



# ***CE-CERT***

***Bourns College of Engineering  
Center for Environmental Research and Technology***



# Research Focus

## *Clean Air*

Quantifying and Measuring Emissions  
Toxic, Ozone and PM formation



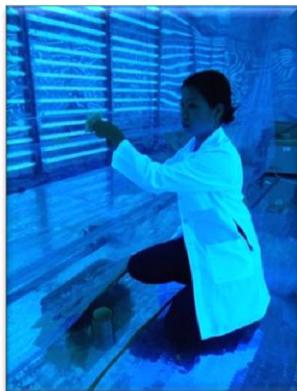
## *Sustainable Transportation*

Eco-driving  
Intelligent transportation systems  
Electric and Hybrid vehicle integration



## *Renewable Fuels*

Aqueous Processing of Biomass to Fuels  
Thermochemical Processing of Biomass to Fuels



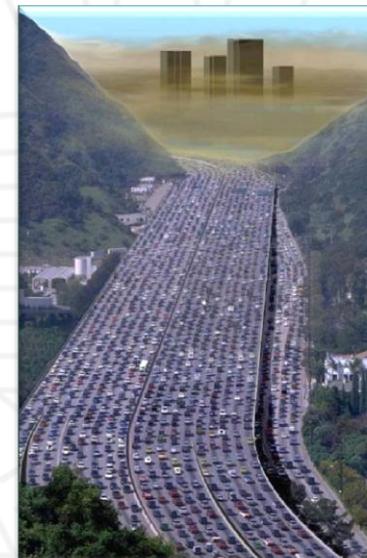
## *Renewable Electricity & Smart Grids*

Advanced Solar Energy Production  
Energy Storage  
Energy Management



## *Climate Change Impacts*

Impacts of our fuels  
Cloud formation & impacts

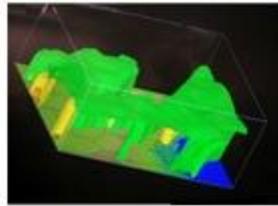


# Integrated Systems Approach

- papers
- EPA and ARB rulemaking
- SIPs

27 interdisciplinary faculty across 5 colleges

Atmospheric Modeling



Secondary Pollutant Studies



Emissions Modeling



- papers
- EPA, DOT, DOE consumption
- User education & behavior modification

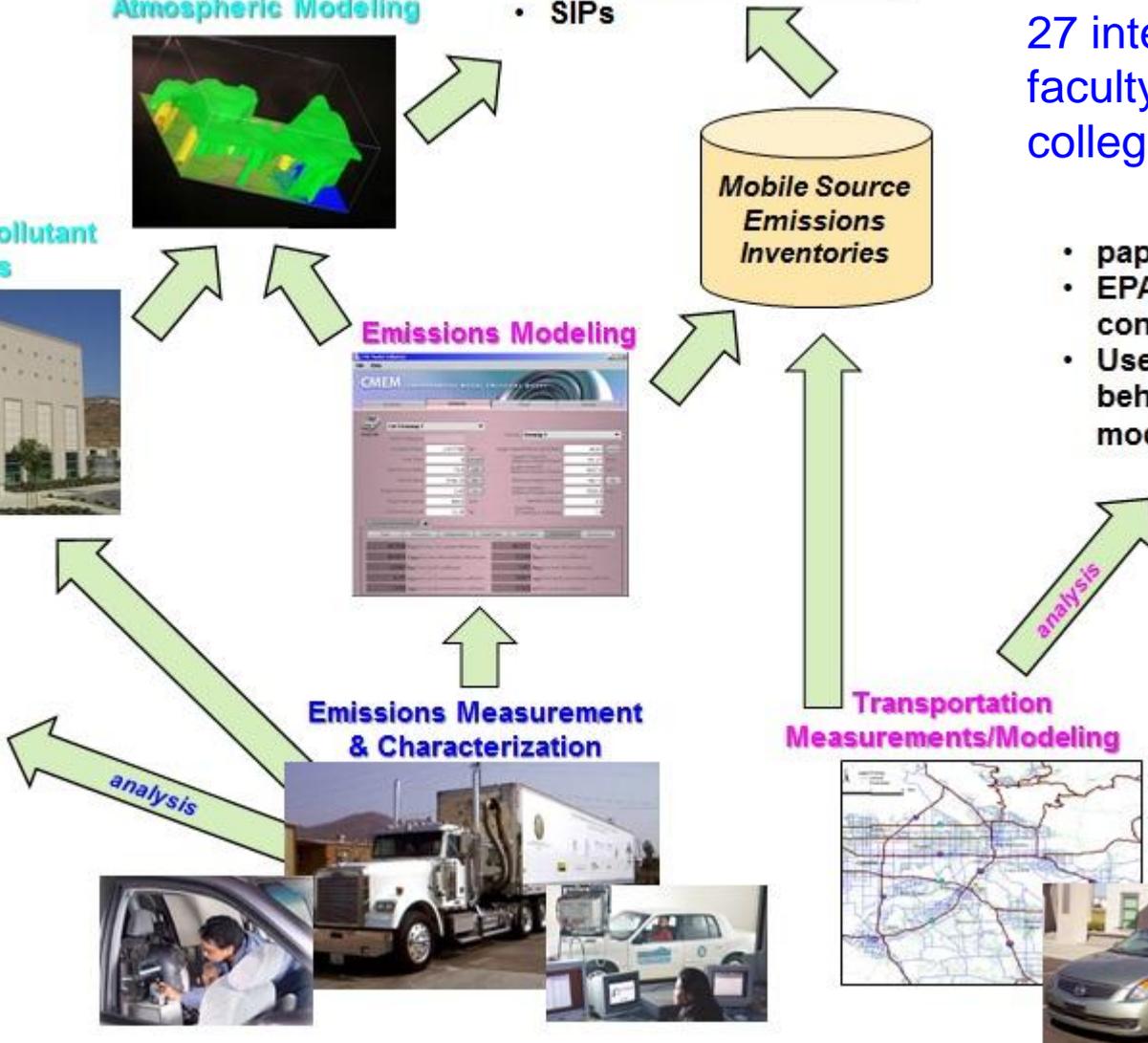
Emissions Measurement & Characterization



Transportation Measurements/Modeling



- papers
- EPA and ARB rulemaking



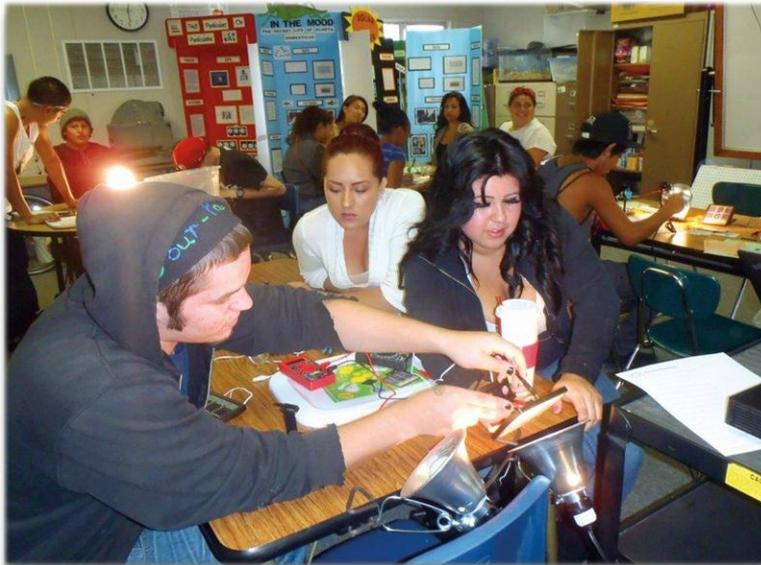
# Balanced Focus as Trusted Agent



~100 Academic, Industry, Government Partners

# Education Integrated with Applied Research

- › Training the next generation of air quality scientists with *classroom theory* and *hands-on practice*.
- › Professional training *courses*, *internships* and *workshops*
- › Visiting Scholar and Graduate Student Exchange



Access to industry and the public through a variety of *STEM outreach programs* targeting K-12, undergraduates & teachers

The South Coast Air Quality Management District has generously offered UCR a \$1M Endowment to develop a training and research program for CARB and SCAQMD staff:

## Air Quality & Climate Research Training (ACT) Program

*Basic-to-Advanced Courses Designed for Air Quality Professionals*

What participants will gain:

**INSIGHT** from the *state of the science research* and *interaction with other professionals*

**LEARN** the *fundamentals and hands-on laboratory techniques* to measure emissions & health impacts

**UNDERSTAND** *co-benefits* between air quality & climate impacts

**BROADEN** *your perspective* for improved research, policy & technical solutions

## ACT Program Format



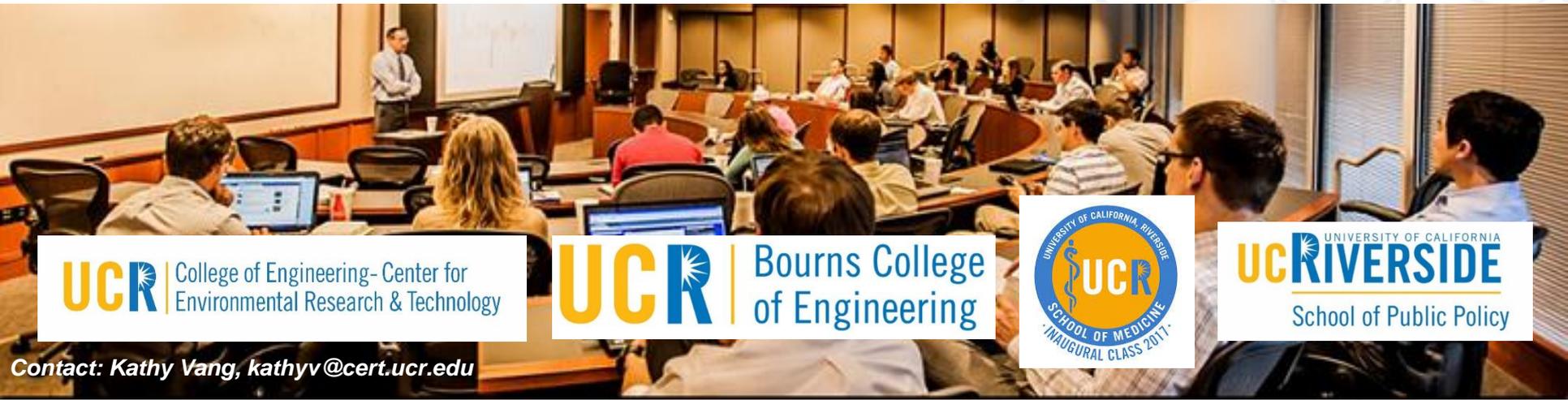
**Base Funding  
Advisory Role**

- **SCAQMD endowment interest**
  - *ongoing support funds*
- **UC matching support**
  - *establish new & existing faculty*
- **Other yearly participation support**
  - *improve & grow the program*

## ACT Program Topics

### *Interdisciplinary Courses in SIX Areas*

- Emissions and Air Quality
- Climate Change Co-Impacts
- Health Impacts of Air Pollution
- Sustainable Transportation
- Improving Policy to meet Clear Air and GHG Goals
- Integrating Renewables into the Grid



**UCR** | College of Engineering- Center for Environmental Research & Technology

**UCR** | Bourns College of Engineering



**UCRIVERSIDE** | UNIVERSITY OF CALIFORNIA  
School of Public Policy

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# ARB and CE-CERT 2015 Collaborations

## Testing, Evaluation, Policy & Modeling Research

Evaluation of the Performance and Air Pollutant Emissions of Vehicle Operating on Various Natural Gas Blends- Phase 2

Evaluation of the Impact of Emissions averaging and Flexibility Programs for all Tier 4 Final off-road diesel engines

Portable Emission Measurement System and Portable Activity Monitoring System (PEMS/PAMS) data collection from heavy-duty on-road test programs for use in EPA's air quality (AQ) inventory model and ARB (3 different studies)

Very Low PM Mass Measurement

Evaluation of the Feasibility, cost-effectiveness, and necessity of equipping small off road diesel engines with advanced PM and/or NOx aftertreatment

Development of Lifecycle Data for Hydrogen Fuel Production and Delivery

NG Infrastructure Study

Update and Documentation of the SAPRC Mechanism and Associated Software and Data Files

Air Quality Impacts of Low Vapor Pressure-Volatile Organic Compounds

# Developing Innovative Approaches Solar Energy, Smart Grid, and Transportation Research

## Sustainable Integrated Grid Initiative (SIGI): Research Priorities



- Provide real-world Smart Grid test-bed platform
- Demonstrate **Net Zero Building Energy Development and Management**
- Evaluate efficiency of energy storage
- Increased research collaboration with local utility, EV transportation, and Smart Grid technology providers
- Evaluate power quality issues
- Demonstrate the functionality of new technology and protocols
- Provide EV charging demand without increased grid loads

# Developing Innovative Approaches

## Solar Energy, Smart Grid, and Transportation Research



**CE-CERT  
0.5 MW**



**CE-CERT  
1 MWh**



**TES 10 MW**



**Palm Desert  
3.5 MW**



**UCR  
3 MW**



**EV**

**EV**

**EV**



**BCOE  
WCH  
1 MWh**

# The University of California's role in responding to the Volkswagen emissions violation

The recent discovery of emissions rigging in diesel-powered Volkswagen automobiles highlights both the importance of academic institutions in protecting the public and the need for new approaches to improving air quality.



CE-CERT is the only academic institution in California, and one of the leading institutions worldwide, equipped to provide this comprehensive progressive research effort with its **Portable Emissions Measurement Systems, Activity Monitoring, and Inspection/Maintenance Program**

- *Independent Testing & Evaluation Center*
- *New Portable Technology*
- *Exposure and Health Modeling*