

Energy Symposium

Energy, Economic Prosperity and the Environment

Mutually Compatible Priorities for Our Nation

Executive Summary

March 31, 2015

The University of Oklahoma Price College of Business Energy Institute hosted its third annual Energy Symposium on March 26, 2015, with two panels of academic and industry experts on hand to discuss “Energy, Economic Prosperity and the Environment – Mutually Compatible Priorities for our Nation.”

Panelists agreed that the energy industry is doing a good job of curbing emissions in the United States, but it will take global cooperation to forestall dangerous climate changes.

Daniel Pullin, dean and Fred E. Brown chair of the Michael F. Price College of Business, said there is an increased focus on economics in the energy industry because there is a better understanding than ever before of where the resources are located. “Now it’s about efficiency, particularly in this softening pricing environment,” he said. “It’s about cost structure. It’s about supply chain. It’s about management. It’s about innovative financing. That’s about business. I would say today this industry is more about business than it’s ever been before.” Pullin said OU offers a variety of educational programs to bolster the energy industry in all aspects of its business.

Bruce Stover, chairman of the Energy Institute’s advisory board, said environmental concerns must be addressed as part of the nation’s ongoing energy renaissance however the debate over such issues has been especially polarizing. He said responsible energy development should include a balanced approach that addresses climate change and conservation of potable water. This year’s Energy Symposium was designed to explore the specifics of how that can be accomplished, and he elaborated by saying, “We want

to present a constructive, responsible path forward that reflects a more balanced approach to the whole issue. Too often it's a polarizing discussion, polarizing debate. The panel showed consensus when Stover said it is time to exercise good judgement on the environment and energy development, with policy decisions based on common sense, good science, and proper consideration of global demographics and basic business principles. Stover concluded his remarks by saying that it is time for telling the story in a more balanced and constructive tone. By doing it right, the US can set a standard of performance for the rest of the world.

Randy Brogdon, a partner with Troutman Sanders LLP and another member of the Energy Institute's advisory board, served as moderator for the panel discussions.

The panel of academic experts included:

- **Ron Bolen** – *Assistant Professor of Entrepreneurship at the Price College of Business and Executive Director of Sooner Launch Pad*
- **Harold Brooks** – *Senior Scientist at the National Severe Storms Laboratory's forecast Research and Development Division*
- **Hank Jenkins-Smith** – *Political Science Professor and Associate Director of the Center for Applied Social Research*
- **Susan Postawko** – *Associate Professor of Meteorology for the School of Meteorology*
- **Jim Sluss** – *Senior Associate Dean and Pitman Professor for the College of Engineering*

Brogdon said there was vigorous debate about the issues discussed at the symposium in the days leading up to the event, which was designed to improve interaction and communication between people in various fields so policymakers can make good decisions. He began the discussion by asking panelists to identify the aspect of climate science that is most misunderstood by the public and the media.

Bolen said nomenclature issues have polarized the debate on climate science, policy and capital formation, noting the U.S. Energy Information Administration's 2013 move to reclassify nuclear power as a renewable resource altered the stack of power sources in the United States. That simple change

propelled renewables past natural gas, while creeping up on coal, as a source of power generation. He said there are three primary mechanisms, on the state and federal level, to encourage investment in alternative energy: investment tax credit, production tax credit and the renewable portfolio standard. “All three of those are effectuated by the name which we might apply to a power generation technology. For example, in the renewable portfolio standard, there’s a bit of gamesmanship. Each state will determine the percentage of power generation to come from alternative energy inside its geographical boundaries. Once that percentage is set, it is up to the marketplace to comply.” He said Maine, one of the first states to adopt such a standard, required 41 percent of its energy to come from alternative sources. It defined hydroelectricity, which already generated 42 percent of the state’s electricity, as an alternative source, so Maine did not have to do anything to meet its standard. “With the mere stroke of a pen, we have polarized both the political system as well as the financing system by determining we’re going to put this in this bucket,” he said. Bolen contends such political maneuvering has affected the flow of capital for energy projects.

Brooks said the impact of carbon dioxide on warming the atmosphere is well documented, but recently the world has experienced dramatic changes in weather. He said there is more variability in severe weather, although the average number of events has stayed the same over the past 50 years. “We actually have one-third fewer days with damaging tornados than we used to have in 1970, but the number of days with a lot of tornados, say more than 30 F1 or greater tornados, has gone up by a factor of five,” Brooks said. He also said Oklahoma City now is more prone to heavy rain, leading to more issues with water, including estimates that droughts could become more common. Brooks said rising sea levels also could threaten fresh water supplies in some coastal areas. He said he hopes his work provides information for people to make intelligent policy decisions.

Jenkins-Smith shared some data on carbon emissions, which are increasing at the highest rate in developing countries like China and India. He said emissions in the United States and Europe are level, if not declining slightly, leading to a lot of discussion about the “decoupling” of economic growth from energy consumption and carbon emissions. Jenkins-Smith said studies indicate about three-quarters of Americans believe human activity is causing global warming. “These are stable trends and they’re part of the political reality,” he said. “In the United States, this comes pretty close to a consensus.”

Jenkins-Smith said most people still don't understand the limitations and costs of renewable energy. "Understanding the grid, the transfer of energy, the storage of energy, those factors are going to play a huge role as we figure out what is feasible for the nation as a whole on renewables," he said.

Postawko said the media often presents a mixed view on climate science, although about 96 percent of scientists agree that climate change is occurring as a result of human activities. She said the planet's climate has changed throughout history, but it has never been warmer than it is right now as carbon emissions have increased over the past 150 years by as much as they typically do between glacial and interglacial times, which can span as much as 10,000 years. "It is an issue that we need to deal with," Postawko said, as the world's population continues to grow and add infrastructure. "We need to think about adaptation regardless of what the mix of energy usage is."

Sluss said technology can improve energy efficiency and mitigate some environmental concerns. He said smart grid technologies can help integrate variable generation sources into the power grid, while improved battery technology could provide much-needed storage capacity for renewable resources, which often are available intermittently or in certain regions. Sluss said hybrid technology and biofuels also can improve efficiency in the transportation sector, although he acknowledged there are still questions about whether biofuels are worth the cost in energy and water expended to produce them.

In response to another question from Brogdon, the panelists agreed that the science on climate change is largely settled. "We're talking about a fundamental physical process: if you increase greenhouse gases in the atmosphere, the planet will warm," Postawko said. "All we have to do is look at any of the other planets in our solar system. That part of the science is completely settled." She said there are still some questions because Earth has such a complex climate system that it is hard to know how quickly changes will take place. Brooks said some climate questions are more complicated when dealing with weather, as there are still some disagreements about what available data means. Jenkins-Smith said there are different levels of consensus in science, but climate science is different because its findings are applied to human interests and intense political and economic debate. "Science is an extremely resilient and robust process," he said. "It's the best method we have for accumulating an understanding of the world, but it's not resilient to intense political debate. It's not a binary system

where there's truth and falsehood. It moves forward in small steps." Jenkins-Smith said scientific debate can be poisoned when it is used to attach blame, rather than cooperating to find answers. Postawko said the science of climate change is understood, but it still needs to be discussed as a social, political and economic issue. Demographics indicate that poorer countries are growing at a rapid rate, which makes it hard to estimate carbon emissions, Jenkins-Smith said. Some of those countries are moving away from burning wood or dung for heat and energy, so switching to fossil fuels could actually reduce their emissions. "There may be really important uses for fossil fuels as that transition takes place," he said. Bolen said countries cannot increase their gross domestic product without power, which leads to difficult debates about how these counties can develop responsibly, with an eye toward the impact on climate change.

Communication is key in addressing science issues, Postawko said. She said people eventually realized concerns about ozone depletion in the 1980s were a global issue, so they were able to develop a worldwide solution. "It takes global discussions," Postawko said. She said people are often resistant to change, but they must work together to discuss important issues. "We can't just be polarized and say this side's right, this side's wrong," she said. Bolen said it will be difficult to settle the climate debate because any changes will result in winners and losers. Jenkins-Smith said it is important to separate science from the political debate. He said some polarization on the issue can be defused if there is a broad array of potential solutions.

The second panel featured industry professionals:

- **Mark Bolling** – *President of V+ Development Solutions, General Counsel and Secretary for Southwestern Energy*
- **Kristi DesJarlais** – *Senior Vice President and General Manager for Saxum*
- **Rayola Dougher** – *Senior Economic Advisor for American Petroleum Institute*
- **Andy Weissman** – *Founder of EBW Analytics Group*

Brogdon kicked off the discussion by asking the panelists whether they thought the industry's continued growth was inherently incompatible with environmental protection.

Bolling answered by giving the industry a mid-term report card, with high grades for geosciences and economics, but lower scores for supply chain management and social studies. He said the industry has allowed environmental groups to wage a misinformation campaign against hydraulic fracturing, with the highly charged debate missing the mark on key issues. Bolling said industry officials erred by failing to acknowledge the potential risks of the completion technique that has helped drive the ongoing oil and natural gas production boom. He said communications efforts should focus on the industry's work to mitigate those risks, rather than trying to minimize them. "We lose credibility as an industry when we continue to say, 'We have done this for 60 years without a problem. Don't regulate us out of business.' because it's just flat not true." He said the scale of today's operations does not resemble what was done decades ago, so the industry should not resist regulation as urgently as it has.

DesJarlais, a former communications executive for ConocoPhillips, said her focus always has been engaging the public, where the energy debate typically only scratches the surface of the issues facing society. She said most talking points fail to acknowledge that energy is the backbone of the U.S. economy. DesJarlais said the industry must broaden the debate, sharing information that makes its complex business more understandable, using personal stories rather than data to illustrate its arguments. She said anti-industry arguments typically are deeply personal, making them compelling even when they're not accurate. "The industry doesn't do enough to counteract that with information that's helpful to their own perspective," she said. DesJarlais said the industry should make a more serious investment in forms of communication that engage the public. "This has to include digital channels, targeted to stakeholders that you want to reach and what they care about," she said.

Dougher said reliable, affordable supplies of energy "mean everything" to the American way of life, from economic development to the ability to protect the environment. She shared U.S. Environmental Protection Agency data that showed significant gains in gross domestic product, vehicle miles traveled, population and energy consumption since 1980, with a 62 percent drop in six common pollutants. "I think that's a pretty good report card," she said. Dougher also highlighted data from the U.S. Energy Information Administration that predicts a near doubling of the gross domestic product over the next

25 years, with a 17 percent growth in population and 9 percent increase in energy consumption. Another chart showed a decline in carbon emissions from energy-related sources since 2007, which Dougher attributed in part to innovation in the oil and natural gas industry. She said the industry has developed technology to increase oil and gas development “at a pace and a rate we didn’t expect.” Dougher said fossil fuels will continue to play an important role in society, a role that will be bolstered by continued technological developments.

Weissman said the oil and natural gas industry deserves credit for reducing greenhouse gas emissions with breakthroughs in natural gas development, along with increases in renewable energy. He said the industry’s success in unlocking greater gas supplies has limited the cost to consumers. Weissman said the key issue is taking advantage of scientific research on climate change to form energy strategy. “The most significant issue that we need to address now ... is how to solve the problem,” he said. Weissman said millions of dollars have been spent on climate research, with little effort to understand the implications of that research on policy or developing plans to significantly cut emissions. He quoted a Harvard professor who called climate change an insurance or risk management issue. “There already are abundantly clear indications that the risks associate with climate change are enormous,” Weissman said. “That is as scary as it could possibly be.” He said the problem gets worse every year, as greenhouse gas emissions continue to accumulate in the atmosphere. Weissman said it is unrealistic to expect carbon emissions to be eliminated altogether, but he expects the ongoing switch from coal to natural gas in electricity generation to drastically reduce emissions in the United States by 2050.

Regulations meant to reduce emissions from industrial sources have not been well received, panelists all agreed. “I think there is a lot we can do to reduce methane emissions cost effectively,” Bolling said. “And we need to do it.” He also said rules meant to reduce emissions from power plants could be a boon to natural gas producers. Boling said he doesn’t have a problem with natural gas being called a “bridge fuel” until cleaner sources of energy can be developed, but the industry must do what it takes to remain relevant when that day comes. “We do have a very important part to play in achieving a secure, reliable low-carbon future for our country,” he said. Boling said the industry needs to figure out a way to harness energy from natural gas without burning it. Dougher said federal regulations have hit

coal the hardest so far, but the oil and gas industry feels like it is facing “death from a thousand cuts” despite efforts to reduce methane emissions while increasing production. She said the industry has spent a lot of money on technology meant to reduce emissions, while continuing to provide reliable, affordable fuel. “This is very complicated, very hard to solve,” she said. “If it was easy, we would have solved it already.” Weissman said the U.S. lacks a national energy policy and is unlikely to develop one, leaving battles in each state over regulations meant to reduce emissions from the power sector.

Renewable energy sources could play a role in warding off climate change, but there are limitations there. DesJarlais said renewables cannot replace more traditional energy sources at present, due to economic and geographic concerns. Dougher said EIA data shows renewables currently provide about 9 percent of U.S. energy. That is projected to grow to 13 percent by 2040, with the majority of energy still coming from fossil fuels. Weissman said it is difficult to predict the future of renewables, but he expects their use to increase with time. He said the problem is intermittency, as wind typically blows on cold nights, not on hot days when electricity demand peaks. Weissman said renewables require a lot of backup generation capacity unless commercial-scale storage options are developed. “Unfortunately that doesn’t exist yet,” he said.

Colton, who was the symposium’s keynote speaker, said ExxonMobil looked at more than 100 countries, 15 demand sectors and 20 fuel types to develop its energy outlook. It also considered trade flows and future technology and government policy that could impact consumers by 2040. “Energy demands start with people’s demands and built up into huge numbers of immense scale on a global basis,” he said.

Colton said the energy demand for one American for one day was about 7 gallons of gasoline in 2010, well above the world average of 1.7 gallons a day. That puts global demand at 12 billion gallons a day. ExxonMobil’s energy outlook indicates the world economy will more than double by 2040, necessitating a 35 percent increase in energy. Colton said energy efficiency allows economic growth to outpace the growth in energy demand. He said the energy demand in developed countries will remain flat, while developing nations will require additional energy to improve their quality of life.

The outlook considered four sectors for energy demand: electricity generation, industrial, transportation and residential/commercial. Electricity demand is projected to log the highest growth. “This isn’t really hard to appreciate,” he said. “Electricity is a very convenient form of energy.” Colton said fuel choice for electricity generation will be driven by cost, carbon dioxide emissions and availability. A chart from EPRI indicates natural gas will be the most popular fuel because it offers a good compromise on those factors.

Colton said transportation demand is expected to grow by 30 percent, with a boom in diesel use as heavy-duty traffic spreads in developing countries. ExxonMobil also predicts hybrid vehicles will emerge as a dominant format, thanks for government mandates.

CONCLUSION

The underlying truth in the debate over energy development and the environment is that the quest for economic growth and a higher quality of living will drive a robust growth in global energy demand over the next 25 years and beyond – particularly in the developing world where a vast majority of the world’s 7 billion people reside. The US is in an enviable position of being increasingly energy secure, with the significant economic and geopolitical benefits that come from that security. Developing countries and many developed countries are far less advantaged and their economic growth ambitions will depend on reliable, affordable energy from the best possible sources – even if they are less desirable from an environmental perspective.

The US has seen its energy resource mix driven more and more by cleaner burning natural gas, and to a much lesser extent by advances in wind and solar over the past decade, while achieving increasing benefits from energy utilization efficiencies driven by leading-edge technological developments. The results of this clear and steady progress are visible in the improving environmental impact indicators at many levels. Directionally, we are on a good path. US policy-makers should work together to find common ground based on 1) the realities of medium term energy resource mix, which will be dominated by hydrocarbon resources for the foreseeable future, 2) a clear understanding of the realities of global demographic impact and energy demand growth, 3) the importance of technology in driving environmental progress and 4) a common sense appreciation that the human impact on

climate change is only a part of the complex set of forces that drive our ever-changing climate - in order to agree on a more pragmatic, common sense approach to environmental policy that ensures measurable and sustainable progress in mitigating future environmental risks while sustaining economic progress. It's a balance that is achievable. Energy utilization and development driven primarily by hydrocarbon resources in the foreseeable future, economic development and prosperity, and environmental stewardship can co-exist. Finally, we must begin now to develop the next generation of energy resources to assure long-term energy security, economic stability and environmental progress. Breakthrough technologies in nuclear fuels may provide the solution. Nuclear energy may be the ultimate "green energy" resource for the future. If we get all this right and execute with a balanced approach, the rest of the world will benefit from our vision, wisdom and leadership.

A closed-captioned video of the 2015 Energy Symposium will be available soon via price.ou.edu/energy.