competitiveness of the universities and the development of the state.

## The **SUNRISE** Vision

- A cluster of interdisciplinary researchers can provide a focused effort for solving complex problems
- Sustainable energy can be an economic driver for the State of North Dakota
- Fundamental research must be effectively and efficiently translated into commercially viable solutions
- Build upon strengths of UND and NDSU researchers to establish a center of excellence

## The **SUNRISE** Research Focus

- Builds on two of North Dakota's primary economic sectors, agriculture and energy
  - Sustainable coal utilization through improved environmental performance
  - Agricultural-based transportation fuels development
  - Establishing a hydrogen-based economy
- NSF program emphasizes basic research

## The **SUNRISE** Research Focus

- Sustainable coal utilization through improved environmental performance
  - Role of trace contaminants and particulates
  - Kinetics of small metal-containing radical species / metal hydrides
  - Transition and excited states of metals using computational electronic theory
  - Partitioning of metals in particulates using 18 kW combustor

# The **SUNRISE** Research Focus

- Agriculture-Based Transportation Fuels Development
  - Explore thermal cracking as alternative to conventional biodiesel production
  - Organic synthesis and molecular modeling
  - Fuel testing in turbine (JP-8)
  - Development of designer oils
    - Characterization of existing crops
    - Crop genetics and growth-related parameters

## The **SUNRISE** Research Focus

- Establishing a hydrogen-based economy
  - Novel hydrogen storage / transport options
  - Development of hydrogen storage models
  - Incorporation into system model to evaluate / optimize renewable energy strategies

## The SUNRISE Team

- SUNRISE Team provides diverse talents
  - Feedstock origins (plant science, geology)
  - Theoretical and experimental chemistry (organic, computational, physical)
  - Applied science and engineering (atmospheric science plus chemical, combustion, and environmental engineering)
- Track record of multi-researcher/discipline projects

# SUNRISE

- North Dakota
  - Repository of large amounts of coal
  - Rich agricultural land
  - Wind energy resources
- SUNRISE
  - Unified program to translate fundamental research into commercial solutions
  - Sustainable energy options for stationary and transportation energy requirements
  - Increased research competitiveness of NDUS