Abstract

This grant funds a collaborative educational project of the Center for Engineering, Ethics, and Society (CEES) at the National Academy of Engineering (NAE) and the Consortium for Science, Policy and Outcomes (CSPO) at Arizona State University (ASU).

The project:

- takes a problem-oriented, real-world approach to ethics education
- defines energy ethics as requiring consideration of technical and social feasibility as well as ethical desirability of energy choices
- addresses issues of individual and collective responsibility and the ethical merits of energy choices by asking whether they are ethically permissible, recommended, required, or should be forbidden.

It developed new research and educational activities on energy ethics that involved graduate students in interdisciplinary research programs. Activities included: seminars, workshops, a week-long institute, a video contest, and outreach and engagement efforts. Evaluation results to date indicate the project has been successful in engaging students in various formats; additionally it illuminated some fundamental ideas about the interrelationships among energy, ethics, and society.

Objectives

This project is designed to research and provide education regarding issues of ethics and justice in the context of an emerging energy transition from fossil fuels to other sources of energy. Specifically, the project aims to:
1. Developing a strong intellectual basis for understanding the ethical challenges posed by large-scale transitions in energy systems, as well as criteria and approaches for evaluating the ethical desirability of future energy options;
2. Providing a variety of robust training opportunities for graduate students to learn about energy ethics and how it applies to energy research and development; and
3. Disseminating the project’s ideas and materials broadly for use in science and engineering education.

**Energy: A Complex Network of Socio-Engineered Systems**

Energy production and consumption occur within a complex network of systems that integrate engineered technologies with social values, behaviors, relationships, and institutions, on the one hand, and natural resources and ecological systems, on the other. This intertwining of nature, society, and technology takes place on scales that range from the local to the global, and from the individual to the organizational. For example:

- The **layout of a city** and its transportation systems structures the use of energy by people as they commute to work and other activities.
- The surge of interest **in rooftop and medium-scale solar** development is challenging utilities to maintain the stability of US electricity grids.
- Disasters, like the **Deepwater Horizon Oil Spill** in the Gulf of Mexico, have demonstrated the interconnection of people, local economies, the environment, and energy technology, and they have also emphasized the dependence that certain regions have on specific forms of energy.
- The recent development in **Hydraulic Fracturing** and concerns over its impact on water supplies has brought into focus the political economies of energy producing countries, and the intertwining of social values on the environment, health, and energy.
Ethics and Justice in Energy

Ethical perspectives employed in the project range from traditional ethics (which considers whether actions are required, recommended, permitted, or forbidden) to issues of individual (microethical) and collective (macroethical) responsibility. The focus throughout the project is on responsibilities rather than outcomes. The ethical issues include:

- **Distributive justice**: allocation of benefits and costs, risks and rewards, wealth and power, today, as a dynamic function of time during an energy transition, and once a new, stable energy system is achieved.

- **Procedural justice**: voices and roles of diverse individuals, communities, industries, leaders, etc., in making decisions that shape an energy transition.

- **Social and environmental justice**: “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement” of an energy transition. (quoted section from EPA definition of environmental justice)

- **Professional and organizational ethics**: the organizational priorities that shape resource allocations (e.g., in research programs and technology investments), including considerations of individual and collective responsibility and ethical permissibility.

Innovative Ethics Education

This project developed a suite of innovative developments in ethical analysis and ethics education:

- **Problem-centered, real-world ethics education**: Building a problem-centered approach means developing integrated approaches to ethical analysis and teaching while also responding to the real-world needs of practitioners facing concrete challenges in the design and management of an energy transition. This approach requires identification, assessment, and integration of diverse ethical traditions, responsiveness to real-world situations, and educational strategies in interdisciplinary settings.
• **Complex socio-engineered systems ethics**: As described above, energy production and consumption occur within complex socio-engineered systems. By focusing on this complex system and the ethical challenges it poses, a full understanding of energy ethics can be achieved.

• **Infrastructure ethics**: Energy, like many other forms of infrastructure, tends to structure human lives and livelihoods in ways that are hidden or occluded and that lie deep within what Langdon Winner calls the “technological constitution” of contemporary societies. Exploring these hidden impacts can reveal profound ethical challenges.

• **The ethics of behavior modification**: As the importance of energy has risen on the public agenda in recent years, it has been accompanied by a growing push for public policy strategies to alter human behavior on society-wide scales. Exploring such practices enables a more full understanding of energy ethics.

**Results**

**Year One** – Research into energy ethics and the creation of a conceptual framework for educational initiatives.

• Faculty and graduate student seminar on energy ethics, society, and policy. It discussed how humanistic and social science perspectives can be fruitfully brought to bear on discussions of energy transitions. (ASU)

• Set of energy ethics case studies (ASU)

• Collaboration in two outreach and engagement events in order to incorporate ethical and social considerations into public and policy deliberations about energy futures: Arizona Town Hall on “Arizona’s Energy Future,” and 2012 EMERGE conference on “Humanist Narratives for Energy Scenario Planning.” (ASU)

• **Planning workshop** that explored the ethical, institutional, and educational dimensions concerning energy ethics. (NAE)

• Began developing an **Energy Ethics topics page** on the Online Ethics Center website
**Year Two** – Piloting and evaluating educational programs.

- One-day **workshop** on “Energy Transitions in Society: Historical Perspectives and Contemporary Challenges,” which considered the human and social dimensions of energy transitions through historical and contemporary research. (ASU)
- Two-day series of **conversations** with Professor Paul Thompson from Michigan State University on the topic of social sustainability of energy transitions and the relationship between social sustainability and energy justice. (ASU)
- Two **pilot educational workshops** for graduate students, on biofuels and on solar energy. (ASU)
- Sponsored an energy ethics **video contest** for students asking them to identify an ethical issue, explore the different views on it, and propose ways to address it. (NAE)

![Image](image.png)

**How much do you believe you (or your advisees) learned about ethics through this video contest?**

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<th>Students</th>
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**Very little**  | **Quite a lot**

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**Year Three** – National educational program and outreach and engagement.

- Week-long **National Institute for Energy, Ethics, and Society** was held for ten graduate students doing energy-related research. It allowed students to examine the ethical and societal issues associated with energy choices and prepared them for leadership in the fields of energy ethics and energy ethics education. (ASU, NAE)
- **Capstone workshop** on “Energy Ethics in Graduate Education and Public Policy: Enhancing the Conversation” engaged educators, policymakers, and representatives from professional societies in examining the social and ethical implications of energy systems, the benefits and challenges of including energy ethics in graduate
education, and the role of public policy and professional society leadership in encouraging graduate education on energy ethics. (NAE, ASU)

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Further details can be found on the project webpage:

http://www.nae.edu/Projects/CEES/57196/EnergyEthics.aspx