ENERGY

The Case for an Academic Curriculum

In Richard Andrews' seminal work on the history of U.S. environmental policy, he states that "no sector of human activity impacts the environment more pervasively than the production and use of energy."[1] I would venture a step further. I believe no other sector of human activity impacts *humans and society*—not just the environment—more pervasively than the topic of energy. The subject of energy is seldom examined as the dependent variable and in a comprehensive, multidisciplinary academic curriculum. When considering our past and current predicament, and projections for the future, the academic pursuit of an energy curriculum must be at the forefront of instruction, research, and writing. Yet few academic institutions provide an educational curriculum specific to energy. Rather, energy studies are typically subsumed under other curriculums, such as environmental science and policy. This is a misplaced opportunity.

By way of example, consider the U.N Sustainability Development Goals (SDGs). Adopted by all member states in 2015, the SDGs are billed as a "shared blueprint for peace and prosperity for people and the planet, now and into the future."[2] It identifies 17 goals, of which energy is linked directly or indirectly to at least 10 goals. You would be hard pressed to find another topic that intersects and impacts our lives more than energy. It simply touches on almost every facet of our lives.

> **"Energy is a common thread weaving through the fabric of critical American interests and global challenges. U.S. strategic energy policy must take into account the three central concerns…—economic security, environmental protection, and poverty alleviation—and set aggressive goals for overcoming them."** Wirth, Timothy; Gray, C. B., and Podesta, J. D. "The Future of Energy Policy." *Foreign Affairs*, vol. 82, issue 4, July/August 2003. [bold mine]

When U.S. government officials engage with other countries, the subject of energy is always an agenda item. Topics include the need for greater access to affordable energy, or the need to find export markets for national resources. Energy impacts every country's national economy, whether as exporter or importer, and in turn affects almost every facet of our lives: employment, national and human security, health and environment, food and water, agriculture, infrastructure, technology research and development, and climate change. Climate change, by far, is at the zeitgeist of academic attention, but no pathway towards a safer planet exists without addressing the single greatest impact on our climate—

[1] Andrews, Richard N.L. *Managing the Environment, Managing Ourselves: A History of American Environmental Policy*. Yale University Press, 2020.

[2] "Sustainable Development Goals," United Nations Department of Economic and Social Affairs, 2015, https://sdgs.un.org/goals. MDG 1: energy poverty is equal access to energy resources; MDG 2: food security and sustainable agriculture relies on energy systems; MDG 5: gender equality is linked with equal access to safe and healthy energy resources; MDG 6: sustainable water management implicates energy and water nexus; MDG 7: access to affordable, reliable, sustainable energy; MDG 8: sustainable economic growth is linked with robust energy systems; MDG 9: resilient infrastructure is linked with safe and resilient energy systems; MDG 10: reduce inequality among nations is linked with access to affordable energy; MDG 12: sustainable consumption; MDG 13: climate change.

the burning or combustion of coal, natural gas, and oil for electricity, heat combustion, and transportation.

But the dynamics of energy also work against itself as an academic pursuit because it is so vast. Consider the various sources of energy: fossil fuels (coal, oil, and natural gas), nuclear power, renewables (hydropower, wind, solar, geothermal), and alternative fuels. These are not simply four categories of energy sources. Each energy source represents multiple sub-components (e.g., conventional and unconventional oil and gas; rooftop solar and utility-scale solar). Each expands or contracts economically as energy costs and markets change based on new discoveries and technologies. We are in an energy transformation now, shifting from once dominant fossil fuels to renewables, energy efficiencies, and alternative sources. Today's "energy revolution" has the potential to re-shape our economy, businesses, environment, health, and security—our lives. This is no small endeavor to digest as an academic curriculum. Indeed, it is big. Perhaps it is precisely because of the vastness of energy that helps explain that, while we have a federal Department of Energy, our national energy policy is not developed there alone. In other words, the academy is not alone in treating energy as a disaggregated, highly fragmented area of public policy.

Energy is best understood in a continuum from creation to disposal. First, energy begins with its source development (e.g., mining coal, exploring for oil and gas, fission of atoms, capturing water, sun, and wind). Second, energy sources are processed (e.g., refining oil, pulverizing coal). Third, the commodity is transported (e.g., pipelines, electrical lines, waterways). Fourth, the resource is combusted or used (e.g., power plants, solar and wind farms). And finally, energy's detritus is disposed of (e.g., coal ash, radioactive waste). Along this spectrum, energy impacts the environment and human health (e.g., climate change, air and water pollution, water consumption, occupational hazards, radiation leaks, species endangerment, social justice, and land use changes). Consequently, energy is greater than the study of any one academic discipline, such as policy or engineering, but is more appropriately viewed through a societal lens, hence the need for an academic discipline on "Energy and Society."

The academic potential in an Energy and Society curriculum is multi-disciplinary, multi-faceted, and fecund with academic potential. Energy touches upon public policy, public administration, national and international security, domestic and international regulations/laws/agreements, national and international politics, international commerce/development/finance, infrastructure, economics, technology research/development/deployment, environmental science and policy, transportation, and societal and cultural impacts.

This brings us back to the lack of an academic curriculum focused on energy. Why has GMU and other universities not adopted a curriculum as dynamic, impactful, and vital as Energy and Society? The answers can vary, but I will identify a few here and offer recommendations to address each.

- Understanding the Role of Energy: First, and foremost, we need to re-calibrate what we mean by "energy." Historically, we have viewed energy policy in terms of powering and protecting our economy and livelihood. Energy is necessary to manufacture things and "keep the lights on." In this view, energy recedes into the background. But there is an explicit cost to energy, which is measured in human health and environmental consequences, national and international security costs, infrastructure costs, civil strife, economic poverty, social injustices, and migration patterns. Another side to energy is the psychological and cultural vulnerability every country

faces during times of high energy prices or disruptions to energy supplies.[3] Since energy is a global commodity, a disruption in one part of the world will affect prices, economics, and well-being in almost every corner of the world (e.g., 1973 Arab oil embargo; 1979 Iranian oil crisis). The impact on prices impacts global well-being: economics, health, security, environment, infrastructure, technology, etc.

  - Recommendation: We must modify our mindset about energy to focus on the impacts to human lives and society. Only when we consider energy's pervasive influence can we begin to appreciate its value as an academic curriculum.

- Faculty Expertise: The study of energy encompasses several disciplines, but typically energy is housed in the environmental science and policy space where only a few energy courses are offered (e.g., energy policy). Consequently, schools lack "champions" to ensure sustainability of an energy curriculum.

  - Recommendation: We must hire faculty with expertise to teach, research, and write on the energy topics that touch upon human lives and society.

- Faculty Leadership: Academic disciplines are built and sustained by its current occupants, and the current occupants guard their spaces carefully. Academics compete for student's attention and matriculation. Therefore, new entries into an academic field require leadership to make room for this vital subject.

  - Recommendation: Faculty leaders must recognize the importance of Energy and Society as an academic curriculum by building space within universities to house this important subject.

- Student Interest: One might question student interest in an energy curriculum. The familiar refrain goes something like this: if students expressed an interest, then universities would build programs to support this interest. This raises the paradox of the "chicken or the egg." However, this is a false premise. There is ample evidence of employer's desire to hire for energy expertise. According to the 2020 U.S. Energy and Employment report,[4] the traditional energy and energy efficiency sectors employed 6.8 million people at the end of 2019 (or almost 5 percent of the U.S. workforce). By the end of 2019, over 120,300 new energy jobs in total were added, which outperformed the rest of the economy in job creation. In fact, employment in the energy sector grew 12 percent from 2015 to 2019, doubling the general economy's 6 percent growth rate. A recent report finds that the "green" sector is experiencing a shortage of workers with the skills

[3] The massive wildfires in California (partially fueled by mismanaged transmission lines) and sustained electricity blackouts in Texas created widespread disruption and are harbingers of how energy issues will continue to plague the U.S., as well as nations around the world.

[4] Jordan, P., Fazeli, S., Pablo, J., and Ellis, D. "Wages, Benefits, and Change: A Supplemental Report to the Annual U.S. Energy and Employment Report." National Association of State Energy Officials, Energy Futures Initiative, BW Research Partnership, 2021, https://www.usenergyjobs.org/

needed to support their ambitious growth plans.[5] Therefore, students are interested because they are applying and securing these jobs.

- Student Growth: U.S. academic institutions face an economic need to attract more students. According to a GMU graduate school report, the school's future fiscal growth will depend on securing students in three areas: out-of-state, full-time, and international.[6] A curriculum on energy has potential to attract students in all three areas. First, no other U.S. graduate school program offers an advanced graduate degree specific to Energy and Society. As a unique concentration, GMU has an opportunity to market and attract out-of-state students. Second, students are attracted to the energy field because of its growth potential. This will likely attract students interested in completing their degrees on a full-time basis or "shifting" and completing their degrees in a timely fashion. Finally, the energy sector is inherently an international marketplace where goods (like oil and gas) are traded globally; technologies (like solar and wind) are developed or assembled in foreign markets; and services (like exploration and installations) drive job growth. These factors apply internationally and will likely draw foreign students to this program.

The subject of energy is broad, complex, and all-encompassing. It touches our lives in so many ways that the pursuit of an academic curriculum can be intimidating. It will be a challenge to create, develop, and sustain an Energy and Society curriculum. However, no other organization in our country has the responsibility and ability to address such challenging and intimidating subjects more so than the U.S. university system.

Paul Bubbosh
Adjunct Professor, GMU

[5] Lombrano, L.M., Mathis, W., Lima, J. "Renewable Energy Boom Unleashes a War Over Talent for Green Jobs." *Bloomberg Green,* 8 June 2021, https://www.bloomberg.com/news/articles/2021-06-08/renewable-energy-boom-unleashes-a-war-over-talent-for-green-jobs (accessible here).
[6] Gest, J., Cheon, H. "Schar 2030 Masters Program Report." George Mason University, Schar School of Policy and Government. Received by Paul Bubbosh, 7 Aug 2020.