JISEA Joint Institute for Strategic Energy Analysis

Welcome to the 2019 JISEA Annual Meeting!

March 13, 2019

NREL/PR-6A50-73698

NREL NATIONAL RENEWABLE ENERGY LABORATORY · COLORADO SCHOOL OF MINES · Colorado State University · Massachusetts Institute of Technology · STANFORD UNIVERSITY · University of Colorado Boulder

Welcome and JISEA Highlights

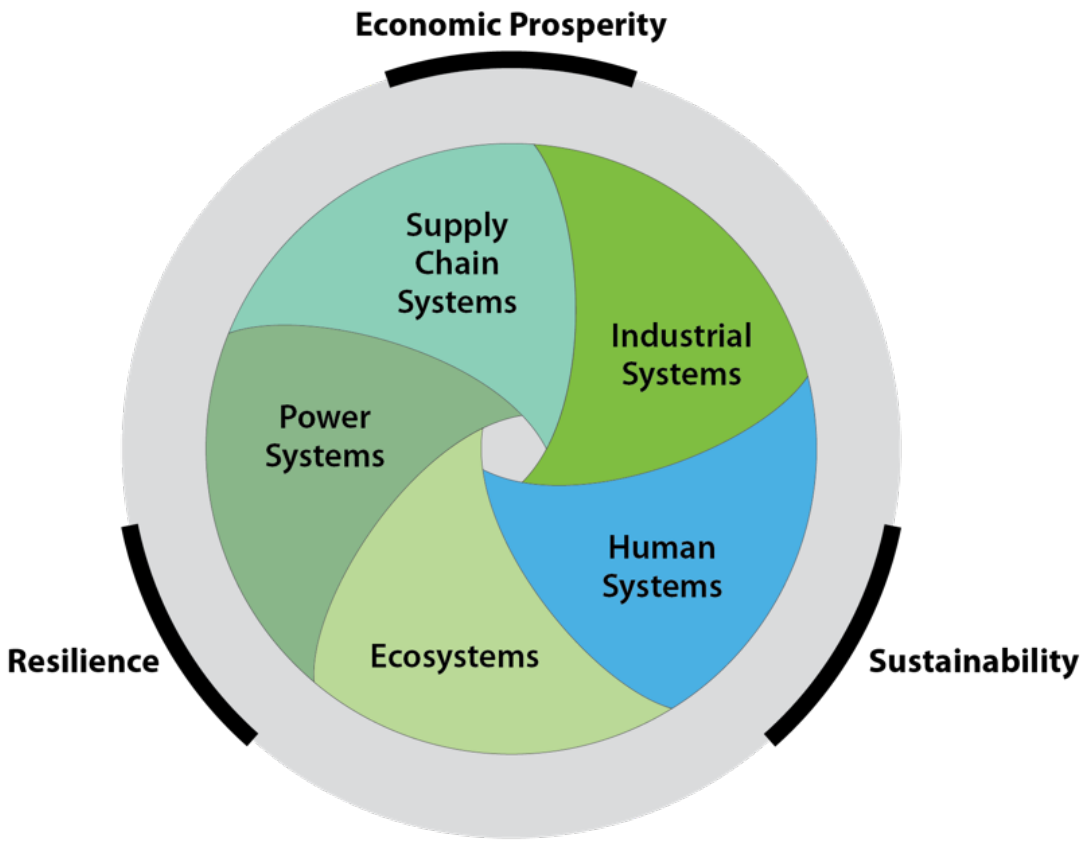
Jill Engel-Cox (JISEA)

JISEA
Joint Institute for
Strategic Energy Analysis

JISEA

Joint Institute for Strategic Energy Analysis

Connecting technologies, economic sectors, and continents to catalyze the transition to the 21st century energy economy.



Founding Members

NREL NATIONAL RENEWABLE ENERGY LABORATORY · COLORADO SCHOOL OF MINES · Colorado State University · MIT Massachusetts Institute of Technology · STANFORD UNIVERSITY · University of Colorado Boulder

JISEA Sponsors:
Ability to convene consortiums

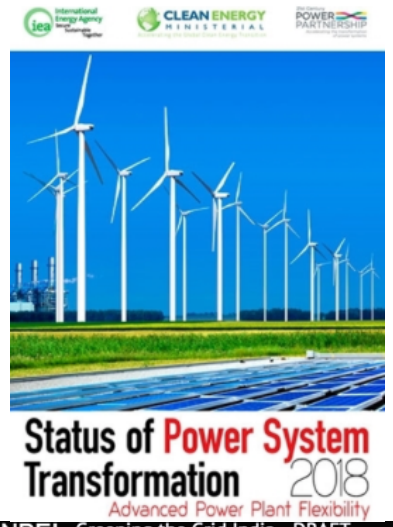
Research Affiliates

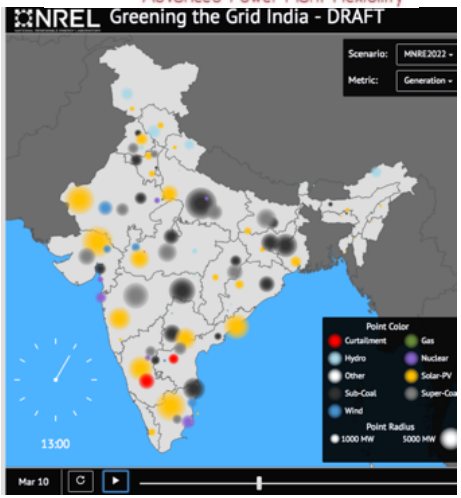
Rice University Baker Institute, Carnegie Mellon University, Energy Institute at University of Texas at Austin, Eskom, Houston Advanced Research Center, International Institute for Applied Systems Analysis, KTH Royal Institute of Technology, Masdar Institute of Science and Technology, Renewable and Appropriate Energy Laboratory at UC Berkeley

21st Century Power Partnership: A Clean Energy Ministerial Initiative

21st Century POWER PARTNERSHIP
Accelerating the transformation of power systems

- A Clean Energy Ministerial (CEM) initiative focused on helping countries achieve efficient, clean, affordable and reliable power system transformation.
- JISEA is the operating agent, organizing efforts of 9 countries to deliver training and technical assistance, such as:
  - "Thought-Leadership" studies that focus on generic **power system transformation** topics across the world
  - In-country technical assistance, often as part of a larger development assistance effort, focused on policy, regulatory, and technological progress; **grid integration studies often highlight this work**.
  - Information exchange, capacity building, fellowship programs, and other exercises to share **international best practices**





CLEAN ENERGY MINISTERIAL
Accelerating the Transition to Clean Energy Technologies

Brazil | China | India (co-lead) | Denmark | Finland | Mexico (co-lead) | South Africa | Spain | United States (co-lead, under review)

Nuclear Innovation: Clean Energy Future (NICE Future): A Clean Energy Ministerial Initiative

CLEAN ENERGY MINISTERIAL
Accelerating the Global Clean Energy Transition

Officially Launched at the CEM9 in May 2018 in Copenhagen, Denmark with global participation

Lead Participants

United States, Canada, Japan

Participants

Argentina, Poland, Romania, Russia, UAE, UK

NICE Future
Nuclear Innovation: Clean Energy Future

Vision: Nuclear power as an important energy option for clean, reliable, and resilient electricity and non-electric applications with innovative designs and applications.

Key Areas of Focus and Actions

- **Innovative applications**: Hybrids, industrial heat and power, desalination, hydrogen production, distributed generation
- **Economics**: Tech breakthroughs, case studies, country analysis
- **Stakeholder Engagement:** Webinars and workshops
- **Communication & Workforce**: Online info and youth events

JISEA is an **Operating Agent** for the Nuclear Innovation: Clean Energy Future
Also leading webinars & ask-an-expert for the **Carbon Capture Utilization & Storage Initiative**

Systems Analysis of Global Manufacturing Supply Chains for Innovation, Policy, and Market Applications

CEMAC
Clean Energy Manufacturing Analysis Center

Communication of Results

Manufacturing Clean Energy Blog

Manufacturing Clean Energy is the official blog of the Clean Energy Manufacturing Analysis Center (CEMAC). It features insights from CEMAC staff, partners, and guests. To contribute to *Manufacturing Clean Energy*, contact us.

Hydropower Turbine Market and Trade Values: A closer look at small hydro turbines in the U.S.

December 14, 2016

By Parthiv Kurup, NREL, and Megan Johnson, ORNL

Hydropower has been a long-term stable power generation source in the U.S. for decades, and research shows there is significant electricity generation potential from powering domestic, non-power hydro dams, which would utilize smaller turbines. This potential growth in the U.S. and international market demand for small hydropower turbines could offer greater opportunities for local and more energy-efficient manufacturing practices, both within the U.S. and for export.

Read more.

Advanced Scientific Analysis

The present and future silver cost component in crystalline silicon PV module manufacturing

Michael Redlinger[1], Michael Woodhouse[2] & Roderick G. Eggert[1]

[1]Division of Economics and Business, Colorado School of Mines (CSM), Golden, Colorado; [2]Strategic Energy Analysis Center, National Renewable Energy Laboratory (NREL), Golden, Colorado, USA

ABSTRACT

The purpose of this paper is to determine how increased c-Si PV module production might affect future silver demand and prices, as well as the impacts on total c-Si module manufacturing costs. A bottom-up estimation of the current and potential material intensity (tonnes of silver per GW) for silver in c-Si PV cell fabrication is presented. Partly because of concerns about material intensity, and also because of the changing economics of manufacturing, there is some interest in shifting away from the traditionally higher material intensity approach of screen printing with silver paste to alternative metallization techniques, such as electroplating, which uses substantially less silver. To evaluate how PV's changing demand for silver might affect future silver prices, and the impact in terms of manufacturing costs, some scenarios of silver's contribution to c-Si PV cell manufacturing costs are compiled on the basis of projected changes in demand and price as a result of changes in material intensity. The analysis indicates that an expansion of c-Si production from 55GW/year to 250GW/year results in a 0.05–0.74/W increase in manufacturing costs because of higher silver prices. As an illustration of this, the current estimates of the manufacturing costs for the two contrasting methods – silver screen printing and nickel–copper–silver electroplating – are presented.

Reports for Policy and R&D Decisionmakers

External Advisory Committee

Engagement from Business Community

Bloomberg Technology — Markets | Tech | Pursuits | Politics | Opinion | Businessweek

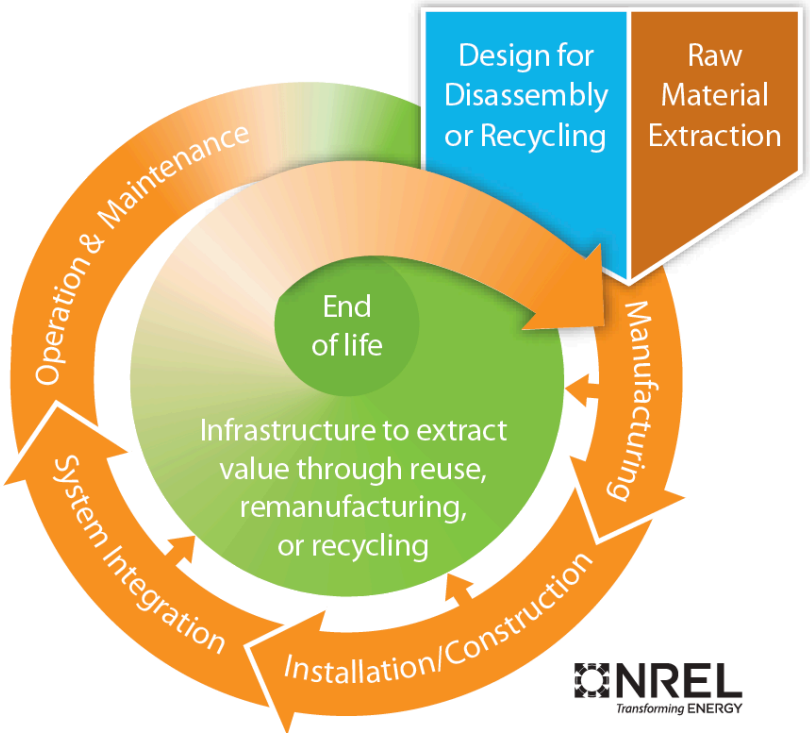
Tesla Flips the Switch on the Gigafactory

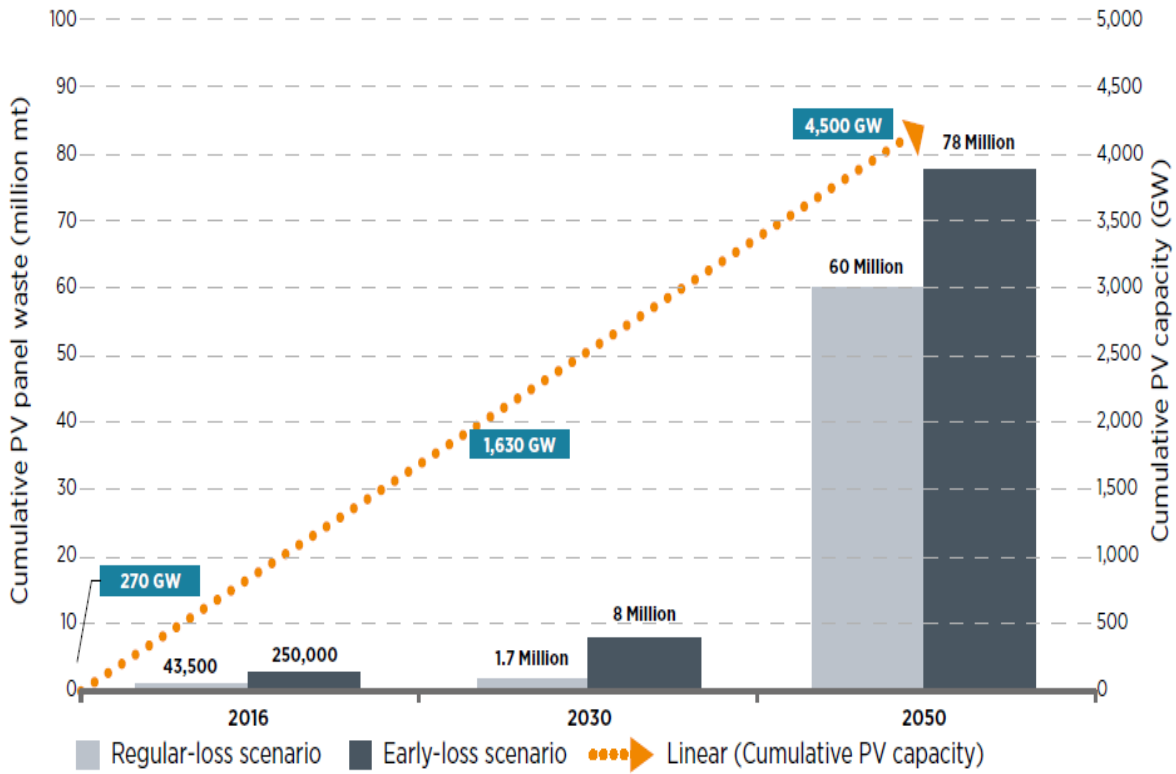
Batteries are the limiting factor for electric cars, but few automakers have made a similar commitment to produce them, choosing instead to let suppliers like LG Chem and Samsung shoulder the risk. [9] In 2015, 88 percent of the global lithium ion cell manufacturing took place in China, Japan, and South Korea, according to a report by the Clean Energy Manufacturing Analysis Center.

Website: www.manufacturingcleanenergy.org

Expanding Manufacturing Analysis to the Circular Economy

Value Chain for Clean Energy Technologies



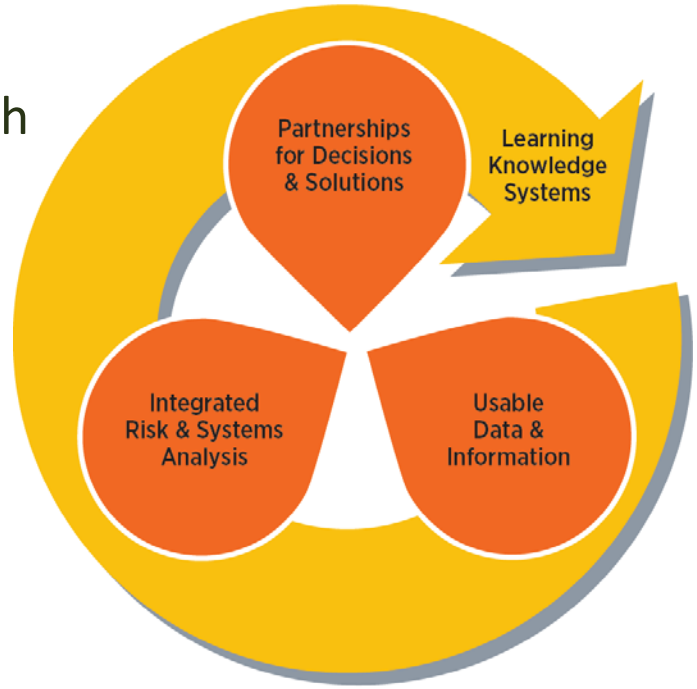


Source: IEA/IRENA 2016

Knowledge Systems for Sustainability

Collaborative of world leading mission-inspired research organisations.

KSS offers expertise in food, energy, and water systems, interactions across these systems, and linkages to social stability, economic development, and wider human-earth system processes.



KSS' work is arranged around three programs:

- *Nexus Outlook Scenarios (NOS)*
- *Food System Risk: Multiple Breadbasket Failure*
- *Evidence-based intervention support system (E-biss)*

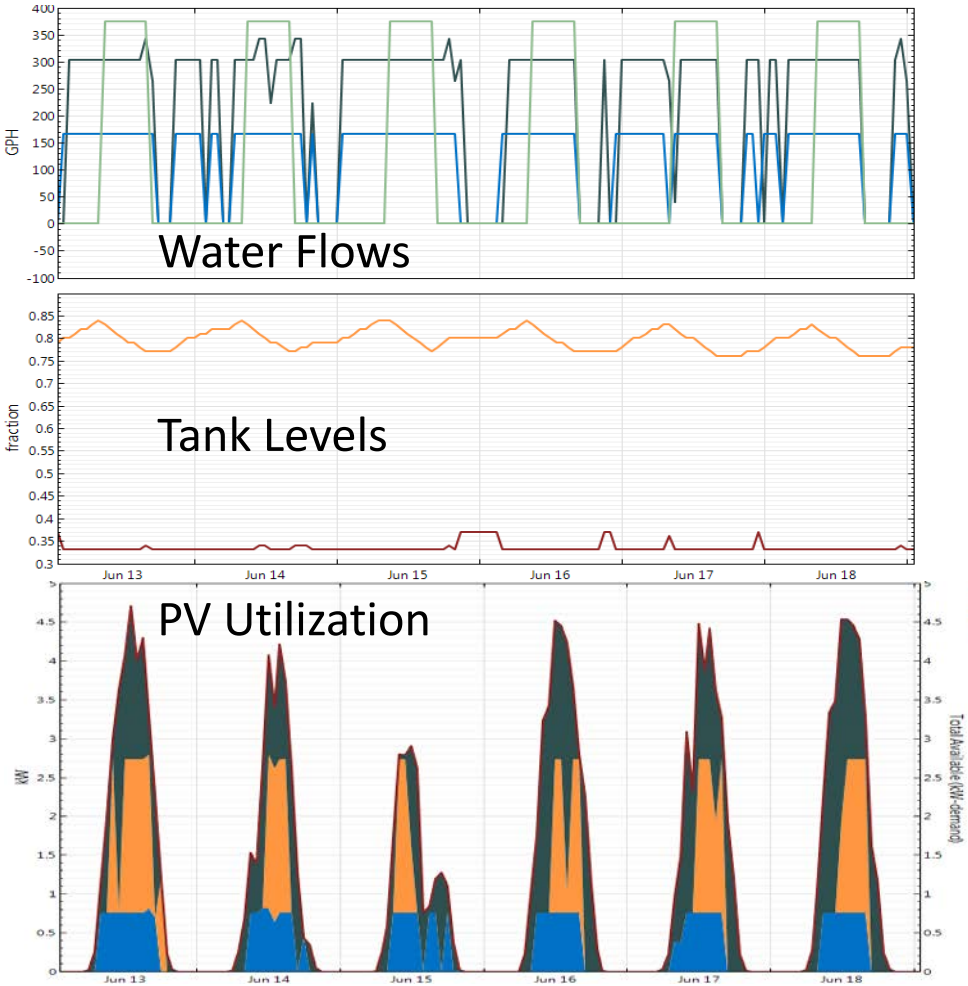
JISEA will be operator of KSS on behalf of Collaborative

Research into co-location of Wind/PV and Agriculture

Source: NREL Images

New Initiative seeking sponsors!

Powering Rural Transformation: Energy, Water, Food Systems



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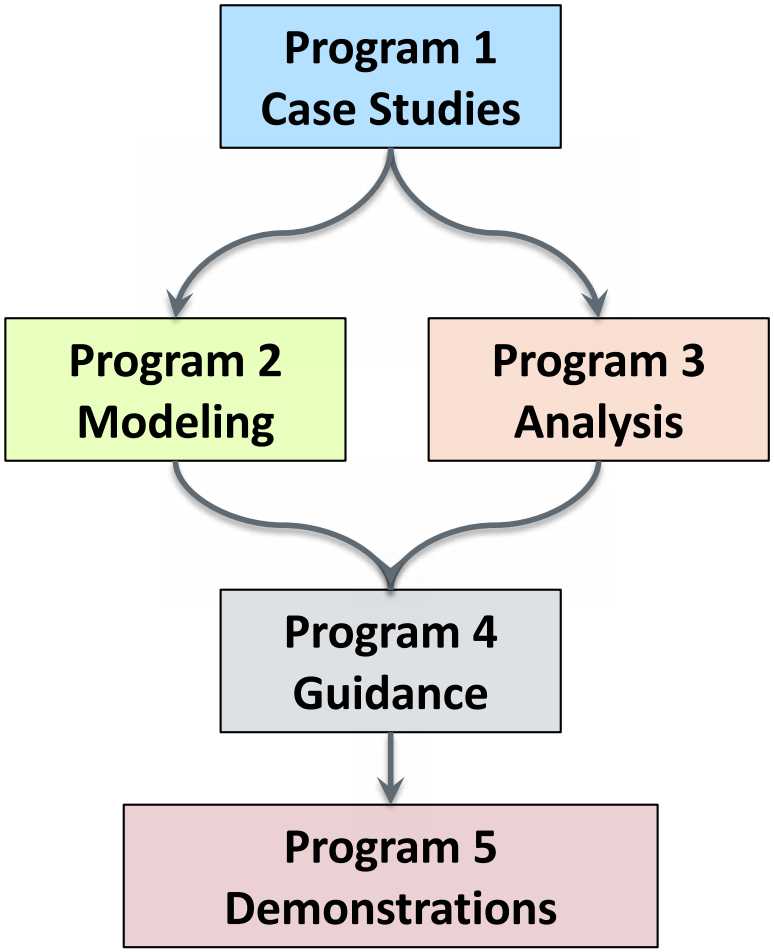


- Assess opportunities to transform energy-water-food (EWF) systems in rural communities to become more productive, equitable, and sustainable.
- Improve lives in rural communities by addressing EWF systems and economics

Electricity Generation: Electric-Natural Gas Interface Study

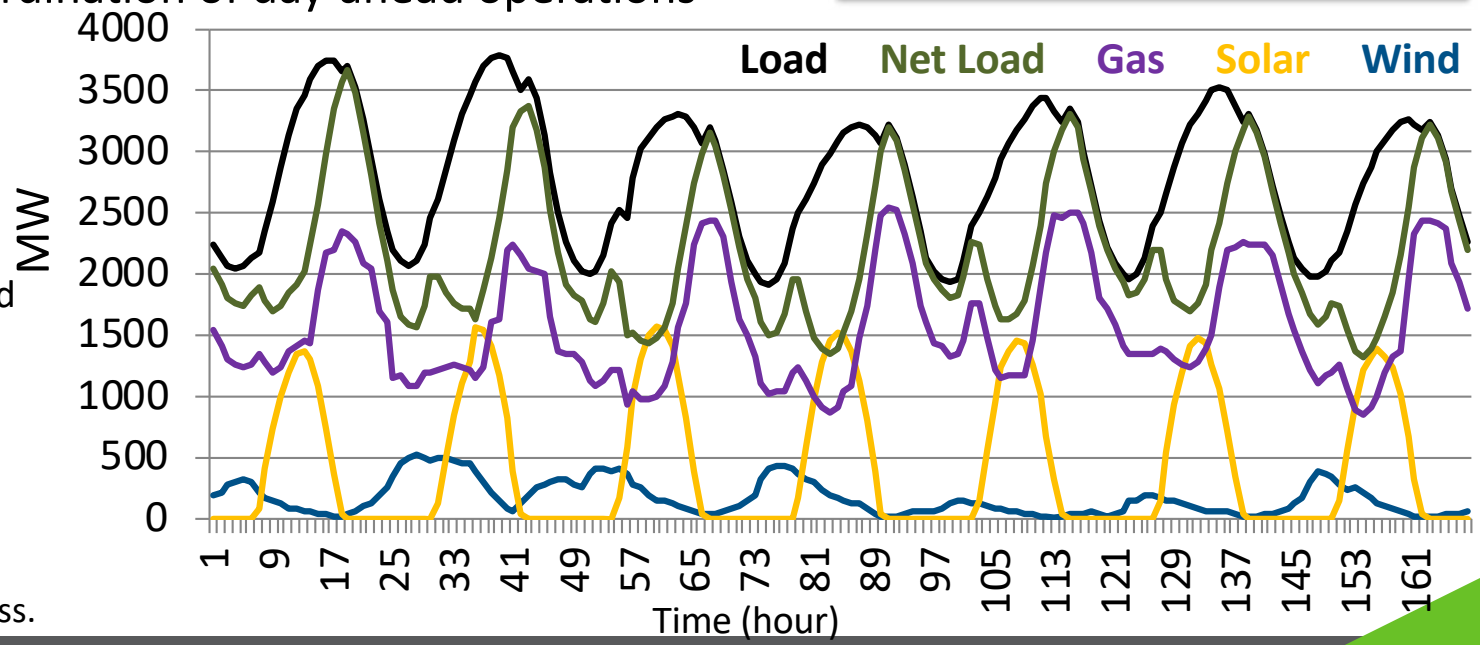
Electricity & **Gas** networks are **interconnected** energy infrastructures whose operation and reliability depend on one another. As the percent of gas and variable renewable power plants increase, the connection between these networks becomes increasingly important.

Goal of project is to:

Co-simulate power and natural gas network operations.

Define an interconnected power and natural gas test system

Determine value of coordination of day-ahead operations



Funded through JISEA sponsorship by:

- American Electric Power
- Environmental Defense Fund
- Hewlett Foundation
- Kinder Morgan
- American Gas Association
- Midcontinent Independent System Operator

Source: JISEA project in progress.

New Initiative seeking sponsors!

Clean Power Technologies for Oil & Gas Industry Operations

Value Proposition:

Demonstrate highly reliable, affordable, clean power for oil & gas operations.

Program Results:

Operational, financial, and environmental improvements within oil & gas operations

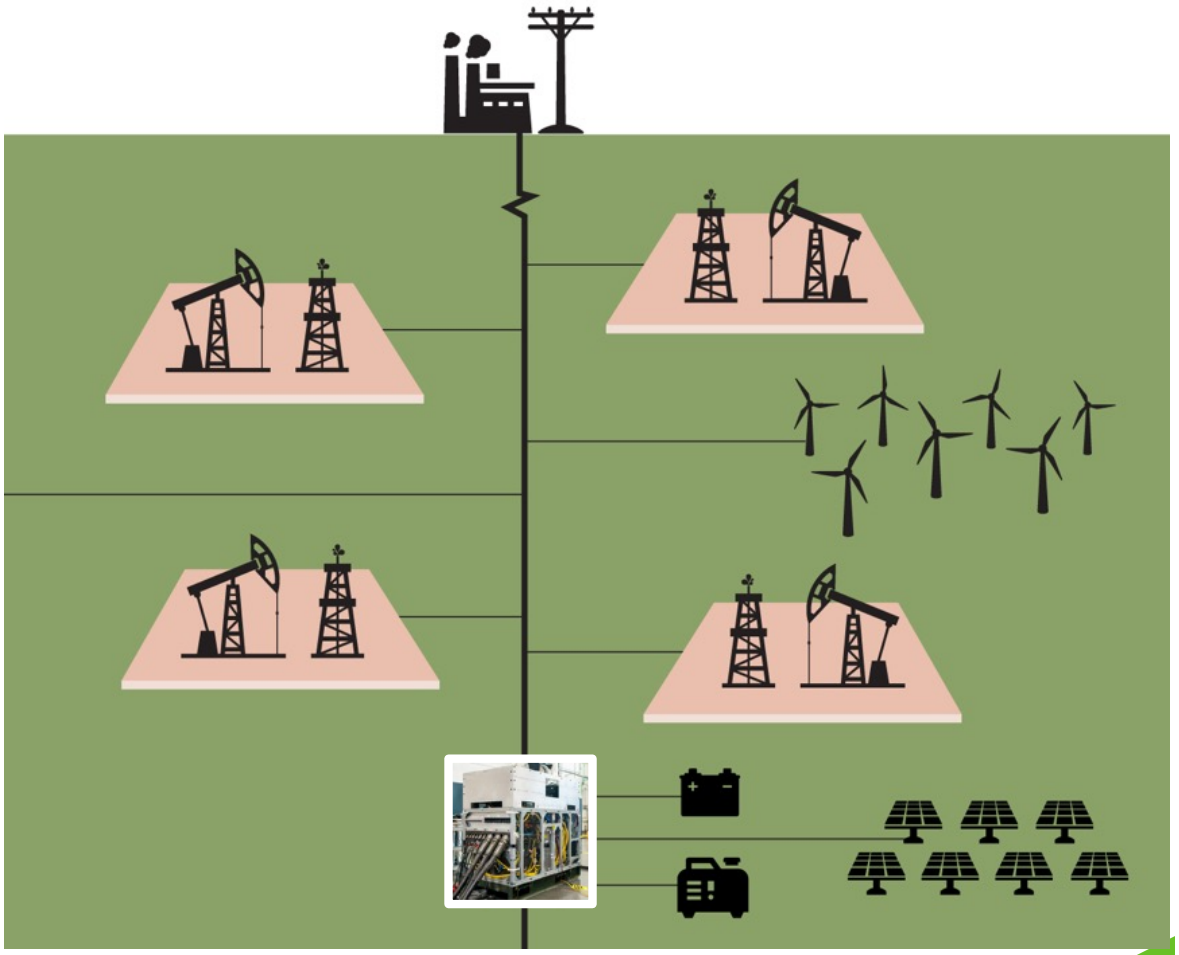
Governance:

Consortium of industry partners to leverage resources for benefit of those involved, supported/managed by JISEA

Structure of Program:

- Phase I: Program design, analysis, and development
- Phase II: Multi-year program with 3-12 month technology pilot tests
- Periodic reporting and access to new technology

***Example**: Electrification of all equipment at wellpad connected via microgrid*



Questions?

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Thank you

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