Panel:
Ongoing Projects and Next Steps

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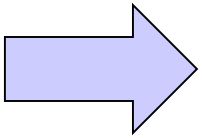
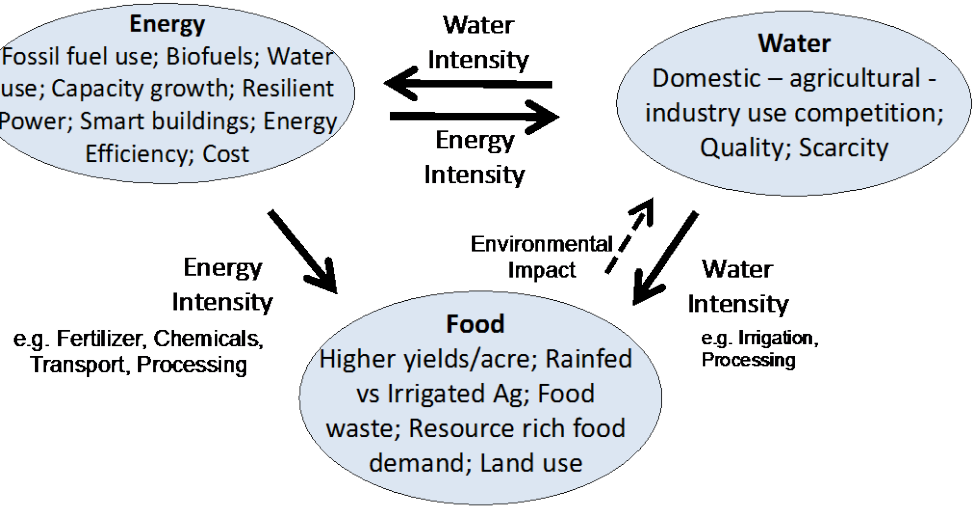
World Café: Energy-Water-Food Nexus Professional Society Collaboration

- AIChE / IChemE Collaboration
  - Solving the nexus challenge requires integrated systems approach – a chemical engineering competency
  - Requires collaboration between multiple disciplines and cultures
  - An engineering 'voice' is important to inform public policy
  - Past presidents of AIChE and IChemE initiated collaboration to address this challenge
  - Initial work focused on building awareness within chemical engineering community through technical meetings – invitations to academic, industry, government; multiple disciplines

Drivers

- Population Growth
- Urbanization
- Technology
- Climate Change
- Industry Development
- Agriculture Transformation
- Cultural Behavior





World Café Energy-Water-Food Nexus
Professional Society Meetings – Example Presentations

- A Process Methodology for Assessing Sustainability Applied to the Nexus, Richard C. Darton, University of Oxford
- Energy-Water-Food: Maui and the World, Carey W. King, University of Texas
- The Water-Energy-Food Nexus, Olivier Dubois, UN FAO
- Impact of Future Energy on Water-Food-Energy Nexus, Joe Powell, Shell Chief Scientist
- The P-graph Methodology as Tool for Studying Sustainability in the Energy-Water-Food Nexus, Heriberto Cabezas, U.S. EPA, University of Pannonia
- Sustainability considerations in the energy-water-food nexus, Adisa Azapagic, University of Manchester
- Agriculture: Feeding the World within Planetary Boundaries, Kate Scow, UC Davis
- Addressing challenges at the water-energy-food nexus, Desmond King, Chevron
- Science / Technology / Risk Communication: It's Harder Than You Think, Paul Fischbeck, CMU

Prior Work That Informs the Collaboration*

- Purpose of Nexus Studies
  - Discussion papers
  - Quality of life studies
  - Product studies

  } Inform public policy; Business strategy; Technology
  - Develop system modeling tools
- Aggregated Nexus Modeling
  - Data intensive computational models
  - Life cycle and supply chain analysis
  - Accounting for the future (business as usual; scenarios)

  } Important role for stakeholder involvement
- Case Studies
  - Regional development
  - Specific sectors (e.g. sustainable agriculture, food production, consumer goods)
  - Urban areas

* Based on Nexus Review by Dale Keairns, Richard Darton, Angel Irabien

World Café: Energy-Water-Food Nexus
Case Studies and Engaging the International Community

- Invitation for specific projects to serve as case studies: develop system modeling methodologies, identify needs and candidate solutions
- Extended collaboration to include the World Chemical Engineering Council to include broader international chemical engineering communities
- Next steps
  - Implement case studies
  - Lessons from case studies
  - Continue ‘awareness’ activities within chemical engineering community (U.S. and international)
  - Initiate dialogue with others (science & engineering, social science, NGOs, business, public policy)

Collaboration Case Study Project Invitation
Techno-Economic-Societal-Environmental System

Problem Definition

Identify Question
e.g. policy, drought constraint, product sustainability, Quality of Life

Study Objective
e.g. solutions, technology opportunity, metrics, analysis methodology, understanding

System Boundaries
Time and Geographical
e.g. State, Watershed, Food Supply Chain

Approach

System Analysis Methodology
e.g. integrated system model, LCA, scenarios

Data Sources
e.g. Population (urban/rural), Water availability and Use, Energy supply/demand, Ag production, Import/Export flows

Assumptions
e.g. demographics, energy-water-food system technology, ag yields, societal change, climate change, industry growth, policy

Case Study Illustration*
Objective: Electric Power Technology – Water Trade-offs

Parameters Affecting Electricity-Water Demand in the Watershed
- Population
- Urban / Rural
- Environmental
- Agriculture
- Industry
- Electric Power
- 'Policies'

Water

Water Supply

Water Available
- Unappropriated surface water
- Unappropriated groundwater
- Appropriated but unused
- Brackish groundwater
- Wastewater

Assumptions about electricity import / export

Assumptions about Ag, M&I, Electricity, Environment

Assumptions about fate of existing power plants

Assumptions about new technology, water requirements, CO_2 emissions, COE

Assumptions about 'drought'

Assumptions about water resource distribution

Time Horizon: Present to 2040

* DOE NETL Case Study