# EUCERS Newsletter

**Newsletter of the European Centre for Energy and Resource Security (EUCERS)** **Issue 74, April 2018**

## Introduction

Dear readers and friends of EUCERS,

It is my great pleasure to welcome you to this edition of the EUCERS newsletter, in which we present you with two articles.

In the first article, Tatiana Bruce da Silva and Fernanda Delgado, researchers at the Brazilian Getúlio Vargas Foundation, draw parallels between the energy transitions of Brazil and Oklahoma.

The second article, written by yours truly, gives a short overview of five current megatrends that will affect the energy sector.

We also warmly invite you to the 2nd KAS/EUCERS Energy Talk 2018 on 13 June. The topic will be "Africa: Climate Change, Security and Violent Conflict". Please register at the following link: https://bit.ly/2kiUFEF .

As always, please feel free to keep us informed about your research projects and findings as we look to remain at the forefront of new knowledge and innovative ideas.

Thank you for your interest in EUCERS and for being part of our community.

Yours faithfully,
**Thomas Fröhlich**
EUCERS Newsletter Editor

**In this Month's Edition:**

## ARTICLES

### Parallels of energy transition, security and diversification in Brazil and Oklahoma

*By Tatiana Bruce da Silva and Fernanda Delgado*

***The United States of America is a country of great cultural and social diversity. Through federalism, the 13 British colonies in North America maintained their independence from one another in such a way that, today, the 50 U.S. states and local governments (municipalities, counties, among others) are autonomous from the federal government in several aspects of their society and economy, as in, for instance, their energy policy.***

**Tatiana Bruce da Silva** has a Bachelor's Degree in Economics from the Federal University of Pernambuco (UFPE) and a Master's of Public Administration from the University of Pennsylvania. She is a researcher at FGV Energia, the Center for Energy Studies at Getulio Vargas Foundation, where she researches on energy transition, electric vehicles, distributed energy resources (distributed generation, energy storage, energy efficiency and demand response), renewable energy and energy integration.

**Fernanda Delgado** holds a PhD in Energetic Planning, with an emphasis on petroleum geopolitics, and Master's degrees in Management Engineering and in International Finance. She published several books on Petropolitics, and is an affiliated professor of Oil Geopolitics in the Brazilian Navy Officers University. Fernanda furthermore gained professional experience in Brazil and abroad at companies such as Deloitte, Vale S.A., the Gama Filho University, Royal Shipping Services and Dickinson Maritime Agency.

Unlike Brazil, the American states set[1] most of their energy policy, such as deciding which sources will make up their energy mix. As in the rest of the world, until recently, Americans consumed the cheapest energy sources available, such as coal. Nowadays, due to climate change, some states have begun to transition to less carbon-intensive sources. There is no consensus in the country, however, regarding whether humans influence climate change. While California, New York, and other states are investing in renewable energy to reduce their greenhouse gas emissions, others, such as Oklahoma and Texas, invest in renewables because these energy sources mean profitable business opportunities today.

In Oklahoma, wind generation has grown considerably in recent years because of its increased competitiveness (Figure 1). In 2015, Oklahoma ranked third in the country in net wind power generation, which provided about a quarter of the state's net generation.

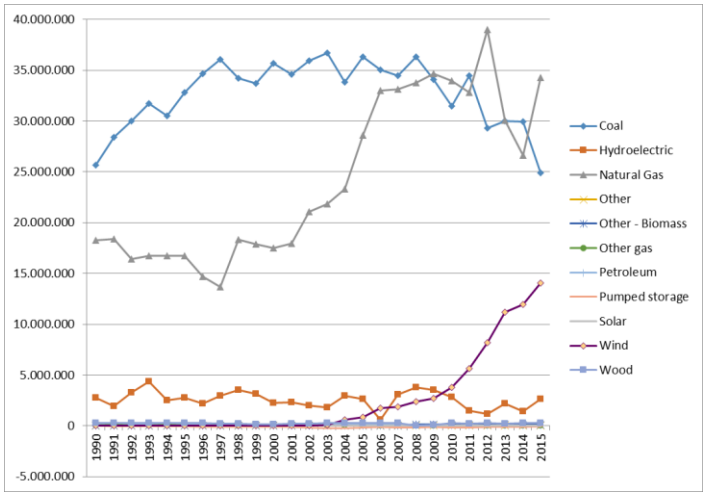



Figure 1: Electricity production by primary energy source in MWh, Oklahoma, 1990 to 2015.[1]

Wind is an intermittent and variable energy source. Thus, its share in the Oklahoman power grid has been growing simultaneously with other sources that provide energy when it is not available. Unlike California, which has chosen not to use fossil fuels to compensate for renewables intermittency because of climate change[2], Oklahoma develops fossil fuels for energy diversity and security.

One example is natural gas from hydraulic fracking of low permeability reservoirs. This technique has been developing extensively in the U.S.A lately due to technological progress, reduced costs, and strong domestic demand, since the U.S. consumes large amounts of fossil fuels. Therefore, the country has become one of the world's largest producers of natural gas, which has been replacing

[1] Federalism also influences energy regulation: federal regulation applies only to those activities that cross state borders. In the power sector, that applies to electricity trading in the wholesale market, while in the natural gas industry the federal regulator (FERC) regulates pipelines that pass through more than one state.

[2] See Bruce da Silva and Delgado, *Energy Transition: California style*, FGV Energia's Opinion Column (available only in Portuguese).

coal for power generation throughout the country, including Oklahoma (Figure 1).

In addition to providing natural gas that contributes to the state's energy diversity, the development of the fracking industry also affects Oklahoma's economy and environment. Figure 2 shows the main implications of fracking: it contributes to lower (and stable) energy prices, and to business and economic development. These benefits represent economic gains from the fracking process, along with national security issues and all their implications. On the other hand, fracking causes many significant impacts in the environment, as shown in Figure 2.

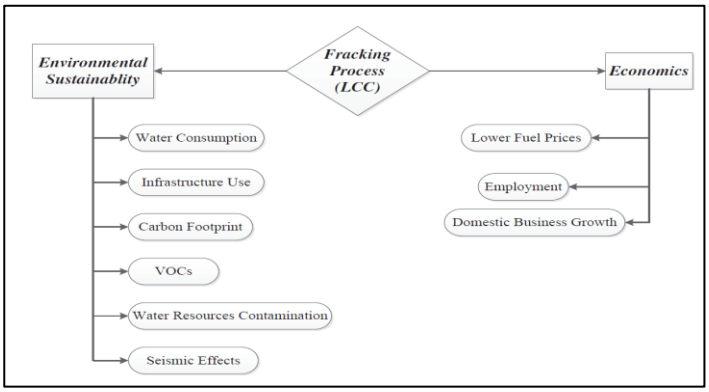
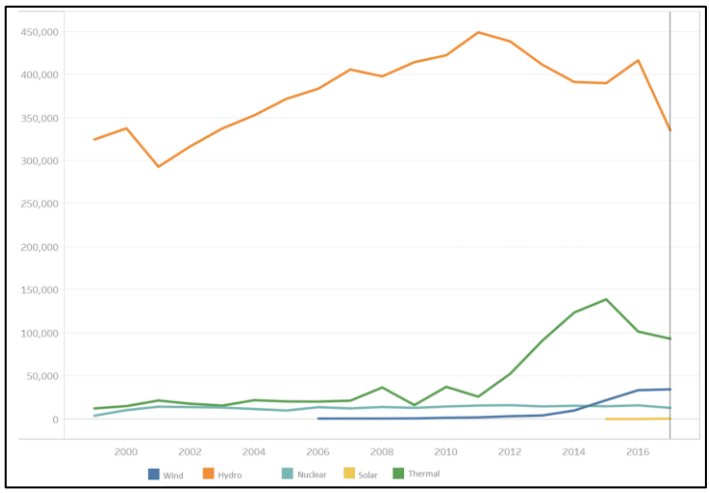



Figure 2: The main economic and environmental implications of fracking.[3]

Not only has fracking changed the energy mix and increased domestic energy production, but it has also enabled local economic growth in small communities throughout the United States. Economic booms, however, can also lead to inflationary pressures, infrastructure constraints, fast population growth, increased crime rate, among other issues. The rapid expansion of hydraulic fracturing in Oklahoma has raised concerns about all the aforementioned implications.

Even so, according to Mehany et al. (2015) and Howell et al. (2017), the positive externalities of fracking and related economic activities have been greater than the negative ones in the North American market. Local communities have experienced the economic benefits mentioned above. The energy planner and most of the population in Oklahoma see fracking as an opportunity for economic growth, a facilitator of the energy transition, and a path to energy independence for their cities and the country.

As in Oklahoma, Brazil also seeks a diversified power matrix. For years, hydroelectricity was the main source in power generation. In recent years, however, other sources are increasing their participation in the matrix (Figure 3). While in Oklahoma wind and natural gas thermoelectric generation grow due to their increased competitiveness, these sources in Brazil have been developing due to several reasons. Concerning wind power, costs are also important: in the last auction held on April 20, 2018, wind power's average price was US$20/MWh.[4] Other sources participating in the auction reached much higher values.[5] Moreover, Brazil's commitments in the Paris Agreement contribute to the development of wind power generation.[6]




[3] Source: Mehany et al (2015).

[4] In an auction in December 2017, wind was traded at US$30 (exchange rate Brazilian Real/US Dollar from the auction day). Importantly, wind power needs subsidies today due to high capital costs. In a few years, however, subsidies are expected to fall, which has already been observed in other countries, such as the Netherlands (https://www.bloomberg.com/news/articles/2017-12-14/subsidy -free-wind-power-possible-in-2-7-billion-dutch-auction).

[5] Solar's average price was US$35, biomass: US$60, and hydropower: US$59. Source: FGV Energia's Energy Newsletter, April 2018 (http://fgvenergia.fgv.br/sites/fgvenergia.fgv.br/files/boletim_abril-2018_rev1.pdf). Exchange rate from the auction day.

[6] Brazil committed to "expanding the use of non-fossil fuel energy sources domestically, increasing the share of renewables (other than hydropower) in the power supply to at least 23% by 2030, including by raising the share of wind, biomass and solar". Source: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Brazil/1/BRAZIL%20iNDC%20english%20FINAL.pdf

Figure 3: Electricity generation in GWh by type of power plant, Brazil, 2000 to 2016.[7]

The growth of thermoelectric generation in recent years is due to a reduction in hydropower generation because of increasing water source variability. In addition, wind and solar production growth will require an energy source to provide baseload power when these sources are unavailable due to their intermittency. This backup can occur through energy storage with batteries or reversible hydroelectric plants, or by using rapid response natural gas thermoelectric plants, as in Oklahoma. Pre-salt natural gas may be an alternative for Brazil, as its production has been increasing recently. In addition, as with fracking in Oklahoma, pre-salt oil and gas exploration, and their eventual economic and social benefits, is an attractive possibility for a developing country such as Brazil.

A significant fraction of Oklahomans, however, does not believe climate change is manmade. Meanwhile, in Brazil, efforts are in course to reduce greenhouse gas emissions. Thus, the trade-off between climate concerns/economic development from exploring fossil fuel reserves, and energy security from a diverse power matrix, is an important issue in Brazil. Therefore, energy transition in Brazil may face harder obstacles than in Oklahoma. Eventually, the Brazilian society will have to reconcile these distinct interests.

This article is a summary of the recently published report "*Transição, Segurança e Diversificação Energéticas no Brasil e em Oklahoma: Paralelos e Semelhanças*" (in Portuguese) available under http://fgvenergia.fgv.br/sites/fgvenergia.fgv.br/files/coluna_opiniao_marco_-_brasil_e_oklahoma_-_fernanda_e_tatiana.pdf

[7] Source: ONS (http://ons.org.br/Paginas/resultados-da-operacao/historico-da-operacao/geracao_energia.aspx).

## Five megatrends in the energy sector

*By Thomas Fröhlich*

***With his book "Megatrends: Ten New Directions Transforming Our Lives", John Naisbitt (1982) coined the term "megatrends." Mittelstaedt et al. (2014: 255) define megatrends as changes that are "complex in nature, extensive in their impact, and reflective of their historic context." Megatrends can therefore be seen as long-term developments in all areas of society that have the potential to fundamentally change current systems and processes. The importance of identifying and understanding such megatrends lies in mid- to long-term planning for political and economic purposes. If unaccounted for, megatrends might face political leaders with new and unexpected problems and proven business models might require fundamental adjustments.***

Research into megatrends has so far been overlooked by academia, however, business actors attribute a significant role to (mega-) trend forecasting. This lack of robust academic data leads to divergent and sometimes conflicting perspectives on the direction of change. Nevertheless, these studies can serve as a starting point for further academic research. Notable works that focus on megatrends in the energy sector are the US National Intelligence Council's 2012 publication "Global Trends 2030: Alternative Worlds", BP's section on megatrends in its annual energy outlook (e.g. 2017), a 2015 study by WWF and LichtBlick, Roland Berger's Trend Compendium 2030, and occasional studies by individual academics like the presentation at the Silicon Valley Energy Summit by Stanford's Mark Gabriel. In this spirit, the following essay will point out five megatrends that will affect the energy sector in the long-term and are worthy of further, rigorous research. These range from global megatrends with indirect effects on the energy sector to sector specific issues. The megatrends in the spotlight of this article are: demographic change, resource scarcity, decarbonization, digitalization, and globalization.

<u>Demographic Change</u>

The world population is growing. According to the United Nations (2017), the world population will reach 8.6 billion by 2030 and 9.8 billion by 2050. While life expectancy and lower birth rates in the developed country lead to an ageing of the population, societies in the developing world will see young work forces and the bigger share of global consumers. This population growth goes in hand with further urbanization. In 2005, the global population in cities surpassed the rural population and by the year 2030, 60% of the world population will live in cities, rising to almost 70% by 2050 (UN 2014).

Demographic change is a cross-sectional megatrend that is not unidirectional and will affect the energy sector in different ways. Older populations in developed countries, for example, will require new forms of assisted living that can be met with smart homes that enable new forms of consumer energy market design. Urban populations will be more susceptible to new forms of mobility, either through mass transport solutions or individual autonomous vehicles. The shorter distances in cities also fit better into e-mobility models. Combined with decentralized energy production in rural areas, demographic change has the potential to fundamentally change current consumer energy market designs towards decentralized and/or prosumer set-ups.

<u>Resource Scarcity</u>

With the global population growth, energy demand is increasing. While primary energy consumption in OECD countries is projected to remain stable due to increased efficiency and the deployment of renewables, primary energy consumption in non-OECD countries is projected to rise significantly from 54% of total world energy use in 2010 to 65% in 2040 (US EIA 2013).

The new demand from developing countries needs to be met in different ways. It is unclear what the future of transport in countries as diverse as China, India or Indonesia will look like and how the higher demand in electricity for home appliances will be met in these places. Either way, the International Energy Agency (2017) leaves no doubt that China will be the trendsetter and

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influence the direction of travel in the standards of mobility and future energy systems design.

At the same time, new technologies in developed countries increase energy demand. Shehabi et al. (2016) estimate that in 2014, close to 2% of total US energy consumption can be credited to data centres, with an overall consumption of 70 billion kWh. This is just under the electricity consumption of Finland. Advances in information technology will further increase demand in this area.

The International Energy Agency (2017) estimates a global increase in energy demand of 30% by the year 2040. While the so called "shale revolution" brought an end to the debate about peak oil, most of the increase in global energy demand will be served by the expansion of renewable energy. This expansion, however, has the potential to lead to further bottlenecks in scarce resources like rare earth minerals (USGS 2015).

Decarbonisation

Even though questions about a global energy transition to renewable energy sources remain unanswered, the reality of climate change made decarbonisation a necessity that has seen its most important manifestation so far in the UNFCCC Paris Climate Agreement. The agreement establishes the link between greenhouse gas emissions and climate change in an international political forum and encourages the signatory parties to significantly reduce their carbon emissions.

Even though decarbonisation is a megatrend driven by conscious decisions, there is no clear-cut direction. In the field of transport, e-mobility is on the way forward but still lacks the scale needed for global dominance. And while the International Energy Agency (2017) projects the highest growth in newly installed energy capacity to come from renewables, the push-back by non-conventional fossil fuels as well as the increase in LNG trade is significant. The same question is valid for carbon emissions trading schemes that have already been introduced by the 1997 Kyoto protocol but still lack behind their potential - not to mention the lack of relevant carbon tax schemes.

While researchers and activists are working towards the goal of "deep decarbonisation," (e.g. Rockström et al. 2017; Deep Decarbonization Pathways Project ), the political will is not fully secured at this point in time. Though once renewable energy is competitive enough to not only capture the growth in energy demand but also to replace fossil fuels, decarbonisation will accelerate exponentially.

Digitalisation

The advent of new information technologies and the increase in digital solutions affects the energy sector in two ways. It has already been said that the exponential growth in computational power leads to higher energy consumption. But on the other hand, new digital solutions open up new venues in terms of market design and business models. This could encompass smart metering and the possibilities that arise from this such as more efficient energy usage by smart home appliances within the internet of things.

Digitalisation might also enable a further decentralisation of energy networks that include peer-to-peer energy trading and optimised storage of surplus energy from renewable sources. At the same time, artificial intelligence will give new insights into the big data that are created from such smart appliances and facilitate the development of new products that due to their scalability do not require profit margins at today's levels.

Globalisation

The final megatrend that I want to mention here is globalisation. While this seems an obvious choice, it has the potential to disrupt energy markets at an unforeseen scale. The digital connectivity across the globe has the potential to transform communication and trade. The increase in LNG trade is one obvious result of the globalisation in global shipping but there are more fundamental changes to expect from globalisation.

Energy networks in the future might cross borders more regularly than they do now which could enable large scale offshore wind power investments along international coastlines. At the same time, energy companies and utilities will have to further internationalise as can be seen with recent attempts by Chinese state companies to enter the British and German markets. Such new and diverse players will make market predictions more complex and also shape new rules and norms in a further globalised environment.

## Conclusion

This list of five megatrends in the energy sector is not meant to be exhaustive. It rather sets a starting point for further research into megatrends and how they interact and shape the future of the global energy system. With megatrends like demographic change, resource scarcity, decarbonization, digitalization, and globalization, there should be plenty of questions on the research agenda to account for the complexities to come.

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## DISCLAIMER



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**The Inaugural Energy Policy Dialogue – Canberra, Australia**

***EUCERS together with the Konrad-Adenauer-Stiftung in Australia and Climate-KIC Australia organised a conference on the topic of "Global Energy Security and Climate Change in Australia, Europe and the Asia-Pacific Region. The conference took place in Canberra over two days, from 26. – 27. March 2018.***

On 26. March 2016, the Inaugural Energy Policy Dialogue organised by EUCERS, the Konrad Adenauer Foundation and Climate KIC Australia commenced with a dinner discussion. The event was opened by Dr Beatrice Gorawantschy, KAS Director Regional Programme Australia and the Pacific who welcomed the guests before giving the word to HE Dr Anna Prinz, Ambassador of the Federal Republic of Germany for a few words of welcome.

The keynote speeches were chaired by Professor Friedbert Pflüger, Director of EUCERS, King's College London who said a few words on Australien-European cooperation and the discussion to follow on sustainable, affordable and secure energy. The keynotes were given by Dr Kerry Schott AO of the Chair of the Energy Security Board (ESB) Australia, Dr Joachim Lang, Director General, Federation of German Industry (BDI) and Carsten Müller, Member of the German Federal Parliament, Chairman of the Parliamentary Circle "Energy Efficiency", Chairman of the German Industry Initiative for Energy Efficiency.

The dinner discussion focused on energy transitions and the experiences from an Australian and European perspective. Challenges for an energy transition in Australia that were discussed included the lack of interconnections available in the Australian energy market. The energy resource coal was another important focus in the discussion, as it is abundant and relatively cheap in Australia. However, the ageing of existing coal generator fleet was discussed as a potentially supporting factor to make the phase-out of coal reality by 2015. Another supporting factor for the transition in Australia is the falling cost of renewable energy with a further downward trend. Already today, half of the households in Queensland have rooftop solar panels. While this is a success in introducing green energy, it also poses a challenge to networks as the grids need to be renewed. One initiative that is to help with the challenges posed by the grids is the introduction of Smart Meters. It is predicted that by 2050 every household in Australia will have a smart meter.

Another point of discussion was the necessity of an international level-playing field to overcome domestic challenges to energy transitions and in order to meet targets set by the Paris Agreement. National policies can no longer work isolated, a global approach is needed.
For example, Germany aspires to achieve a share of 80-95% renewable energy in its energy mix by 2050. An ambitious target which needs an additional investment of 1.5 trillion Euro to be realised. Synthetic fuels can help achieving this goal. These synthetic fuels can possibly be imported from Australia as prospects for development are good and the relationship between Germany and Australia has developed well in the last five to six years.

After the keynote remarks a discussion with participants followed, where the above topics were further explored.


The Inaugural Energy Policy Dialogue – Conference 27.3.2018

The one-day conference was opened by Dr Beatrice Gorawantschy, KAS Director of the Regional Programme Australia and the Pacific and Professor Stuart White, Director of the Institute for Sustainable Futures, University of Technology Sydney and Board Member of Climate - KIC Australia.

The first panel focused on the challenges for a comprehensive energy security strategy in
Australia, Europe and the Asia-Pacific Region. The panel was chaired by Christoph von Speßhardt, Director Public

Affairs & Strategy Knauf Group, Vice Chairman of the German Industry Initiative for Energy Efficiency. Panel speakers were HE Patrick Suckling, Ambassador for Environment, Department of Foreign Affairs and Trade, Australia Carsten Müller, Member of the German Federal Parliament, Chairman of the Parliamentary Circle "Energy Efficiency", Chairman of the German Industry Initiative for Energy Efficiency, Caroline Lambert, Climate and Environment Counsellor, Delegation of the European Union to Australia, Prof Brahma Chellaney, Professor of Strategic Studies, Centre for Policy Research, New Delhi and Tony Wood, Energy Program Director, Grattan Institute. Dr Vlado Vivoda, Research Fellow, Sustainable Minerals Institute, University of Queensland commented on the panel. Key findings of the first panel were that cooperation between Australia and Europe in the field of energy security and energy efficiency is met with great interest and offers various opportunities in regard to the transition from conventional to renewable energy resources.

The second panel discussed climate and resource security: How does climate change affect the political landscape in Australia, Europe and the Asia-Pacific Region and was chaired by
Dr Paul Burke, Fellow, Arndt-Corden Department of Economics, Crawford School of Public Policy, Australian National University. The speakers of the second panel included Kane Thornton, CEO, Clean Energy Council, Dr Peter Röttgen, Executive Director, German Renewable Energy Federation, Colonel Ian Cumming, Defense Climate and Security Advisor,
Dr Paul Barnes, Head of the Risk and Resilience Program, ASPI and Associate Prof Llewelyn Hughes, Crawford School of Public Policy, Australian National University and researcher, Energy Transition Hub. Carola Logan, Operations Coordinator, EUCERS, King's College London commented on the panel. In summary, the second panel clarified the need for more attention to the security dimension of climate change, as there is still no international consensus on the topic and the Paris Agreement only mentions it in terms of food security. Climate change causes challenges to security such as rising sea levels to mega cities, draughts and heatwaves are a driver of diseases, to just name a few.

The third and final panel looked at the digitalisation of energy and cyber security and discussed opportunities and risks of the digitalisation of energy. Prof Friedbert Pflüger, Director, EUCERS, King's College London chaired the third and final session. Speakers of the third panel were Dr Frank Umbach, Research Director, EUCERS, King's College London,
Jeff Connolly, CEO of Siemens in Australia and Fergus Hanson, Head of International Cyber Policy Centre, ASPI. In the third panel, key findings included that we currently do not have the appropriate skills to deal sufficiently with cyber security threats. The threat to the energy sector is immense because every critical energy infrastructure is connected to the internet and reliant on stable electrical supplies. Large scale cyber-attacks require a more active government response because handling these falls outside of capabilities of most companies. Finally, it was remarked that there is also no international stance on cyber security and more cooperation is needed.

The conference was concluded by Dr Peter Hefele, Head of the Regional Project Energy Security and Climate Change in Asia and Pacific (RECAP) based in Hong Kong and Acting Representative to Mongolia and Prof Friedbert Pflüger, Director, EUCERS, King's College London.

The two-day conference brought together selected government, business and academic representatives from Australia, Europe and the Asia-Pacific region to discuss different perspectives for a comprehensive energy security strategy. During the conference we had fruitful exchanges and participants in the dialogue programme confirmed that an energy policy discourse with an energy and climate security focus is not only relevant, but also highly topical. We therefore hope to build upon the discussions and continue the energy policy dialogue in the future.

## ANNOUNCEMENTS

**2nd KAS/EUCERS Energy Talk**
**Africa: Climate Change, Security and Violent Conflict.**

13 June 2018
14:00 - 16:00 followed by a reception
Anatomy Museum, Strand Campus, King's College London WC2R 2LS

The second energy talk in the 2018 series, jointly hosted by Konrad Adenauer Foundation in London and EUCERS, will examine the link between climate change and human security in Africa.

Programme

14:00 Welcome Address and Introduction
**Professor Dr Friedbert Pflüger**, Director, EUCERS, King's College London
**Felix Dane**, Director London Office, Konrad-Adenauer-Foundation (KAS)

Introductory Statements by
**Harriet Edwards**, Senior Policy and Advocacy Adviser, UNICEF
**Brendan Bromwich**, PhD Candidate, Department of Geography, King's College London
**Dr Frank Umbach**, Research Director, EUCERS, King's College London

Comment by
**Dr Moses Ekpolomo**, Director, Energy Industry Research, ESIRGroup

15:00 Discussion
16:00 Reception

In order to attend the event please register by filling your name and affiliation on the sign-up sheet (https://bit.ly/2kiUFEF ).

By signing up, you agree to be added to our list of attendance distributed on the day. If you have any further questions or would not like to appear on the list of attendance, please contact Simon.Chin-Yee@kcl.ac.uk.

## EUCERS ON THE ROAD

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|---|---|
| 26.-27.04.2018 Luxembourg | Frank conducted a second training course of „The (EU)-Security Union: Cybersecurity“ for employees of the European Parliament in Luxembourg, organised by the European Parliament and the European Institute of Public Administration (EIPA). |
| 16.-18.04.2018 Natolin/Warsaw, Poland | Frank taught a block-seminar to “EU External Energy Governance” at the EU-College at Natolin/Warsaw |
| 12.-13.04.2018 Munich, Germany | Frank gave a presentation on “Deutsche Energie- und Sicherheitsstrategie gegenüber Russland” (“The German Energy and Security Strategy towards Russia”) at the bilateral German French Conference: „Bayerisch-französischer Dialog über Europa. Europa(politische)-Konzeptionen in Frankreich und Deutschland “, organised by the Hanns-Seidel-Foundation (HSS) and Le Centre d’information et de recherche sur l’Allemagne contemporaine (CIRAC). |
| 10.-11.04. 2018 Gammarth, Tunisia | Frank gave a presentation on “Enhanced Connectivity in the Energy Sector” at the international conference: “China‘s Belt and Road Initiative: The Return of the Silk-Road to the Mediterranean“, organised by the Konrad Adenauer Foundation (KAS)-Tunesia. |
| 28.03.2018 Melbourne, Australia | Friedbert gave an opening statement at the EU-AUS Energy Policy Dialogue, jointly organised by the Konrad Adenauer Foundation, Climate KIC Australia and EUCERS. |
| 26.-27.03.2018 Canberra, Australia | On 26. April, the Inaugural Energy Policy Dialogue: Australia, Europe and the Asia-Pacific Region, jointly organised by the Konrad Adenauer Foundation, Climate KIC Australia and EUCERS, began with a dinner discussion. Friedbert chaired the event. The following day, Friedbert chaired the third panel of the dialogue, focussing on “The digitalisation of energy and cyber security: Opportunities for digitalisation or energy at risk?” |
| 26.03.2018 Sydney, Australia | The AHK Sydney and international law firm Bird & Bird organised the Business Breakfast Forum where Friedbert gave a statement on Europe’s transition from a carbon- and nuclear-driven energy market to a low-emission economy and the related challenges such as energy security. |
| 24.03.2018 Brisbane, Australia | Friedbert spoke at a dinner discussion organised by the Konrad Adenauer Foundation and University of Queensland about current challenges in energy policy. |

## PUBLICATIONS

Umbach, Frank, "'Capacity Markets' Must Remain Technologically-Neutral", EURACTIV, 3 April 2018 (https://www.euractiv.com/section/electricity/opinion/capacity-markets-must-remain-technologically-neutral/).

Umbach, Frank, "The EU's Gas Directive and New Energy Security Challenges of the EU", CEEP-Newsletter, 23 March 2018 (https://www.ceep.be/gas-directive/).

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