

Report on the Tulsa USAEE/IAEE Conference

CONFERENCE OVERVIEW

The 34th USAEE/IAEE North American conference was held in Tulsa, Oklahoma. There were 213 attendees representing 19 distinct countries, 43 of whom were students, and 46 of whom were welcomed as new members to the organization. The backgrounds of the delegates included, but were not limited to, academia, the U.S. federal government, oil and gas companies, utilities, and research and consulting groups. The theme of this year's conference was "Implications of North American Energy Self-Sufficiency". As the third largest natural gas producing and fifth largest crude oil producing state in the United States, Oklahoma provided a timely and appropriate location for this year's conference, particularly in the current environment of increased production. Throughout the conference delegates had the opportunity to attend a variety of plenary sessions where expert panels discussed issues ranging from the future of oil and gas prices to consumer-facing demand-side issues. The Tulsa conference additionally saw some new elements introduced to the program including a specialized Government Track and discussants in concurrent sessions. Student members were able to compete in events for cash prizes such as the Case and Poster competitions and all members were given extensive opportunities to network with other members from a variety of backgrounds. With a combination of plenary sessions, concurrent sessions, networking opportunities, interesting lunch speakers, tours of local energy facilities, and technical workshops, this year's conference provided attendees with a comprehensive first-hand exposure to the state of the North American energy sector.

SUNDAY OCTOBER 23RD

GRAND RIVER DAM AUTHORITY TOUR

On Sunday morning prior to the opening of the conference a number of USAEE members participated in an interesting tour of the Grand Dam River Authority facility. Throughout the day attendees toured the main Grand Dam River Authority facility, Salina Pumped Storage facility, and Pensacola Dam. Presentations were given to the group by the Chief Executive Officer, Chief Operating Officer, and several General Assistant Managers. The trip provided an extremely informative and up-close look at the workings of the Grand Dam River Authority as well as interesting presentations on topics including, but not limited to, the economics of building new units, storage capability and ancillary services of a pumped storage plant.

CASE COMPETITION

[Written by Parth Vaishnav, Carnegie Mellon University]

2016 marked the fifth time the USAEE Case Competition ran since its start in 2012. The competition casts participating teams in the role of consultants with clients from government or industry who need them to do a quick, first-order analysis to inform a complex energy-related problem, usually with a technical, economic, and political component. This year, students were asked to advise a minister about the feasibility and wisdom of transitioning much of Saudi Arabia's electricity generation to solar photovoltaic. Participating teams, each consisting of 2-5 students, submitted an 8,000-word report with their recommendations in April. Of these participating teams, three teams were then selected to present in Tulsa to compete for first (\$2500), second (\$2000), and third (\$1500) prizes. An additional prize for those selected to come present in Tulsa was the waiving of the registration fee for the conference for two members of the winning teams.

Generous sponsorship for the competition came from the King Abdullah Petroleum Studies and Research Center (KAPSARC). The Case Competition was organized by Parth Vaishnav (Carnegie Mellon University) and David Hobbs (KAPSARC), Walid Matar (KAPSARC), Lester Hunt (KAPSARC), and Michael Canes (LMI) acted as judges.

This year, Joe Nyangon and Nabeel Alabbas of the University of Delaware shared the first prize with Pritham Aravind, Stephanie Beels, Suyash Kela, Raaf Khan, and Apratim Vidyarthi of Carnegie Mellon University. The third prize was taken by Arash Saboori and Ben White of the University of California, Davis.

An additional exciting development in the Case Competition this year was that the USAEE Council decided to open future competitions to students from all over the world; not just the United States. The Case Competition has a history of strong teams and solutions and we are looking forward to even more high-quality, creative entries in the coming years.

MONDAY OCTOBER 24TH

OPENING PLENARY (ENERGY POLICY- COMPETING VISIONS FROM THE TWO PARTIES)

On Monday morning Jim Smith (Professor of Finance, Southern Methodist University and USAEE President), welcomed everyone to the 34th USAEE/IAEE North American Conference in Tulsa, Oklahoma, extending thanks to all who helped make the conference happen. Gürkan Kumbaroglu, president of the IAEE, then spoke to the recent success the international organization has had in expanding to regions such as the Balkans and the Middle East, emphasizing the global nature of the organization and putting the conference's theme, 'Implications of North American Energy Self-Sufficiency' in a broader

context. Delegates were then addressed by Ron Ripple, University of Tulsa, and Tom Robins, Deputy Secretary of Energy at the Oklahoma Secretary of Energy and Environment, who spoke to the significance of Oklahoma in the wider energy picture.

The opening remarks were followed by an enlightening session on the formation of the North American Energy Security and Infrastructure Act of 2016, a pending piece of legislation, by key staffers on both sides of the aisle whose senators serve on the Senate Energy and Natural Resources Committee. Christine Tezak (Managing Director, Research, Clearview Energy Partners LLC) chaired a wonderfully interesting discussion between Angel A Becker-Dippmann (Democratic Staff Director, Senate Energy and Natural Resources Committee) and Colin Hayes (Republican Staff Director, Senate Energy and Natural Resources Committee) that covered topics ranging from infrastructure to the impact of lower energy prices on the political process and concerns about the Strategic Petroleum Reserve. Delegates were exposed to an insightful description of the difficulties of creating legislation in a divided Congress, but also how much time and effort is spent to make workable compromises and find common ground. From the discussion it was clear that while there were obvious differences between the parties on many specifics, both sides were committed to the common goal of an updated framework for federal energy policy. However, it was also emphasized that the federal nature of such legislation makes it a 'very blunt' instrument and there will be a lot of very important discussions at the regional and state-level.

GOVERNMENT TRACK (TRANSITIONS)

The 34th USAEE/IAEE North America Conference hosted the debut of the Government Track sessions. The inaugural session, 'Transition from the Point of View of the Incoming Political Party', was held on Monday morning and was about transitions in government. Abe Haspel (President, Cogent Analysis Group LLC) presided over an expert panel of Brain Waidmann (Chief of Staff, American Council of Life Insurers), Elgie Holstein (Senior Director for Strategic Planning, Environmental Defense Fund), and Ross Swimmer (Partner, Native American Fund Advisors LLC). Haspel started the session with an extremely informative overview of the transition process, emphasizing the point that with a new Administration over 4,000 political appointee positions will turn over and 50% of incoming appointees are likely to not have a background in government. Transition is therefore an enormous undertaking and involves not only the outgoing and incoming appointees, but also a specific transition taskforce. On the panel, both Waidmann and Holstein have had extensive experience as members of the transition teams of George (W.) Bush and Barak Obama. Swimmer, on the other hand, was a political appointee himself and therefore was able to provide insight from that side of the process. Waidmann started the panel off by describing transition as affecting 'virtually all of the senior leadership of every agency of government'. The next hour and a half was filled with phenomenally interesting insight from each of the panellists about their experiences as both transition members and political appointees. The discussion was wide ranging and quite frank at times providing for great insight into an extremely important process. For conference delegates that either work in or liaise with any government agency the inaugural government track provided extremely valuable insight that would be extremely hard to obtain anywhere else.

AWARDS LUNCHEON

At lunch on Monday the USAEE Adelman Frankel Award was given to Fereidun Fesharaki (FACTS Global Energy) and USAEE Senior Fellow Awards were given to Mary Lashley Barcella (IHS Markit), John Felmy (Midnight Energy Economics), and Ronald Ripple (The University of Tulsa). The IAEE Outstanding Contributions to the Profession Award was then given to Richard O'Neill. Also at the Monday Awards Luncheon, Robert (Bob) Borgstrom (Independent Consultant) was honored for his service to the USAEE/IAEE as the Editor of *USAEE Dialogue*.

DUAL PLENARY (MANAGING IN A LOW-PRICE ENVIRONMENT)

The plenary session 'Managing in a Low-Price Environment' was presided over by Bob Tippee (Editor, Oil & Gas Journal) and the panel consisted of David Chenier (Chief Procurement Officer, ConocoPhillips), Randy Foutch (Chairman and CEO, Laredo Petroleum Holdings Inc), and William Lawson (Vice President, Corporate Development and Execution, Williams Company). Chenier started the discussion by giving some historical context for the current low oil and gas prices. He pointed out that this is not the first time we have been in a low price environment and that actually major oil and gas companies have even performed relatively better in periods of price weakness. The 2014 supply shock was, he cited, the largest annual increase in U.S. oil production ever therefore helping the U.S. become the top oil and gas producer, above even Saudi Arabia. In a low price environment we are able to pull on three levers he said: standards, planning & execution, and suppliers. He then finished his presentation by highlighting a portfolio of contracting strategies that we should be pursuing in various combinations in such an environment. Foutch's presentation reinforced the idea that companies have had experience in similar low-price environments and the key to success in such times is appropriate long-term planning. Reducing risk, collecting data early, and investing in forward-looking infrastructure were all highlighted as strategies. The panel was rounded out by Lawson who gave insight into the natural gas industry. Supply is on the increase and prices are low, and demand is increasing steadily. Lawson gave insight into what he believes the gas market needs now including continued cost control, improved political climate, staffs sized to handle 'lower for longer' price environments, and an engaged supporter base to

advocate infrastructure, among other things. The panel was concluded by calling for vigilance in driving down costs, safe and reliable operations and the expansion of demand driven infrastructure. Overall the message was clear: that prices are low in oil and gas markets is not unprecedented and if we are smart we can move through the depressed price period.

DUAL PLENARY (CHALLENGES AND OPPORTUNITIES IN THE TRANSPORT SECTOR)

The plenary session ‘Challenges and Opportunities in the Transport Sector’ was presided over by Ben Schlesinger (President, Benjamin Schlesinger & Assoc LLC) and the expert panel was comprised of Sanya Carley (Associate Professor, Indiana University), Ken Gillingham (Assistant Professor of Economics, Yale University), and Nancy Homeister (Manager, Green Gas and Fuel Economy Regulatory Strategy, Ford Motor Company). The discussion was kicked off by Carley who gave a ‘2016 perspective’ of the developments that have taken place in the industry since the 2012 Corporate Average Fuel Economy (CAFE) Standards were released. Since 2012 much has been learned about the benefits and challenges of the policy, particularly in the wake of the lower oil and gas prices. Gillingham built upon Carley’s presentation by emphasizing many of the unintended consequences of such economically ‘second-best’ policies. Both Carley and Gillingham dug into the cost-benefit analysis behind the standards and illustrated how quantification on both sides is difficult and has shifted since they were first undertaken. Homeister’s presentation complemented Carley and Gillingham’s by giving the perspective of an automotive company. The standards have a great impact on automotive companies and many of them are worried about potential negative implications of ‘getting the policy wrong’. To Homeister technology is not so much the issue, but rather making the cars that consumers want to buy. She emphasized the fact that there are many other things that consumers care about much more than fuel economy when purchasing a vehicle. Moving forwards the panel gave attendees a sense that there is much we still have yet to understand about the demand-side of the automotive market, particularly in such a low oil price environment, and its potential impact and relation to the CAFE standards. Electric vehicles were also touched upon as having potential to become a much larger share of the automotive market than they currently are. From the discussion one thing was absolutely clear- the transportation sector is an extremely dynamic one at this point in time and there are likely to be many important developments (potentially game-changing ones) in the coming years.

POSTER SESSION

The student poster session, organized and chaired by John Holding (Independent Energy Analyst), is an opportunity for students to present their work to a broad audience in an interactive manner. This year the posters were showcased during the coffee breaks before the poster session so that delegates could have more time to look around all the projects that were being presented. During the Monday night networking reception the poster competition actually took place where students stood by their posters and answered questions, including those of anonymous judges who made their rounds throughout the evening.

This year’s competition had ten posters representing a diverse set of projects. Topics covered by posters this year included the efficacy of energy retrofits in buildings, electricity demand forecasting, integrated assessment model diagnostics, royalty rates, renewable energy integration, gasoline price dynamics, vertical and horizontal wells, global LNG outlook, energy storage grids coupled with expanded wind energy, and shale oil producer hedging policies and firm value.

The winner of this year’s poster competition, and a check for \$1000, was Mark Agerton (Rice University) whose poster was entitled ‘Drivers of Royalty Rates and Primary Terms in Private U.S. Mineral Leases’.

TUESDAY OCTOBER 25TH

DUAL PLENARY (U.S. OIL AND NATURAL GAS EXPORTS- HOW HAVE THE ECONOMICS CHANGED?)

[Written by Kelly Ann Stevens, PhD Student, Syracuse University]

The plenary session, “U.S. Oil and Natural Gas Exports – How have the Economics Changed?” chaired by Tina Vital (President, TJV Consulting), featured an enlightening discussion by Kathleen Eisbrenner (Founder, Chairman & CEO, NextDecade), John Felmy (Consultant, Midnight Energy Economics), and Chris Pedersen (North American LNG Analyst, S&P Global Platts) on Tuesday morning. The discussions focused on paradigm shifts in natural gas and oil markets in the U.S. and abroad, and expectations on how the markets will respond in the future. John Felmy provided a brief history of the events and perceptions of our supply of natural gas and oil that have severely limited the ability of the U.S. to export as it should. The following discussions focused more on the recent paradigm shift in natural gas markets due to the shale gas revolution, and future swings to come stemming from the development and use of new technologies. Eisbrenner stressed how the current LNG oversupply is overshadowing recent LNG milestones such as the first exports from the Gulf Coast to Europe and Asia in 2016. Despite the current low price setbacks, the panelists believe LNG and floating storage regasification units (FSRUs) are the next game changer for U.S. natural gas exports. Pedersen discussed the advantages and market for FSRUs to meet growing energy demand for natural gas in the developing world. These new units come with a low risk of investment since they are mobile, and will quickly expand locations for LNG demand while decreasing regasification costs. There was a sense of optimism that a demand pull for gas is imminent, which the U.S. is well positioned to respond to

given our current infrastructure, recent improvements in extraction processes, and abundance of gas in places such as the Alpine High in Texas. However, the panelist seemed to agree that while LNG in global gas markets is tightening price margins, regional variations in infrastructure, transportation costs, and demand will prevent global price convergence from occurring anytime soon.

DUAL PLENARY (CHALLENGES AND OPPORTUNITIES FOR RENEWABLES)

The plenary session 'Challenges and Opportunities for Renewables' was presided over by Stephen Munro (U.S. Policy Analyst and Editor, Bloomberg New Energy Finance). The expert panel was comprised of Scott Vogt (VP of Energy Acquisition, Comed), JT Smith (Director, Policy Studies, MISO), and Mario Hurtado (Executive Vice President Development, Clean Line Energy Partners). Munro started the session off with a great overview of the current state of renewables, highlighting the fact that the levelized costs of electricity (LCOE) for many technologies have decreased in recent years allowing for greater renewable penetration. Munro emphasized federal and state support as key drivers in the industry and also provided some global context for costs. Hurtado followed Munro's introduction with a discussion focused on infrastructure investment, particularly transmission lines. His presentation focused heavily on opportunities for arbitrage over transmission lines in connecting areas of low electricity demand and high renewable resource potential with those of high demand and lower resources. Smith was able to then give an ISO perspective. His talk gave attendees some context for what renewables mean to an ISO and the paradigm shift that has accompanied increased penetration. Finally, Vogt gave a complementary utility perspective with a focus specific to his company's service territory: the role of nuclear power plants in the context of renewable energy credits. Vogt cited the key challenges as meeting customers' desire for clean energy and self-generation while also meeting mandates. By the end of the session it was clear that the paradigm shift referenced by Smith is one that is being experienced across the electricity sector and there is still much to be seen as to what kind of role renewables will play and how.

AWARDS LUNCHEON

At Tuesday lunchtime delegates were treated to a keynote speech by the Secretary of Energy and Environment for the State of Oklahoma, Mike Teague. Teague's talk focused on the issues Oklahoma has been having with induced seismicity due to the injection of produced water in disposal wells. At the beginning of his talk Teague asked for a show of hands from delegates of who believed that hydraulic fracking was a cause of increased seismic activity. He then explained that while there is a relationship between the two, it was not the cause of the problems they were having in Oklahoma. In Oklahoma, they have a water disposal problem. Teague's talk was extremely interesting and informative. He walked delegates through the efforts that the State of Oklahoma has been undertaking in order to tackle the problem head on. The State's approach is grounded in reaching out to the best minds across all sectors in order to take advantage of the state-of-the-art knowledge in induced seismicity. Teague summed up his talk with a few key points: that that State of Oklahoma has a problem, a big problem, but they are working hard to do what they can to better understand and manage it.

Also at the Tuesday lunch, the IAEE Journalism Award was given to Russell Gold. Mark Agerton of Rice University was awarded first prize in the Poster Competition for his poster entitled 'Drivers of Royalty Rates and Primary Terms in Private U.S. Mineral Leases', and The Dennis J. O'Brien USAEE Best Student Paper Award was awarded to Jen Z. He of the University of Maryland for her paper entitled 'Heterogeneous Responses and Differentiated Taxes: Evidence from the Heavy-Duty Trucking Industry in the U.S.'. Troy Thompson (Chevron) was honored as the most recent Past President of the USAEE and gifts of appreciation were awarded to Tina Vital (TJV Consulting), Sanya Carley (Indiana University), John Holding (Independent Energy Analyst), Ron Ripple (The University of Tulsa), Parth Vaishnav (Carnegie Mellon University), Better Simkins (Oklahoma State University), Mike Troilo (The University of Tulsa), and Tom Drennen (Hobart and William Smith Colleges). Finally, Brant Liddle (Energy Studies Institute, NUS) was presented with the Working Paper Award.

DUAL PLENARY (SHALE AND THE FUTURE OF WORLD OIL)

[Jim Smith reviewed and added to the following paragraph]

The plenary session entitled 'Shale and the Future of World Oil' was presided over by Jim Smith (Professor of Finance, Southern Methodist University and USAEE President). The expert panel was composed of Philip Verleger Jr (President, PK Verleger LLC; Visiting Fellow, Colorado School of Mines), Marianne Kah (Chief Economist, ConocoPhillips), James Griffin (Professor and Bob Bullock Chair in Public Policy and Finance, Texas A&M University), and Harold Hamm (Chairman and Chief Executive Officer, Continental Resources Inc). Verleger started the panel off by highlighting the fact that we are in a different market today than in the past and demand swings being more critical than swing producers. Today we have many more opportunistic buyers and sellers, both paper and physical traders. Increased activity by paper trading opportunists shifts the supply-of-storage curve for crude oil, despite research that traditionally has suggested there to be no link between paper traders and oil prices. Additionally, today's market of "fuzzy" demand and supply makes it much more difficult to control prices. Kah's presentation complemented Verleger's by giving an overview of the oil and gas supplies globally and

in the U.S. Inventory changes, she claimed, are likely to become the short-term balancing mechanism as the U.S. tight oil supply response time is not as short as may have been believed. Additionally, she claims that, absent OPEC's active management of supply, oil prices will become more volatile as prices are the primary signal for building/drawing down inventories and ramping U.S. tight oil up or down. Kah emphasized that tight oil is produced by a technology that is still evolving, with significant cost reductions still in the offing. Beyond the resilience and relatively low cost of shale oil, Kah noted that a large part of the global surplus in crude oil supplies is due to the substantial increase in production volumes coming out of the Persian Gulf during the past two years. Griffin proceeded to give a presentation on 'The New Normal' in which he sees the oil price most likely remaining in the range of \$30 to \$70 per barrel. Griffin disputes the notion that Saudi Arabia made a big mistake in failing to cut their production. The cost to the Saudis of defending \$100 oil, in his opinion, would have been even greater (and longer lasting) than the damage that has resulted from the oil glut. Griffin observed that part of the uncertainty regarding future oil prices stems from the fact that oil field service and supply costs will undoubtedly rise as the industry regains its footing, but no one knows by how much those costs will rise. He also notes that OPEC can be expected to come together again in defense of the oil price, albeit at a lower price level in the new normal. At the end of the day, however, Griffin believes that fracking will discipline OPEC's price ceiling. Hamm described in some detail the nature of technological advances that gave rise to the tight oil revolution, with horizontal drilling techniques perhaps playing the starring role--even beyond the impact of fracking, which is not new to the industry. The same technological developments, he observed, have transformed the U.S. natural gas industry (emphasis on the Marcellus basin) with profound impact on the global natural gas market. He attributes the dramatic drop in the price of oil to a huge miscalculation on OPEC's part regarding the resilience of U.S. shale oil supplies and the scope of low-cost production. He, like Kah, cited repeal of the U.S. crude oil export ban as having played a key role in sustaining the U.S. oil industry.

DUAL PLENARY (CLEAN POWER PLAN- IMPLICATIONS AND STRATEGIES)

The plenary session entitled 'Clean Power Plan- Implications and Strategies' was presided over by Eric Hittinger (Assistant Professor, Rochester Institute of Technology). The expert panel was composed of Christine Tezak (Managing Director, Research, Clearview Energy Partners LLC), Charles Rossmann (Forecasting & Model Development Manager, Southern Company), and Erica Bowman (Chief Economist, American Petroleum Institute, API). The goal of the panel was to discuss the critical issues and implications of the Clean Power Plan unveiled in 2015 by the U.S. Environmental Protection Agency (EPA). Hittinger gave some context to the panel by giving a background of the Clean Power Plan. Tezak followed by giving a broad overview of the political landscape emphasizing the global trends of fragmentation and the large role energy efficiency has played in recent decades. Shifts in Congress and the potential for tax reform were highlighted as issues on the horizon and emphasis was placed on heterogeneity across states in their compliance strategies. Rossmann then provided a viewpoint on behalf of a utility. In his presentation he highlighted the 'multiple worlds' the EPA was creating in the sense of the multitude of systems that individual states could choose to achieve their targets. Rossmann's discussion centered on the differences between a rate-based or a mass-based world in terms of the relevant standards and instruments pertaining to each. Rossmann's perspective was particularly interesting because the utility that he works for spans several states and therefore there is a chance that there may be different 'worlds' in terms of regulatory instruments within its service territory. Bowman rounded out the discussion by presenting a data-driven analysis carried out by the American Petroleum Institute. Findings from this study included conclusions that the EPA was underestimating the resource base for natural gas and overestimating the role of energy efficiency. Later in the session the differences between EPA and API modelling assumptions were discussed in light of these findings. Overall it is clear that in the current political landscape, discussion about the implications of the Clean Power Plan is extremely timely. Attendees left with a better sense of the overall picture as well as valuable insight into some of the specific concerns of various stakeholders and a look 'under the hood' of some of the modelling efforts surrounding the policy.

WEDNESDAY OCTOBER 26TH

DUAL PLENARY (ACROSS THE BORDERS- UPDATES FROM CANADA AND MEXICO)

The plenary 'Across the Borders- Updates from Canada and Mexico' was presided over by Peter Hartley (Professor and Baker Institute Scholar, Rice University). The expert panel was composed of Andre Plourde (Dean Faculty of Public Affairs, Carleton University), Juan Rosellon (Professor, CENACE (Mexican ISO)), and Alejandra Elizondo (Research Fellow, Center for Research and Teaching in Economics (CIDE)). The aim of the panel was to discuss the recent developments in Canada and Mexico and how they may affect North American energy markets and trade in oil, natural gas, and electricity. Plourde started the panel off by discussing Canadian energy policy and politics, with a focus on the politics of oil sands exports. After an overview and brief history, he described the situation in 2010 and then reflected upon what had, or had not changed, from then to now (2016). One thing that has not changed is that Mexico is still not a large factor in North American energy relations from the Canadian perspective. However, the growth in U.S. crude oil production and the politics surrounding the Keystone Pipeline have been major shifts in the last six years. Something else that has changed is the development

of climate policy in Canada, particularly pertaining to the tar sands. Rosellon's presentation shifted geographic focus southward to the reforming of the Mexican electricity market. His talk covered critical issues in the restructuring such as market design, nodal pricing, transmission, renewable integration, and implications for policy making in Mexico. Elizondo finished the panel by also presenting on Mexico, but the energy reform for oil and gas rather than electricity markets. She provided an overview of both the old and the new system commenting on the short and long term benefits of the shift. The major short-term benefit, she claimed, was increased energy security. Issues that are still pending, on the other hand, are things like carbon emissions, subsidies and carbon taxes, regionalization, social issues, and North American Regulatory Harmonization. Overall it is clear that there are many developments occurring both North and South of the U.S. that will have great impacts on the structure and functioning of the domestic energy industry. Much has changed in the past decade, and it is clear that there are likely to be many more changes in the coming decades as all three countries work towards self-sufficiency.

DUAL PLENARY (ON THE OTHER SIDE OF THE METER- DEMAND SIDE ISSUES)

The plenary 'On the Other Side of the Meter- Demand Side Issues' was presided over by Melanie Craxton (PhD Candidate, Stanford University). On the panel were Jim Sweeney (Director of the Precourt Energy Efficiency Center, Professor, Stanford University), Seth Blumsack (Associate Professor, Penn State University), and Jeff Brown (Energy Efficiency & Consumer Programs Manager, Public Service Company of Oklahoma). The aim of this session was to shed light on the demand-side of the electricity market, focusing on the policies, programs, and consumer behaviors 'behind the meter'. The panel was kicked off by Sweeney who gave an excellent overview of the role energy efficiency has played across the energy system in recent decades. In his presentation Sweeney also was able to highlight a variety of consumer-facing programs and policies as well as what some of the concerns are on the demand side going forward. Blumsack followed on by presenting an experiment carried out in Vermont that tested consumers' reactions to Critical Peak Pricing days with penalties or rebates associated with them depending on the treatment group. Insights from Blumsack's presentation included that penalizing people, rather than rewarding them for 'good' behavior, is more effective, though perhaps unsurprisingly politically unpopular, consumers *do* respond to incentives, but not persistently enough to have much retail or capacity value, and the key to inducing desired actions on the part of the consumer is making it extremely easy for them. Brown provided a complementary view of the demand side from the perspective of a utility. He highlighted many of the programs (past and present) his company has run and provided interesting comments on their efficacy therefore providing an interesting comparison to the study presented by Blumsack. All three panellists were asked before the session what they believed the most important demand-side development would be in the next ten years. All three panellists seemed to agree that information dissemination was going to be critical and finding creative ways to carry it out, whether it be smart meters or other information-based apps, was going to be key for furthering the broader impact of the demand side.

CLOSING PLENARY (OUTLOOK AND GLOBAL PERSPECTIVES)

[Contributed by Melanie Craxton and David Knapp]

The 34th USAEE/IAEE North American conference's main agenda ended with the Closing Plenary entitled 'Outlook and Global Perspectives'. The session was chaired by David Knapp (Chief Energy Economist, Energy Intelligence Group). The expert panel was comprised of Jeff Currie (Global Head of Commodities Research, Global Investment Research Division, Goldman Sachs), Fereidun Fesharaki (Chairman, Facts Global Energy), and Adam Sieminski (Administrator, Energy Information Administration). Fesharaki and Sieminski are past presidents of the IAEE/USAEE respectively. Fesharaki is a much followed expert on China and offered a number of interesting insights on the country during the panel discussion and Q&A, while Currie substantially expanded the discussion on the financial side of energy markets. Sieminski was there to enhance the focus on the US, but offered a number of observations on the broader oil market. The purpose of the session was to pull together key themes from the conference primarily related to oil markets - with the three key questions addressed focusing on whether the market is rebalancing, where are oil prices going and what are the key influences beyond the oil market that those involved in the market directly or professionally watching the market need to know about.

The discussion that followed also provided an interesting insight into how each of the panellists broadly view the global future for energy and, in particular, how it will impact the United States. Knapp kicked off the discussion by asking Fesharaki for his take on where we are now and his thoughts on what lies ahead. Fesharaki's response focused on the fact that free markets may be something that economists historically love, but they also "make things really tough" -- particularly with regards to forecasting. The answer to where things might settle, he claims, is still very much up in the air. Knapp followed up on Fesharaki's comments by highlighting the supposed importance of 'energy independence' and the decades old conversations about energy security, despite the still relevant concept of comparative advantage suggesting importing cheap oil and processing it into higher priced refined products, petrochemicals and other higher value-added derivatives to sell back to the original producers and others.

That led into an interesting discussion by Jeff Currie of critical role of the dollar as part oil's role as a dollar-based com-

modity, like copper and others. Oil price's high correlation with the dollar index, largely driven by three macro-drivers -- oil market development, the Fed, and China, allows oil transactions, particularly outside the U.S. a source or sink for global liquidity. Curie excluded the U.S. because of an effective regulatory apparatus meant to control the supply of money. The convergence of low oil prices, a tightening Fed and a weakening China all work against liquidity

Sieminski then spoke of three important sources of uncertainty: global economic (and not just in China, but in the United States and Europe as well), geopolitics, and, in the longer term, climate policy. Such uncertainty makes forecasting difficult, and Sieminski highlighted, with a slight amount of humor intended, that he could say with 95% confidence that the crude oil price in 2017 would be between \$25 and \$90 a barrel and natural gas prices would be between \$1.50 and \$6. The panel then went on to discuss issues ranging from rebalancing trade, inventories, technology development, energy access, the differences in developing countries, and the potential for electric cars and how that would affect the future.

The prime takeaways from the session were the high level of uncertainty about the state of rebalancing (not there yet) and the likely effectiveness of Opec's latest market management attempt (leaning toward negative) and oil prices (moving higher but not by too much too soon). Milestones to watch included an end-October Opec planning meeting, now unsuccessfully concluded, and Opec's November 30th full meeting about which the sense of the panel could be characterized as dubious. China policy, Venezuela and Nigerian politics also bear close scrutiny as does Saudi signalling in advance of Saudi Aramco's Initial Public Offering purportedly coming in 2018 although at least one panellist, Fesharaki, expressed scepticism. The various counter force are expected to bat oil prices around in the \$40s and \$50s over the next year with an upside tendency toward the end of the decade when supply shortages may loom.

WORKSHOPS (THE CAUSE AND CONSEQUENCE OF INDUCED SEISMICITY AND GLOBAL ENERGY RISK MANAGEMENT: TURNING RISK INTO A COMPETITIVE OPPORTUNITY)

After the Closing Plenary some USAEE Members stayed on to attend workshops on induced seismicity and energy risk management. The Society of Petroleum Engineers put on a workshop entitled 'The Cause and Consequence of Induced Seismicity' sponsored by the Center for Energy Studies at Rice University's Baker Institute. Ken Medlock (Director, Center for Energy Studies, Rice University's Baker Institute for Public Policy) presided over presentations by Linda Capuano (Fellow in Energy Technology, Center for Energy Studies, Rice University's Baker Institute for Public Policy), Jeremy Boak (Director, Oklahoma Geological Survey, University of Oklahoma), and Kyle Murray (Hydrogeologist, Oklahoma Geological Survey, University of Oklahoma). The workshop explored the technical elements of deep injection disposal wells and induced seismicity. It also covered policy issues and discussed technical solutions.

The second workshop, 'Global Energy Risk Management: Turning Risk into a Competitive Opportunity', was presided over by Glenn Labhart (Chairman of Energy Oversight Committee of GARP ERP Program & Senior Partner Labhart Risk Advisors). Speakers included Joe Byers (Senior Director of Risk Management, Direct Energy) and Bob Broxson (Managing Director, BDO Consulting). Topics covered in the workshop included the basics of energy risk management, real option valuation to address risk and value added strategies, hedging strategies to add extrinsic value to a company's asset structure, and developing leadership skills of managing assets and value added strategies.

THURSDAY OCTOBER 27^H

CUSHING TOUR

The final activity on Thursday of the 34th USAEE/IAEE North American Conference was a technical tour in Cushing, Oklahoma sponsored by the American Petroleum Institute. On the tour, attendees visited crude oil tank farm storage and pipeline handling facilities in Cushing, OK; the pricing point for the NYMEX crude oil futures contract. Members on the tour also visited an operating lease site and oil and gas production research facilities at the University of Tulsa. Over the course of the day attendees were exposed to cutting-edge research in production performance, an actual producing lease, and the handling and storage of crude oil. It was an extremely interesting and informative end to an interesting and informative conference.

Melanie Craxton