Energy and Economic Growth
Applied Research Programme

Research and Matchmaking Conference Report

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UKaid
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Oxford Policy Management

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List of abbreviations

CEGA	Center for Effective Global Action
CSIS	Center for Strategic and International Studies
DFID	Department for International Development
GDP	Gross Domestic Product
EEG	Energy and Economic Growth
EEG PD	Energy and Economic Growth Programme Director
EFEWEE	Empowering Women Through Electrification
ESMAP	Energy Sector Management Assistance Programme
FOSTER	Facility for Oil Sector Transparency and Reform
GDP	Gross Domestic Product
GOGIG	Ghana Oil and Gas for Inclusive Growth
GW	Gigawatt
kWh	Kilowatt-hour
MCC	Millennium Challenge Corporation
M&E	Monitoring and Evaluation
OPM	Oxford Policy Management
SoK	State-of-Knowledge
T&D	Transmission and Distribution

1 Introduction

On November 3rd and 4th, 2016, the Applied Research Programme on Energy and Economic Growth (EEG) held an inaugural Research and Matchmaking (R&M) Conference in Washington, DC. It brought together over 100 participants, including top level policymakers from Africa and Asia, renowned researchers from around the globe and other energy practitioners. Participants discussed what is currently known (and not known) about the relationship between energy and economic growth—along with a few ideas about how EEG research, and shared ideas about how the EEG programme can help guide the development of large-scale energy systems that foster economic growth.

The EEG programme, sponsored by the UK Department for International Development (DFID) and implemented by Oxford Policy Management (OPM) and the University of California - Berkeley, explores the relationship between energy and economic growth in low-income countries, with a focus on Sub-Saharan Africa and South Asia.

The R&M Conference follows on from two Policy Engagement Workshops, the first in Dar es Salaam in July and the second in Kathmandu in September. After this initial agenda-setting year, the programme will fund a large portfolio of rigorous research designed to shift energy consumption and pathways towards a more sustainable, efficient, and equitable paradigm.

This R&M Conference was a call to action – an opportunity to take stock of the key players in this space, the resources and insights we each bring, and the ways in which we can collaborate to achieve the greatest possible impact. Importantly, EEG emphasises the active engagement of policymakers, researchers and practitioners in the co-creation of research to ensure maximum relevance and impact. The event was designed to facilitate focused and productive discussion among participants, and to generate insights that will inform the development of the EEG research agenda in years 2-5 of the programme.

Over the two days, panel discussions were hosted relating to each of the six EEG Themes:

1. Linkages between electricity supply and economic growth
2. Financial and policy instruments for encouraging appropriate large-scale power infrastructure
3. Supply and efficiency measures in supporting sustainable urbanisation
4. Constraints to the use of large-scale renewable energy sources
5. Extractives for electricity provision and sustainable development
6. Appropriate design of larger-scale, centralised energy infrastructure

For each theme, a Research Panel was held, in which researchers presented a series of State-of-Knowledge (SoK) papers. This was followed by a Policy Panel Discussion, in which policymakers, practitioners and audience members provided feedback on the SoK papers[1].

The following section summarises the early lessons learnt from the R&M conference. Section 3 provides a more detailed description of the feedback from the Policy Panel Discussions on each theme. Section 4 discusses the priority research areas and partnerships that emerged from the R&M conference. Section 5 outlines how the EEG network has expanded. Section 6 concludes with an explanation about how the conference was planned and resourced.

[1] Details on the resourcing and planning for this conference are included in Annex A. Annex B includes the R&M conference agenda and Annex C the list of participants.

2 Early lessons and feedback on SoK papers

The EEG R&M Conference was a valuable opportunity to solicit feedback on draft SoK papers, and openly discuss how best to translate key findings into research. With complete drafts due one month before the conference (September 30th), and final drafts due two months afterwards (December 31st), the timing was ideal for authors to receive input from a diverse audience. It has further allowed authors to consolidate—and weigh—feedback from formal peer reviews (which were due in late October), with in-person comments from participating academics, policymakers, and donors.

The event provided the following forums for discussing papers: 1) question & answer sessions following each 15-minute paper presentation, 2) panels of policymakers, organized by Theme, which centred on the same topics addressed in the papers, 3) breakout sessions focused on distilling lessons from the papers, and 4) informal networking opportunities throughout the two-day event (including the conference dinner on Day 1).

Feedback on the papers was varied in content and quality; academics were quick to point out sections of the literature that were missing under each theme, while policymakers responded by discussing the unique challenges they face in their countries and regions (particularly with respect to infrastructure and regulatory constraints). Carefully selected Discussion Leaders were charged with facilitating the policy panels, which helped to keep the conversation focused and productive. Feedback delivered during the policy panels (which the team captured in the form of extensive notes) was particularly valuable, as it has provided critical context for prioritizing and operationalizing our EEG research questions.

In general, the majority of SoK papers submitted meet a high standard of rigor. The results of the formal peer review process reflects this: of the 32 reviews we've received (out of 34 requested), 22 reviewers recommended only minor revisions. The rest (10) recommended more significant revisions, but provided detailed comments as for how the draft can be improved. Currently, the EEG team is working with Theme Leads to ensure that authors take this feedback seriously and revise their drafts in time. We recognize that some of the reviewers were delivering feedback that was not blind, as the theme leads were also paper authors, and that norms on reviewing criteria may vary across disciplines (e.g., a "revise and resubmit" is a positive recommendation in economics). We nonetheless think the overall positive nature of the reviews is encouraging.

3 Feedback from policymakers

This section summarises the feedback on the SoK papers provided during Policy Panel Discussions. One panel discussion was held per theme.

3.1 Theme 1: Linkages between electricity supply and economic growth

Need to disentangle the impact of electricity from other factors of growth

Panellists and audience members in the Theme 1 Policy Panel Discussion emphasised the importance of isolating the impacts of electricity from other factors of growth (transport, etc.). Dr Swarnim Waglé, from Nepal's Energy Planning Commission explained inadequate electricity supply has indeed constrained growth in Nepal, but without accounting for the numerous other constraints to growth, one cannot isolate the specific impact of energy supply, prices, reliability, etc. Isolating this impact is important to policymakers when deciding on how to allocate limited budgets.

'I wouldn't make a policy choice based on correlation between GDP and electricity,' explained Mr Sharma. 'I know that. The question is what marginal benefit you get from each extra dollar spent?'

Prof Joyashree Roy concurred, 'Why are we reinventing the wheel? We know that electricity is needed. Let us start with the question, what can we do to make sure that each dollar spent maximises return?'

Need for focus on the demand-side determinants

Some commentators felt that although the SoK papers provided a good summary of the evidence regarding the relationship between electricity supply and economic growth, further focus was needed on the demand side. We need to understand the demand for electricity, explained Mr Suman Sharma, Senior Secretary of the Government of Nepal. Demand is not static. How can other sectors absorb electricity as part of their development process?

Prof Roy, Professor of Economics at Jadavpur University, explained that the impact of electricity on growth will depend on the structure of the economy – is it manufacturing, services or agriculture-based?

Need to consider other benefits of electricity, besides growth

Prof Adeola Akenikinju, Director of the Centre for Petroleum, Energy Economics and Law at the University of Ibadan, said that the impact of electricity on economic growth is not the only evidence that policy makers are interested in to support policy decisions. Electricity also impacts other policy objectives like regional balanced development, employment, gender equality, poverty, etc. These other factors cannot be captured through the single variable of economic growth.

Dr Govinda Timilsina, Senior Economist at the World Bank, agreed that we need to consider the relationship between energy and welfare, but conceded that these impacts are harder to quantify.

Another audience member asked how the impact on the informal sector might be taken into account, for example, in the consideration of electricity on labour hours.

Prof Akenikinju was also interested in the inclusivity of the economic growth impacts. How do we prioritise energy investments among different consumers of electricity? Do you prioritise residential

consumers over industrial ones? Do you prioritise rural consumers over urban ones? Do we prioritise specific sectors?

Lastly, Dr Margaret Matinga cautioned that many of the benefits of electricity may accrue over a long period of time, potentially generations. For example, women who grew up in households that had more electricity are much more empowered, though impacts on their parents' generation were minimal. Longer term impacts are so ingrained in the fabric of society that they are often not reflected in studies.

3.2 Theme 2: Financial and policy instruments for encouraging appropriate large-scale power infrastructure

The costs, benefits and political and regulatory challenges of power sector reform

Ms Catrina Godinho's presentation of her joint paper with Anton Eberhard on Rethinking Power Sector Reform sparked a debate on the benefits of power sector reform.

Mr Mohammad Arbaaz Nayeem, a Principal Consultant at Ricardo Energy & Environment, questioned whether the evidence is established that an unbundled power sector leads to the anticipated benefits. He pointed out that many integrated companies operate just fine, and asked whether performance of a power sector was more about the institutional strength, rather than whether it is integrated or unbundled.

Ms Godinho countered that South Africa's utility Eskom, a public monopoly, is extremely inefficient and ineffective. A lot of the mismanagement, she said, has to do with the politics of managing a big utility: their connection to the political elite enables rent seeking. She agreed that we do need to consider the strength of institutions, but not just formal institutions (courts, property rights, etc.); we also need to think about the informal institutions that govern society in a real political way.

Once audience member asked whether there are ways of decoupling politics from the power sector.

Mr Syed Rizwan Mahboob, the Prime Ministerial Focal Point on Climate Change of the Government of Pakistan, responded that in Pakistan there is a belief that power sector reform is bigger than just basic service delivery. It would be difficult, and perhaps undesirable, to delink power sector reform from politics. Whenever power sector reform is taken up, the starting point is the road map. Then policymakers sit back. The regulating part is trickier. The political drive often dries up when it comes to the nitty gritty of delivering.

Prof Catherin Wolfram explained that the standard model of power sector reform is meant to lead to competition, but competition is not an end to itself. It is meant to generate better performance. She asked whether there are alternatives to power sector reform, such as better training for regulators.

Mr Abhishek Jain suggested that an interesting research project would be to explore the evidence of how effective independent regulators are in practice. Another audience member asked, how do you prevent the regulatory agency from being politically captured?

Some also pointed to the challenge of obstructionist state unions. In Nepal, Mr Sharma explained that there has not been a champion to carry out reforms, and the unions are against reform. He said that response must be to create an element of competition outside of utilities that pushes them to keep up.

Debate over the political nature of development aid

Dr Neil McCulloch's paper, The Political Economy of Aid for Power Sector Reform, also sparked debate. He asserted that development organisations need to operate in a more politically savvy manner, incorporating political economy analysis in their programming.

An ex-World Bank audience member countered that donors do conduct political analysis, and help build coalitions, etc. but they do not talk about it openly. Why? If you work for a multi-lateral donor, and you do political analysis, you are doing political analysis on your shareholders, and could get into trouble by being candid. If you are working as a bilateral donor, you are working in the context in a bilateral government relationship. He asked, how can you get donors to be more candid in these contexts?

Another audience member asked how the increase in Indian and Chinese funding has changed the political economy of aid in the context of power sector reform, particularly as China provides funding in a partnership model, bringing business, etc. Dr McCulloch responded that Chinese and Indian aid has loosed the influence of Western donors, and that as a consequence, Western aid agencies are starting to operate in a similar partnership model.

3.3 Theme 3: Supply and efficiency measures in supporting sustainable urbanisation

Are there trade-offs between access and reliability?

A number of policymakers and practitioners felt that there was a trade-off between access and reliability. Dr Kofi Marfo, Director of M&E and Economics at the Millennium Development Authority in Ghana, questioned whether infrastructure improvements can improve reliability and accessibility at the same time. He argued that accessibility and reliability need to be considered hand-in-hand during policy reforms.

Mr Samson Ondiek, Chief Officer at Kenya Power, argued that policymakers need to consider that outages are a necessary by-product of expanding access to new customers. 'How would you connect new customers without putting off old customers? We're trying to increase the rate of electrification so we have frequent rates of planned outages.'

Solutions to reliability issues

Mr Ondiek also argued that poor reliability is generally the result of network mismanagement and T&D infrastructure, not supply: 'We have a loss level of 20%. Supply isn't the problem. Lots of [low-income countries] are building and increasing supply. But distribution is the problem. The network is the problem. We need to be focusing on network upgrades.'

In contrast, Ms Nameerah Hameed, Policy Specialist at the Energy Department of the Government of Punjab, stated, 'In Pakistan the reason for outages is there's a gap between supply and demand, and for that reason, we're putting up lots of power plants.' She explained that her government is working to address unreliability on both the supply side and demand side. On the supply side, it is rapidly commissioning power plants. On the demand side, it has created a strategy and agency focused on energy efficiency. It is implementing energy efficiency building codes and appliance standards for items like fans.

Ms Hameed suggested that an additional area for research would be consumer perceptions and understanding of how energy savings related to financial savings.

3.4 Theme 4: Constraints to use of large-scale renewable energy sources

Institutions and policies for enabling renewable energy investment

Prof Sam Fankhauser pointed out that a low-carbon power sector will require very different institutions to a conventional one. Increased intermittency from wind and solar, for example, will require that a premium is given to capacity. Mr Jain commented that the Theme 4 research papers should focus more on strategies to manage grid intermittency.

Prof Fankhauser pointed out that renewable technologies also have different financing profiles, with higher capital costs and low operating costs, requiring different relationships with financiers whom are risk averse. Dr Feng Song, from Renmin University in China, described a number of the policies that China has applied to overcome these financial challenges and successfully increase its installed wind power capacity from 1 GW to 145 GW. These policies included, most notably, a wind concession programme from 2003-2008 and a feed-in tariff policy from 2009.

Mr Moses Murengi, from Uganda's Ministry of Energy and Mines, argued that given the high capital costs of renewables, the SoK paper should have placed further attention on currency risks and political risks, which dissuade investment in developing countries. Mr Nayeem suggested that development partners could help by providing investment and loan guarantees for political risks foreign exchange fluctuations, as most countries do not have these resources in country.

The cost and low-capacity factors of renewables

The Discussion Leader of the Policy Panel Maureen Cropper, Professor of Economics at the University of Maryland, questioned how the levelised costs of electricity from renewables compare to other types of generation. She asked whether they were competitive or depended on government intervention to overcome negative externalities, such as climate change, air pollution and associated health problems. She suggested that the latter externalities could be solved through technological solutions, like scrubbers, at little cost, so the comparison should be between renewables and coal power, once you have scrubbed, along with the outstanding climate externalities.

Prof Mario Ragwitz, Deputy Head of the Energy Policy and Energy Markets Department at the Fraunhofer-Institute for Systems and Innovation Research, pointed out that if countries are to comply with the Paris Agreement, they must price the climate-related externalities of fossil fuels. He also argued that renewables have reach grid parity in some regions. In auctions in Spain, for example, wind has been sold with zero additional premium. Mr Jain added that in Dubai, bids for solar PV are coming in at under 4 cents per kWh.

Prof Cropper also suggested that given the low capacity factors of wind and solar, India is going to have three-quarters of its electricity generated by coal even if it meets its ambitious renewable targets, so despite climate commitments, coal is here to stay.

Prof Frank Wolak agreed that it is certainly a possibility that alongside an increase in renewables, we will also see increased coal use, because dispatchable generation is needed to back up intermittent renewables. In the developing world, he said, coal is ubiquitous and cheap to extract. Without import-export facilities for natural gas, etc., coal is very attractive. Mr Murengi countered that most of Africa has actually always been based on renewables, particularly hydro and geothermal.

3.5 Theme 5: Extractives for electricity provision and sustainable development

Dependency of fuel exports, Dutch Disease, Resource Curse

The panel discussion on extractives focused largely on some developing countries' dependency on fuel exports. In his SoK paper presentation, Prof Michael Ross, from the University of California Los Angeles, explained that it is difficult to determine which countries are becoming more or less dependent on fuel exports, and at risk of "Dutch Disease" and the Resource Curse. An audience member suggested that rather than focusing on the resource curse, research should focus on the steps needed to diversify economies, for example, favourable tax regimes for the manufacturing sector.

Dr Timothy Okon, Advisor to Nigeria's Ministry of Petroleum, explained that in Nigeria, the state and the political elite reinforces its dominance by allocating proceeds from resources. He and Yakubu 'Lai' Yahaya, from Nigeria's Office of the Presidency, both argued that without political pressure, it is highly unlikely that a fossil fuel dependent nation will see reforms, as it would be too politically painful to those that try to pass them. However, both also felt that reform was possible if governments were compelled. To this end, Mr Yahaya argued that donors play a key role in applying pressure for reform.

Harnessing fossil fuels for electricity

The Policy Panel also questioned how petrol rich countries can harness their resources for electricity purposes: how are countries like Nigeria and Ghana facing such serious electricity shortages given their wealth of resources?

Dr Joseph Essandoh-Yeddu, Acting Director of Strategic Planning & Policy at the Ghana Energy Commission, argued that they are harnessing their resources to some degree. Ghana is producing gas power at 4 cents per kWh. However, he explained, that retail is the weak link in value chain, and suggested that an interesting research project would be to explore opportunities to correct it.

3.6 Theme 6: Appropriate design of larger-scale, centralised energy infrastructure

How can we improve demand forecasting as a tool for policymaking decisions?

A common topic in the Theme 6 Policy Discussion was demand forecasting. Dr Luis Munuera, the Smart Grids Technology Lead from the International Energy Agency explained that historically, demand was projected based on GDP. With innovation in censoring technologies, such as smart meters, that allow utilities, etc. to monitor end users' timing and sometimes purpose of energy consumption, we now have a better understanding of the factors that drive demand, which can feed into forecasts, planning and policy incentives.

Gareth Walsh from the Africa Governance Initiative explained that there are two approaches to planning: (1) government target-based planning, and (2) least cost investment planning, based on a demand forecast. He contended that demand forecasts take between 12-18 months to produce and often get thrown out because they fail to gain consensus. Mr Walsh felt that valuable area for EEG to focus on would be demand forecasting. A really good database, like Prof Vijay Modi presented in the Researcher Panel, would be useful in explaining demand projections to utility managers and ministers.

Decentralisation and/or increased interconnection?

A common theme in many of the policy panel discussions was the disruptive impact that renewable energy technologies might play on electricity systems. In the Policy Panel Discussion on electricity and economic growth, Mr Walters, Senior Advisor at Castalia, compared the power sector today to telecoms in the 1990s, both poised to be transformed by disruptive technologies that negate the need for interconnection. His comments were echoed by Prof Sam Fankhauser, in the Policy Panel Discussion on constraints to use of large-scale renewable energy sources, who questioned whether increased decentralised generation will make grids less essential and create a completely different market structure.

In contrast, in the Theme 6 Policy Panel Discussion, Dr Ahmad Kaikaus, Chairman of the Bangladesh Power and Energy Research Council, explained that seasonal variations and intermittency of some types of renewable energy can be mitigated through greater interconnection and regional cooperation. Small-scale solar-based systems, for example, are unreliable in regions with three months of monsoon. For this reason, Bangladesh is now deciding how to incorporate solar home systems into the main grid.

Mr Nayeem pointed out that transmission and interconnection is also important in transporting large-scale renewable electricity to markets. For example, electricity trade is essential in allowing Nepal and Bhutan to sell hydropower to India.

Dr Luis Munuera, the Smart Grids Technology Lead at the International Energy Agency, suggested that EEG could help bridge a knowledge gap by establishing a best practice methodology for low-income countries that are deciding how to balance efforts between building up larger scale generation capacity, upgrading national grids and developing interconnection between small-scale systems.

4 Priority research areas and partnerships for Part 2

The R&M Conference—and the inception year overall—has provided critical perspective to the EEG team with regard to the challenges faced by energy sector decision-makers in South Asia and Sub-Saharan Africa. It has further shed light on a number of opportunities to collaborate across sectors and disciplines – economics, engineering, political science, geography, anthropology and environmental studies – to generate rigorous, actionable evidence for policymakers. Conference participants largely agreed that rigorous, field-based research is needed to support energy policy decisions (rather than more theoretical, desk-based research).

Multi-disciplinary approaches to tackling some of the challenges identified through the eighteen SoK paper presentations and subsequent panel discussions are already emerging. For example, a discussion during the Theme 1 panel regarding the linkages between energy and economic growth naturally transitioned into a discussion about the role of clean tech innovation in promoting growth.

Another key theme to emerge was the question of distribution of benefits from investments in the energy sector. Several participants suggested that we hone our focus on inclusive growth, rather than limit ourselves to measuring GDP. Participants suggested that despite EEG's focus on large-scale energy systems, it is not enough for us to measure GDP growth. Rather, we must explore how the benefits of investments in large-scale energy systems are distributed across industries, geographies, and demographies (including gender, which is an important cross-cutting theme for EEG). In the context of this conversation, Magi Matinga suggested that we should avoid a top-down approach and allow consumers in the developing world to decide what the priorities of the development community should be. For instance, if consumers value certain electricity-consuming activities (e.g. electric ironing), then decisions about how to invest in large-scale energy systems should support this.

Throughout the conference, we learned of the critical role institutions play in catalysing benefits from energy investments. Paper 1.3 on Binding Constraints (authored by Dr McCulloch) demonstrated that electricity is the second most common binding constraint to growth, with corruption and governance being the most important. We further discussed the role of national and international policy, in particular the international climate treaty signed in Paris, and speculated as to how this may or may not affect the electricity sector.

Finally, it was agreed that knowledge gaps remain around how to attract necessary capital into the energy sector, how to enable public-private partnerships, how to finance renewables (a topic relevant to Themes 2 and 4), and whether the single-buyer model works. We are in the process of synthesizing these early impressions from the conference through follow-up conversations with our network, which will further inform the Research Framework for Part 2.

The EEG team is carefully tracking potential collaborations to emerge from the conference and policy workshops, which we hope will lead to full-scale research during Part 2. We have already had promising follow-up conversations with the Government of Punjab in Pakistan, the Government of Uganda, and the Millennium Challenge Authority in Ghana (among others) about co-creating research on energy and economic growth. In the coming months, as we receive final drafts of SoK papers and concept notes from Theme Leads, we look forward to developing a research agenda that reflects and supports the knowledge gaps outlined by policymakers and industry practitioners.

5 Expanding the EEG network

The conference was a valuable opportunity to consolidate and expand the networks that EEG has developed during Part 1. This section describes these outcomes in terms of policy networks, academic networks, and donor and private sector networks.

In each case, a description is provided of (a) the respective institutions and/or individuals, and the nature of their engagement with (and relevance to) EEG, and (b) opportunities emerging from the networks. Section 5.4 discusses the next steps and our strategy for keeping the momentum, which is currently being re-assessed.

5.1 Policy networks

The following summary describes the policy stakeholders in attendance, the reason or origin of their invitation, and their track record of engagement with EEG. Policy stakeholders include those representing governments, government-affiliated research institutions, and policy advisors. Several had attended the EEG policy workshops, and this conference was an opportunity to further consolidate the programme's relationship with them, as anticipated in the discussion of 'change agents' in the Research Uptake and Communications strategy.

- From **Nepal**, Suman Sharma (former Secretary of Energy) and Swarnim Wagle (National Planning Commission member). Mr. Sharma had delivered the keynote speech at the September workshop, and Mr. Wagle had met with the EEG team alongside that workshop. Both bring deep knowledge and experience of Nepal's energy sector from a public policy perspective, and an appreciation of the potential role of research in supporting policymakers. The EEG Research Director has since been in touch with Mr. Sharma to follow up on specific research questions and data sources.
- From **Pakistan,** Nameerah Hameed, Policy Advisor in the Department of Energy of the Government of Punjab in Pakistan spoke on a panel. Ms. Hameed works closely with Asad Gilani, Secretary Energy, who had attended the Nepal workshop and who had recommended Ms. Hameed to attend in his place for this conference as he had prior commitments. Rizwan Mehboob, Prime Minister's Focal Person on Climate Change, also spoke on a panel.
- From **Afghanistan,** Mo Qayoumi, Chief Advisor to the President on Infrastructure and Technology delivered a keynote speech on Afghanistan's energy strategy. Also representing the Government of Afghanistan was Abdul Azimi, Deputy Minister of Administration and Finance in the Ministry of Energy and Water. Mr. Azimi had been recommended by Zubair Fattahi, who had represented Afghanistan at the EEG South Asia policy workshop.
- From **Bangladesh,** Ahmad Kaikaus, Chairman of the Bangladesh Energy and Power Research Council spoke on a panel. Dr Kaikaus had been recommended to CEGA by their networks in the country, and is also collaborating with Ricardo Energy & Environment, also represented at the conference, on a project that is very relevant to EEG.
- From **Kenya,** Samson Ondiek, Chief Officer of Kenya Power. Mr. Ondiek had attended the EEG East Africa policy workshop. He has previously worked with Catherine Wolfram, EEG Research Director, and there are clear opportunities to build upon their previous work within the scope of EEG.
- From **Uganda,** Moses Murengezi, Advisor in the Ministry of Energy and Minerals Development. Mr. Murengezi had attended the East Africa policy workshop.
- From **Ghana,** Kofi Marfo, Director of M&E and Economics at the Millennium Development Authority (recommended by Millennium Challenge Corporation); William Sam-Appiah, Director

of Power Generation and Transmission at the Ministry of Power; Joseph Essandoh-Yeddu, Acting Director of Strategic Planning and Policy at the Ghana Energy Commission. Mr. Sam-Appiah and Dr Essandoh-Yeddu were recommended and connected to the EEG team through the OPM-led Ghana Oil and Gas for Inclusive Growth (GOGIG) programme.

- From **Nigeria,** Lai Yahaya, Advisor to the President of Nigeria (already within the EEG network, as described in the EEG Technical Proposal, and recommended by Gareth Walsh of the Tony Blair Africa Governance Initiative); Timothy Okon, Special Advisor to the Minister of Petroleum Resources (recommended by the OPM-led Facility for Oil Sector Transparency and Reform (FOSTER))
- Gareth Walsh of the **Tony Blair Africa Governance Initiative** spoke on a panel, following an introductory conversation with the EEG Programme Director. The AGI has strong relationships with African policymakers working on energy, and could contribute to the research agenda for EEG in Part 2.

5.2 Academic networks

Academic consortium partners of EEG involved in developing SoK papers who attended the R&M conference included **Australian National University**, **University of Exeter**, **Asian Institute of Technology**, **Heriot Watt University**. Several academic institutions beyond the EEG team (consortium, theme leads and paper authors) were also represented at the conference (including **Columbia University, Jadavpur University, University of California LA, University of Cape Town,** and many others). They provided feedback to the papers either as panellists or audience members. Discussions with the EEG team revealed various academic initiatives that align with the focuses and objectives of EEG (and many of whom have activities in, and data relating to, the EEG focal regions) and could be applicants for EEG funding in Part 2.

Dr Malcom McCulloch, The Co-Director and a Fellow from the **Oxford Martin Programme on Integrating Renewable Energy** (University of Oxford) attended the conference; the objectives and activities of this programme are highly relevant to Theme 4, and there are clear opportunities for collaborative research in Part 2. For a start, Dr McCulloch will peer review the Theme 4 concept note, as described in Section 5.4.

Southern research institutions were represented as follows:

- From **Myanmar,** Zaw Oo, Director of the Center of Economic and Social Development spoke on a panel. Dr Oo had been recommended by his colleague who had attended the EEG South Asia policy workshop.
- From **Nigeria,** Adeola Adenikinju, Director of the Centre for Petroleum, Energy Economics and Law at the University of Ibadan. He was recommended by OPM colleagues working on the FOSTER programme in Nigeria.
- Kassim Kulindwa of the **University of Dar es Salaam** had previously attended the EEG East Africa policy workshop
- Yonas Alem, Research Director of the **Environment for Development Initiative,** had also attended the EEG East Africa policy workshop and subsequently been discussing potential research collaboration with the EEG team.
- Feng Song of **Renmin University** (China) and Karin Kritzinger of **Stellenbosch University** (South Africa), both members of the EEG consortium, spoke on panels.

- Abebe Beyene of the **Ethiopian Development Research Institute** had previously attended the EEG East Africa policy workshop
- Magi Matinga, an independent researcher and consultant working on gender and energy, spoke on a panel, following her involvement with the EEG East Africa policy workshop. Magi has subsequently invited the EEG Research Director to attend a conference organised by the **Empowering Women Through Electrification (EFEWEE)** initiative, in New Delhi in December.

Several key US research institutions were represented - including University of Michigan, Tufts University, the University of Santa Cruz, Georgetown University, Columbia University, UC Berkeley, Duke University, Texas A&M University, and Dartmouth College.

Importantly, EEG will continue to expand its network to new academic partners that were unable to attend the Policy Engagement Workshops or R&M Conference, Our strategy for network expansion is covered in Section 5.4

5.3 Donor, think tank and private sector networks

Several representatives of the **World Bank** attended the conference, including the Lead Energy Specialist and representatives of the Energy Sector Management Assistance Programme (ESMAP). The EEG Programme Director discussed with EEG State-of-Knowledge 2.1 paper co-author **Catrina Goudinho** about her work on a World Bank-funded project on the political economy of energy in Sub-Saharan Africa, which could potentially be an opportunity for collaboration and co-funding in EEG Part 2.

The conference was hosted by the **Center for Strategic and International Studies**, which runs a programme on Energy and National Security. CSIS has valuable and prestigious networks in the U.S. and internationally, and in the build-up to the conference they linked EEG with these networks and made specific contributions in terms of recruiting high-level participants. CSIS have expressed interest in supporting EEG with research uptake. We will discuss this in the spring, as EEG could potentially benefit from their contacts in the energy sector, including private industry partners.

The Associate Director and Director of Evaluation at the **Millennium Challenge Corporation** attended the conference. This builds upon engagement with the MCC in preparation for the EEG South Asia policy workshop, where they provided valuable inputs on invitees and on the energy policy context in Nepal. EEG has been in touch with MCC Ghana about potential synergies in a new project focused on increasing electricity reliability in Ghana[2].

EEG consortium partners **International Energy Agency; Council on Energy, Environment and Water; Fraunhofer Institute for Systems and Innovation; Center for Global Development; Castalia** and **Vivid Economics** were represented in speaking roles at the conference. Other consultancies working on energy in the EEG focal regions, **Ricardo Energy & Environment** and **Valence Strategic**, also attended, the former with a role on a policy panel. The applied work of consultancies and think tanks is a valuable addition to academic research. These 'practitioners'

[2] The first phase would involve a deployment of GridWatch, an innovative mobile phone application developed at UC Berkeley to measure grid reliability using phone sensor technology. The second phase would leverage information from the GridWatch trial to inform regulator and utility decision-making.

tend to have strong connections with governments and other decision-makers in the focal countries and regions.

Major energy corporations including **Chevron**, **ConocoPhillips** and **Duke Energy** were represented at the conference. These are key actors in (and shapers of) energy policy and development more broadly.

5.4 Keeping the Momentum

EEG has generated significant momentum in its initial phase through the SoK papers, Policy Engagement Workshops and the R&M Conference. OPM is now producing a 'Keeping the Momentum Strategy', which will outline our plans to continue our engagement with high-level policy makers, industry practitioners and academics through the end of Part 1 and into Part 2 of the EEG programme. This strategy builds on EEG's Research and Uptake Strategy, submitted to DFID during Quarter 1.[3]

Our Keeping the Momentum Strategy is framed around the research uptake principles of co-creation; communication; and understanding policy, power and knowledge contexts. At each point, we will endeavour to:

- Communicate with and include academics, policymakers and practitioners in the EEG programme
- Expand EEG's networks to new organisations working in the energy space that were unable to attend the Policy Engagement Workshops or R&M Conference. New organisations could include, but are not limited to, additional energy-focused government bodies, universities and research organisations in the UK and developing countries, energy developers and consultancies and industry organisations, including for example, the UK Energy Research Partnership.

The preliminary steps planned in the Keeping the Momentum Strategy are as follows[4]:

1) Peer review of the thematic concept notes by policymakers and industry practitioners

- The concept notes, produced by the thematic leads, summarise the main knowledge gaps outlined by the SoK papers and propose a research agenda for Part 2. Each note will be peer reviewed by two policymakers and/or practitioners, including those listed in 5.1, creating an additional opportunity to co-create the Part 2 research agenda. A complete list of reviewers will be included in the third quarterly report.

2) Membership in the UK Energy Research Partnership

- The UK Energy Research Partnership (ERP) is a group of key funders of energy research, development, demonstration and deployment. Its aim is to provide leadership and enhance the coherence of energy research and innovation in the UK, set within an international context. ERP members include organisations across government, industry and academia across the UK, and it aims to increase its international presence. By joining the ERP as a

[3] A 'Keep the Momentum Strategy' will be submitted to DFID in early December, where we will present more details of the activities described below, and the extent to which they will be implemented/started during Part 1 of EEG.
[4] These are *preliminary* steps that we envision will take place, or at least get started, during Part 1 of EEG. However, they represent an initial phase in the translation of EEG research outputs into formats that are more accessible to policy makers and practitioners. During Phase 2, we envision the continuation of this process, which would ultimately lead to more specific outcomes at the policy level. This is currently being discussed and will be described in more detail in EEG's inception report.

member, EEG would expand its network to many of the most influential government and industry organisations working in the energy space. These organisations could act as a channel for peer review from an industry perspective, and open up channels for co-financing and research uptake. ERP events – plenary meetings, workshops, conferences and Leaders' Forums – could also provide valuable opportunities to disseminate EEG research findings.

3) A series of communications outputs from the SoK papers

- The workplan for the Research Uptake Strategy planned and budgeted for one working paper, blog post, or policy brief in March 2017. Our Keeping the Momentum Strategy proposes that three further outputs are produced between December and March: one webinar on energy and economic growth, and two additional written publications. These outputs will communicate the key messages from the SoK papers, Policy Engagement Workshops and the R&M Conference. They will be produced either by the EEG team or commissioned from an external provider. The outputs will be disseminated through the EEG network and to a wider audience, in attempts to expand our reach.

4) Direct engagement with policymakers and practitioners where there is potential for high impact, co-created research projects

- As outlined in Section 4, the EEG team has identified a number of potential research collaborations where there is both demand for research from a developing country government or practitioner, and potential for high-impact technology dissemination or evidence-based policy reform. Specific promising opportunities include partnerships with the Government of Punjab in Pakistan, the Government of Uganda, the Millennium Challenge Authority in Ghana, and Ricardo Energy & Environment in Bangladesh[5]. In order to fully leverage these connections for Part 2, EEG will continue to engage directly with these promising partners throughout the remainder of Part 1. If necessary and possible, EEG team members could visit them in-country to identify possible data sources, cultivate buy-in and develop high-quality proposals for Part 2.

[5] Details on this will be included in the Keep the Momentum strategy.

Annex A Resourcing and Preparation

Preparation for the conference occurred in the following phases[6]:

1. Decision on purpose and overall format

An agreement upon the objectives of the conference was informed by the EEG Terms of Reference, the EEG Research Uptake and Communications strategy, and discussions between the EEG Programme Directorate and DFID. A further step at this early preparatory stage was to confirm the budget available for the conference, and to provide an approximate division of costs based upon the budget division for the policy workshops available within the programme and OPM's experience in event management.

A concept note was prepared capturing the goals of the conference, a description of the overall number and mix of participants and an outline agenda (i.e.: describing the sessions but without naming speakers at this stage). The output of this stage was a concept note, a budget total, and an approximate total number of overall participants spread across the following categories: EEG researchers, EEG management and support team, other researchers not involved with the EEG programme, policy stakeholders, MDBs and donors, private sector.

2. Participant identification and initial outreach

The EEG PD created a shared document and a long-list of potential participants. CEGA provided most of the suggestions for academic participants, OPM provided most of the suggestions of policy participants and UK researchers, and they jointly provided suggestions for donors, consultancies and other categories. This list totalled about 160 individuals.

OPM undertook outreach to the following UK-based institutions and individuals: University of Exeter, University of Sussex, University of Oxford, University of Dundee, Vivid Economics and Ricardo Energy & Environment. Recognising that representation from UK-based entities can be improved, efforts to broaden and strengthen the EEG network in the UK are a priority for the EEG Programme Directorate in Quarters 3 and 4.

CEGA reached out to its US networks to identify a venue for the event. A short list of potential venues was identified based on criteria of cost[7], size and location: the UC Berkeley building, the World Bank, and the Center for Strategic and International Studies. The latter was selected because they agreed to waive the costs of the venue hire, improving value for money[8]. The excellent location and conference facilities were additional considerations.

The EEG PD collaboratively developed a detailed conference agenda and identified potential speakers for the policy panels. The weekly EEG PD calls were a key platform for planning.

[6] This section is complemented by the separate report detailing lessons learned from EEG policy engagement events in Part 1. EEG Policy Workshop Planning: Lessons Learned and Guidance, August 2016
[7] Most centrally located private venues in Washington D.C., such as hotel conference centres, were found to be too expensive.
[8] The savings were reallocated to increase the travel budget for participants from Sub-Saharan Africa and South Asia

The EEG PD began initial outreach to confirm key participants. The priority was identification of potential speakers, including the EEG paper authors. Contacts from the EEG policy workshops who had received an informal invitation to the event were also contacted at this stage.

3. Shortlisting participants, confirming roles and responsibilities, communications

A target number of 100 participants was defined primarily by venue capacity and budget. The participant long list of 160 people was divided into two 'rounds': a priority round of about 120 individuals, and a secondary round of about 40 individuals. Individuals could be transferred to the priority list if space was available, following invitation rejections. The criteria for placing people in the priority round were as follows:

- Ability to give a substantive contribution to the conference outcomes
- Overall balance of participant groups- with about 2/5 of participants being associated with EEG, we focused on approximately 1/5 representing policy stakeholders from Sub-Saharan Africa and South Asia; 1/5 representing researchers not associated with EEG; 1/5 representing donors, industry, consultancies.

OPM sent to shortlisted participants a formal invitation, the concept note (including the tentative agenda), and logistical guidance. In total approximately 160 invitation emails were sent out, and approximately 80 flight and hotel bookings were made by OPM[9].

In order to ensure that panellists were well prepared to give the desired contributions, briefing notes were prepared. CEGA shared guidance with EEG paper authors regarding the timing and format of their presentations, and organised phone calls with each of the discussion leaders. OPM prepared a guidance note for those participating in the policy panels[10].

OPM prepared various communications materials in advance of the conference. This included identifying and briefing a videographer; preparing an EEG banner; and, most significantly in terms of resourcing, producing a conference booklet including the agenda, biographies of all participants, titles of all papers, and information on the purpose of the conference and what types of engagement were expected from participants. The booklet can be downloaded here.

[9] See Annex C for a list of participants whose attendance was supported by EEG, and for a list of invited persons who did not attend
[10] See Annex D for documentation

4. Conference implementation

A detailed account of roles and responsibilities for the EEG team, indicating which people were responsible for what tasks in each session, was created in advance of the event as an Excel spreadsheet[11]. The roles included registration, note-taking, time-keeping and facilitating video interviews. Other logistical functions were fulfilled by CSIS staff.

[11] See Annex D

Annex B R&M Conference Agenda

Copies of presentations from the 6 keynote sessions and all paper presentations can be downloaded here, and have also been sent as an attachment. We have included the summaries of key note speeches in Annex E.

Day 1: Thursday, November 3rd, 2016 (9 am – 5 pm plus dinner)

Time	Activity	
8.45 AM	**Opening remarks** *Marcela Tarazona, EEG Programme Director, OPM*	
9:00 AM	**Welcome** *Sarah Ladislaw, Director of the Energy and National Security Programme, Center for Strategic and International Studies*	
9:10 AM	**Opening Remarks from EEG Research Director** *Catherine Wolfram, Cora Jane Flood Professor of Business Administration, UC Berkeley and Faculty Director, Energy Institute at Haas*	
10:00 AM	COFFEE	
	Session 1: Themes 1 & 6	
	Room A: Theme 1 Linkages between electricity supply and economic growth (Lead: David Stern)	**Room B: Theme 6** Appropriate design of larger-scale, centralised energy infrastructure (Lead: Vijay Modi)
10:15 AM	***Paper Presentations*** *Paper 1: David Stern* *Paper 2: Ken Lee* *Paper 3: Neil McCulloch*	***Paper Presentations*** *Paper 1: Luis Munuera* *Paper 2: Vijay Modi* *Paper 3: Vijay Modi*
11:25 AM	***Policy Panel*** *Discussion Leader: Govinda Timilsina, World Bank* *Swarnim Wagle, National Planning Commission, Government of Nepal* *Magi Matinga, Independent researcher* *Adeola Adenikinju, Centre for Petroleum Energy, Economics and Law, Nigeria* *Jonathon Walters, Castalia*	***Policy Panel*** *Discussion Leader: Paulina Jaramillo, Carnegie Mellon University* *Ahmad Kaikaus, Bangladesh Power and Energy Research Council* *Samson Ondiek, Kenya Power* *Arbaaz Nayeem, Ricardo Energy and Environment* *Gareth Walsh, Africa Governance Initiative*
12:30-2:00 PM	**Lunch / Keynote**	
1:20-1:50 PM	**Policymaker Keynote: Energy and economic growth: a policymaker's view** *Mo Qayoumi, Chief Advisor to the President on Infrastructure and Technology, Government of Afghanistan*	
	Session 2: Themes 4 & 5	
	Room A: Theme 4 Constraints to use of large-scale renewable energy sources (Lead: Bridget Woodman)	**Room B: Theme 5** Extractives for electricity provision and sustainable development (Lead: Michael Ross)
2:00 PM	***Paper Presentations*** *Paper 1: Frank Wolak* *Paper 2: Bridget Woodman*	***Paper Presentations*** *Paper 1: Paasha Mahdavi* *Paper 2: Michael Ross*
2:45 PM	***Policy Panel*** *Discussion Leader: Maureen Cropper, University of Maryland* *Moses Murengezi, Ministry of Energy and Minerals Development, Government of Uganda* *Abhishek Jain, Council on Energy, Environment and Water, India* *Feng Song, Renmin University*	***Policy Panel*** *Discussion Leader: Todd Moss* *Joseph Essandoh-Yeddu, Ghana Energy Commission* *Timothy Okon, Ministry of Petroleum Resources, Government of Nigeria* *Yakubu 'Lai' Yahaya, Presidency of the Government of Nigeria*
3:50 PM	COFFEE	
4:20 PM	**Briefing on Energy Data Systems** *Eric Masanet, Head of Energy Demand Technology Unit, International Energy Agency – TBC*	

4:40 PM	**Day 1 Closing Remarks** *Catherine Wolfram, EEG Research Director*
6:30 – 8 PM	**Conference Dinner** ***Location: Sette Osteria, 1666 Connecticut Avenue NW*** *[10 minutes' walk from CSIS/hotel]. Participants were previously asked to RSVP to this dinner- please direct questions to Stacey McLaren, OPM (stacey.mclaren@opml.co.uk)*

Day 2: Friday, November 4th, 2016 (9 am – 4 pm)

Time	Activity	Speaker / Moderator	
8.45AM	**Opening and introductions** *Marcela Tarazona, EEG Programme Director, OPM*		
9:00 AM	**Welcome** *Dan Runde, Director, Project on Prosperity and Development, Center for Strategic and International Studies*		
9:20 AM	**Opening Remarks** *Todd Moss, Chief Operating Officer and Senior Fellow, Center for Global Development*		
9:40 AM	**Briefing on Gender and Energy** *Harold Wilhite, Professor Emeritus, Centre for Development and Environment, University of Oslo*		
10:00 AM	COFFEE		
	Session 3: Themes 2 & 3		
	Room A: Theme 2 Financial and policy instruments for encouraging appropriate large-scale power infrastructure (Lead: Joyashree Roy)	**Room B: Theme 3** Supply and efficiency measures in supporting sustainable urbanisation (Lead: Shobhakar Dhakal)	
10:15 AM	***Paper Presentations*** *Paper 1: Catrina Godinho* *Paper 2: Neil McCulloch* *Climate change paper: Sam Fankhauser*	***Paper Presentations*** *Paper 1: Meredith Fowlie* *Paper 2: Ken Lee* *Paper 3: Harry Smith*	
11:20 AM	***Policy Panel*** *Discussion Leader: Brian Min, University of Michigan* *Zaw Oo, Centre for Economic and Social Development, Myanmar* *Suman Sharma, Ministry of Peace and Reconstruction, Government of Nepal* *Abdul Azimi, Ministry of Energy and Water, Government of Afghanistan* *Rizwan Mehboob, Prime Ministerial Focal Point on Climate Change, Government of Pakistan*	***Policy Panel*** *Discussion Leader: Taryn Dinkelman, Dartmouth College* *Nameerah Hameed, Department of Energy, Government of Punjab, Pakistan* *Kofi A. Marfo, Millennium Development Authority, Ghana* *Karin Kritzinger, Stellenbosch University*	
12:30-1:30 PM	**Lunch / Discussion**		
1:30 – 2:00 PM	**Research Uptake Strategy for EEG** *Mark Henstridge, Chief Economist, Oxford Policy Management*		
	Session 4: Priorities & Next Steps*		
	Room A	Room B	Room C
2:00 PM	*Discussion of Research Priorities & Next Steps (Facilitator: Catherine Wolfram)*	*Discussion of Research Priorities & Next Steps (Facilitator: Paul Gertler)*	*Discussion of Research Priorities & Next Steps (Facilitator: Marcela Tarazona)*
3:30 PM	**Conference Closing Remarks from EEG Deputy Research Director** *Paul Gertler, Li Ka Shing Professor of Economics, University of California, Berkeley*		

Annex C List of workshop invitees and participants

C.1 List of workshop participants

Name	Title	Job title	Institution/Company
OPM			
Marcela Tarazona	Dr	Programme Director, EEG	Oxford Policy Management
Mark Henstridge	Mr	Chief Economist	Oxford Policy Management
Felicity Le Quesne	Ms	Programme Manager, EEG	Oxford Policy Management
Stacey McLaren	Ms	Project Administrator, EEG	Oxford Policy Management
Ryan Hogarth	Dr	Consultant	Oxford Policy Management
CEGA			
Catherine Wolfram	Prof	EEG Research Director	CEGA, University of California- Berkeley
Paul Gertler	Prof	EEG Deputy Research Director	CEGA, University of California- Berkeley
Kenneth Lee	Mr	PhD Researcher	CEGA, University of California- Berkeley
Alexandra Wall	Ms	EEG Programme Associate	CEGA, University of California- Berkeley
Carson Christiano	Ms	EEG Programme Manager	CEGA, University of California- Berkeley
CSIS			
Conor M. Savoy	Mr	Deputy Director and Fellow, Project on U.S. Leadership in Development and Project on Prosperity and Development	CSIS
Daniel F. Runde	Mr	William A. Schreyer Chair and Director, Project on Prosperity and Development	CSIS
Ian Barlow	Mr	Program Coordinator	CSIS
Sarah Ladislaw	Ms	Director and Senior Fellow, Energy and National Security Program	CSIS
Lisa Hyland	Ms	Associate Director, Energy and National Security Program	CSIS
EEG Theme Leaders and Paper Authors			

Bridget Woodman	Dr	Deputy Director, Energy Policy Group	University of Exeter
Catherine Mitchell	Prof	Professor of Energy Policy	University of Exeter
Catrina Godinho	Ms	PhD candidate	Graduate School of Business of the University of Cape Town (UCT)
David Stern	Prof	Professor	Crawford School of Public Policy, The Australian National University
Eric Masanet	Dr	Head of the Energy Demand Technology Unit	International Energy Agency
Frank Wolak	Prof	Director, Program on Energy and Sustainable Development	Stanford Institute for Economic Policy Research
Harold Wilhite	Prof	Professor Emeritus of Social Anthropology	Centre for Development and Environment, University of Oslo
Harry Smith	Prof	Associate Professor and Director of the Centre for Environment and Human Settlements	Heriot-Watt University
Joyashree Roy	Prof	Professor of Economics	Jadavpur University
Luis Munuera	Dr	Smart Grids Technology Lead	International Energy Agency
Mario Ragwitz	Prof	Deputy Head of the Energy Policy and Energy Markets Department	Fraunhofer-Institute for Systems and Innovation Research (ISI)
Meredith Fowlie	Prof	Associate Professor	University of California, Berkeley
Michael Ross	Prof	Professor of Political Science	University of California Los Angeles
Neil McCulloch	Dr	Freelance Consultant and Researcher	
Paasha Mahdavi	Prof	Assistant Professor	Georgetown University
Samuel Fankhauser	Prof	Co-Director	Grantham Research Institute on Climate Change, London School of Economics
Shobhakar Dhakal	Dr	Associate Professor and Coordinator of Energy	Asian Institute of Technology
Vijay Modi	Prof	Professor	Columbia University
EEG Consortium partners			
Feng Song	Prof	Associate Professor, School of Economics	Renmin University

Karin Kritzinger	Prof	Senior Researcher	Stellenbosch University
Jonathan Walters	Mr	Senior Advisor	Castalia
Todd Moss	Mr	Chief Operating Officer and Senior Fellow	Center for Global Development
Abhishek Jain	Mr	Senior Programme Lead	Council on Energy, Environment & Water
Gianmarco Servetti	Mr	Practice Leader, Renewable Energy and Energy Efficiency	Castalia

External participants			
Abdul Basir Azimi	Mr	Deputy Minister of Administration and Finance	Ministry of Energy and Water, Afghanistan
Abebe Beyene	Dr	Environment and Climate Research Center	Ethiopian Development Research Institute (EDRI)
Adeola Adenikinju	Prof	Director	Centre For Petroleum, Energy Economics And Law, University of Ibadan, Nigeria
Ahmad Kaikaus	Dr	Chairman	Bangladesh Energy and Power Research Council
Aidan Coville	Mr	Economist, Development Impact Evaluation Team	World Bank
Alisha Pinto	Ms	Consultant, Energy Sector Management Assistance Program (ESMAP)	World Bank
Brian Min	Prof	Associate Professor, Faculty Affiliate Energy Institute	University of Michigan
Colin McCormick	Dr	Chief Technologist	Valence Strategic
Daniel Schnitzer	Mr	Founder	EarthSpark International
Davida Wood	Dr	Senior Associate- Energy Program and Governance Centre	World Resources Institute
Fiona Burlig	Ms	Graduate Student	UC Berkeley
Gareth Walsh	Mr	Energy Practice Lead	Tony Blair Africa Governance Initiative
Govinda Timilsina	Dr	Senior Economist, Development Research Group	World Bank

Hana Freymiller	Ms	Associate Director	Millennium Challenge Corporation
Jacquelyn Pless	Dr	Postdoctoral Researcher and Fellow	Oxford Institute for New Economic Thinking and Oxford Martin School
Johanna N. Tulle and Kirsten Thorne	Ms	Manager, Development and Public Policy, Policy, Government and Public Affairs,	Chevron
John Asafu-Adjaye	Prof	Associate Professor, Natural Resource Economics	University of Queensland
John Molyneaux	Dr	Director of Independent Evaluations	Millennium Challenge Corporation
Joseph Essandoh-Yeddu	Dr	Acting Director, Strategic Planning & Policy	Ghana Energy Commission
Kabir Malik	Mr	Economist, Africa Energy Unit	World Bank
Kassim Kulindwa	Prof	Professor of Economics	University of Dar es Salaam
Kelsey Jack	Prof	Assistant Professor, Economics	Tufts University
Kirsten Thorne	Ms	Manager, Environmental Strategy	Chevron
Kofi Marfo	Dr	Director, M&E and Economics	Millennium Development Authority, Ghana
Lai Yahaya	Mr	Advisor to the President	Government of Nigeria
Louis Preonas	Mr	Graduate Student	UC Berkeley
Mack M. Moore	Mr	International Affairs and Risk Manager	Conoco
Malcolm McCulloch	Prof	Co-Director, Oxford Martin Programme on Integrating Renewable Energy	University of Oxford
Manuel Barron	Dr	Economist	University of Santa Cruz
Marc Jeuland	Prof	Assistant Professor, Public Policy and Global Health	Duke University
Margaret Njirambo Matinga	Dr	Independent consultant (gender and energy)	
Maureen Cropper	Prof	Chair of Department of Economics	University of Maryland
Michael Eddy	Mr	Vice President of Analytics	Global Innovation Fund

Mo Qayoumi	Dr	Chief Adviser for President of Afghanistan (Infrastructure, Human Capital, Technology)	Government of Afghanistan
Mohammad Arbaaz Nayeem	Mr	Principal Consultant	Ricardo Energy & Environment
Morgan Bazilian	Dr	Lead Energy Specialist	World Bank
Moses Murengezi	Mr	Adviser to Permanent Secretary	Ministry of Energy and Minerals Development, Government of Uganda
Moussa Blimpo	Dr	Economist, Office of the Chief Economist for the Africa Region	World Bank
Nameerah Hameed	Ms	Policy Specialist	Energy Department, Government of Punjab, Pakistan
Nandan Nawn	Prof	Associate Professor	TERI University
Patrina Eiffert	Ms	Senior Director	National Rural Electric Cooperative Association
Paulina Jaramillo	Prof	Professor, Engineering & Public Policy	Carnegie Mellon University
Robert Byrne	Dr	Lecturer, Science Policy Research Unit	University of Sussex
Robyn Meeks	Prof	Assistant Professor, Environmental Policy and Planning	University of Michigan
Rose Mutiso	Dr	Senior Fellow, Office of International Climate and Clean Energy	U.S. Department of Energy
Samson Ondiek	Mr	Chief Officer	Kenya Power
Samuel Kwon	Mr	Acting Practice Lead & Senior Director, Energy	Millennium Challenge Corporation
Sandra Keller	Ms	Independent	
Shaun McRae	Prof	Assistant Professor, Department of Economics	ITAM
Shreena Patel	Ms	Director of Evaluation	Millennium Challenge Corporation
Soozhana Choi	Ms	Energy Analyst	JP Morgan Chase Bank
Steve Puller	Prof	Associate Professor, Economics	Texas A&M University

Subhrendu Pattanayak	Prof	Professor, Head of EDF's Energy Initiatve	Duke University
Suman Prasad Sharma	Mr	Senior Secretary	Government of Nepal
Swarnim Waglé	Dr	National Planning Commission Member	Government of Nepal
Syed Rizwan Mehboob	Mr	Prime Minister's Focal Person on Climate Change	Government of Pakistan
Tarek Ghani	Mr	Assistant Professor of Strategy, Olin Business School	Washington University in St. Louis
Taryn Dinkelman	Prof	Assistant Professor of Economics	Dartmouth College
Timothy Okon	Dr	Special Advisor to the Minister	Ministry of Petroleum Resources, Government of Nigeria
William Sam-Appiah	Mr	Director, Power Generation and Transmission	Ministry of Power, Ghana
Yonas Alem	Dr	Research Fellow, Department of Economics	University of Gothenburg
Zaw Oo	Dr	Executive Director	Centre for Economic and Social Development

C2. List of invitees who did not attend

Name	**Designation**	**Organisation**	**Status**
Mike Toman	Research Manager, Environment and Energy Research Program	World Bank	Could not attend
Nick Ryan	Assistant Professor	Yale University	Could not attend
Michael Greenstone	Professor	U Chicago	Could not attend

Miriam Golden	Professor, Political Science	UCLA	Could not attend
Ken Chomitz	Chief Analytics Officer	Global Innovation Fund	Could not attend
Thomas Leautier	Professor of Management	Toulouse School of Economics	Could not attend
Jean Tirole	Chairman of the Executive Committee	Toulouse School of Economics	Could not attend
Hunt Allcott	Associate Professor, Economics	NYU	Could not attend
Benjamin Sovacool	Business Development	Aarhus University	Could not attend
Rabindra Nepal	Lecturer in Economics, Business School	Charles Darwin University	Could not attend
Mary Suzan Abbo	Managing Director	Center for Research in Energy and Energy Conservation (CREEC) at Makerere University	Could not attend
Tanguy Bernard	Senior Research Fellow	CGIAR	Could not attend
Kate Steel	Deputy Coordinator (Acting)	USAID Power Africa team	Could not attend
Karl Fickenscher	Deputy Coordinator	USAID Power Africa team	Could not attend
Masami Kojimi	Lead- Global Energy Practice	World Bank	Could not attend
Eric Brewer	Professor, Computer Science	Berkeley	Could not attend
Laurencia Ngaji	Company Secretary	Kenya Power & Lighting Company Limited (KPLC)	Could not attend
Prof JL (Wikus) van Niekerk	Professor in the Department of Mechanical and Mechatronic Engineering and Director of the Centre for Renewable and Sustainable Energy Studies	Stellenbosch University	Could not attend

Dr Peter Cameron	Director, Centre for Energy, Petroleum and Mineral Law & Policy	Dundee	Could not attend
Arunabha Ghosh		CEEW	Could not attend
Helen Mountford	Director of Economics and New Climate Economy lead	WRI	Could not attend
Dr. Leena Srivastava	Vice Chancellor	TERI University	Could not attend
Dr. Rashid Aziz	Energy Specialist	Ex-World Bank Pakistan	Could not attend
Mr Sushanta Chatterjee	Joint-Chief		Could not attend
Gissima B. Nyamo-Hanga	Acting DG	Rural Energy Agency	Could not attend
Mr. Kivlyn Asante	General Manager of Corporate Planning at ECG	MCC	Could not attend
Mr. Anil Kumar Jain	Advisor (power, renewable energy, infrastructure, extractive industries, etc.)	NITI Aayog (Planning Commission)	Could not attend
Dr. Albert Butare	Former Minister of Energy	Government of Rwanda	No response
Nilufar Ahmad	Director, Gender and Social Department	MCC	No response
Bikash Pandey	Director of Clean Energy & Environment	Winrock International	No response
Terri Fariello	Officer and Vice President	Exxon	No response
Tracey Mcminn	Director, International Government Relations	Shell	No response
Norman F. Anderson	President and CEO	CG/LA Infrastructure	No response
Pauline Idogho	Investment Professional - Energy & Infrastructure	SunEdison	No response

Mark Finley	General Manager, Global Energy Markets	BP	No response
Lance Crist	Global Head, Extractives Industries	IFC	No response
Laura Brannen	Government Affairs Manager	Bechtel	No response
John Banks	Visiting Scholar in the Energy, Resources and Environment Program	Sais, John Hopkins University	No response
Doug Arent	-	National Renewable Energy Laboratory	No response
Drew Maloney	VP Government and Public Policy	Hess	No response
Bill Nelson	former US ambassador on the GE power team	GE	No response
Andrew M. Herscowitz	Coordinator	USAID Power Africa team	No response
Brian Levy	Professor (Practice of Intl Dev), formerly at WB for +20 yrs	John Hopkins	No response
Mark Thurber	Associate Director, Program on Energy and Sustainable Development	Stanford University	No response
Matt Baker	Program Officer, Environment Program	Hewlett Foundation	No response
Allen Eisendrath	Office of Global Climate Change	USAID	No response
Dorian Mead	Adviser, Energy Reform and Reconstruction	USAID	No response
Nicolina Angelou	ESMAP	World Bank	No response
Albert Zeufack	Africa Region Chief Economist	World Bank	No response
Rohini Pande	Economics Professor	Harvard	No response

Melanie Nakagawa	Deputy Assistant Secretary for Energy Transformation	DAS Energy Bureau, State Dept	No response
Worku Gachou	Vice president for international development	HFAC	No response
Andy Olson	Senior Advisor for International Economics and Trade	SFRC (Senate version)	No response
Seth Sanders	Electrical Engineering and Computer Science	UC Berkeley	No response
Stephen Littlechild	Business	Cambridge University	No response
David Newbery	Economics	Cambridge University	No response
Dieter Helm	Professor, Energy Policy	University of Oxford	No response
Francesco Caselli	Professor, Economics	LSE	No response
Matt Kotchen	Economics	Yale	No response
Maximo Torero	Division Director, Markets, Trade and Institutions	IFPRI	No response
Chris Knittel	Professor, Energy Economics	MIT	No response
Ed Glaeser	Economics	Harvard	No response
Enrico Moretti	Professor, Economics	Berkeley/Economics	No response
Gib Metcalf	Economics	Tufts University	No response
Robin Burgess	Director, Research Steering Group	IGC	No response
Carlo Papa	Director	Enel Foundation	No response
Makhtar Diop	VP, Africa Region	World Bank	No response

Annex D: Documentation

D1: Briefing note for energy policymakers and practitioners

Overview

We look forward to your attendance at the Research & Matchmaking Conference at the Center for Strategic and International Studies (CSIS) in Washington, D.C. The conference is designed to solicit feedback from yourself and other policymakers and practitioners on 18 State-of-Knowledge papers that were written in the first year of the Applied Research Programme on Energy and Economic Growth (EEG). A further purpose is to identify and discuss key research questions that EEG could address in subsequent years- your input will help to ensure that those questions are relevant to energy policymakers and practitioners.

Over the course of five years, EEG is exploring how investments in large-scale energy systems contribute to poverty alleviation and economic growth. Through a series of rigorous studies, the programme will generate a body of evidence to inform energy policy and other high-level decisions being made in the energy sector. Ultimately, the goal of EEG is to support countries in Sub-Saharan Africa and South Asia to shift their energy production and consumption pathways towards a more sustainable, efficient, and equitable paradigm.

The upcoming Research & Matchmaking Conference follows two EEG policy workshops held earlier in the year, in Tanzania and Nepal. We have sent you the workshop reports so you can get a sense of what was discussed there- and we look forward to supplementing, through this conference, what we learned about the critical areas for applied energy research. Thank you in advance for attending and for your important contributions.

Agenda

The event is designed to facilitate focused and productive discussion among participants. Keynote talks on Day 1 will be delivered by EEG Research Director Catherine Wolfram and Chief Advisor to the President of Afghanistan on Infrastructure and Technology, Mo Qayoumi. Over the two days, we will host parallel sessions relating to each of the six EEG Themes.

Each theme session will be introduced by the designated EEG Theme Lead, followed by two panel dicussions. First, a panel of paper authors will present key insights from their state-of-knowledge papers. Second, a panel of policymakers and practitioners will be invited to give feedback on the papers and suggest opportunities for research and collaboration. A discussion leader has been appointed for each session, who will help to stimulate and steer the conversation. **Your role in these sessions and how to prepare for it are described in more detail below.**

Three final sessions (run in parallel) will be moderated by the EEG Research Director, Deputy Research Director, and Programme Director. Their purpose will be to consider, refine and prioritise the research ideas and questions that have emerged from the conference.

We encourage participants to use lunch and coffee breaks to follow up on threads from the panels and explore tangible opportunities for collaboration with other participants. Additionally, at the end of the first day, all participants will be invited to attend a conference dinner as a further opportunity to get to know each other. The keynote speaker at the dinner is Mr. Jim Rogers, former CEO of Duker Energy. More information about this dinner will be shared shortly.

Your role

You have an active role in one of the theme parallel sessions. After the paper presentations, each panellist will be given 6 minutes to provide feedback to the papers presented in the session.

We would like to encourage a dynamic and inclusive discussion among panellists and the audience. Therefore **we would prefer that PowerPoint slides are not used**, and panellists communicate their points verbally. If you have a strong preference to use slides to illustrate a particular point, please let Felicity Le Quesne (felicity.lequesne@opml.co.uk) know as soon as possible.

Once all panellists have intervened, there will be time for Q&A.

How to prepare?

To prepare for the conference, we encourage policy makers and practitioners to do the following:

1. Read through the initial research questions outlined in the table below.
2. Read the abstracts of the State-of-Knowledge papers pertaining to the relevant theme of the session to which you were assigned. The abstracts will be shared on the conference website on Friday the 21st of October (http://cega.berkeley.edu/events/conferences/).
3. Consider whether the research questions and approaches outlined in the State-of-Knowledge papers address the most pressing knowledge gaps related to the power sector in your country.
4. Consider some case studies and practical examples that could illustrate your response to point (3), and/or which could be targets for rigorous research.
5. Consider what additional questions are needed to reflect further pressing issues relating to your work or that of energy policymakers and practitioners generally.
6. Consider what steps could be taken to ensure that research outcomes of EEG are taken into consideration in the energy policy making process.
7. We also invite you read the 2 EEG Policy Engagement workshop reports, which summarizes learnings from parallel exercises conducted earlier this year.

Table. Energy and Economic Growth Research Questions

Theme 1: Energy and Economic Growth	
1	How serious do electricity supply side problems have to be in order to constitute a serious brake on economic growth?
2	What can be learned from analysis of energy infrastructure and supply relationships to better reflect differences in costs *and* quality of service?
3	To what degree is a binding constraint of inadequate electricity supply problems reflected by very high average prices for electricity (including privately generated electricity), or indeed high costs of other inputs including labour?
4	To what degree is the inherent flexibility in the type and timing of electricity infrastructure exploited to support economic activities?
5	What can be learnt from additional econometric work with more disaggregated data? Does it provide further insights into how electricity investments affect economic development? Does the quality of such data support such analysis? For example, triangulation of sector investment, electricity prices and other prices and outputs.

6	What can be learnt from historically successful countries, including in Asia and Latin America, which have invested successfully in energy systems, and the degree to which this has prolonged economic growth and maintained competitive average electricity prices?
Theme 2: Financial and Policy Instruments and governance structures	
1	Where power sector reforms have been undertaken, what has worked and why?
2	What does political economy research tell us about driving pro-development changes in access to energy by sub-sector (including gas, coal, oil, renewables etc.), and by context (national, regional)?
3	Using political economy analysis, what can we say in terms of progress on power sector reform (structural issues, unbundling etc.); tackling subsidies; promoting inclusive electricity access, donor behaviour etc?
4	What are the transitional possibilities for improving the supply of electricity, possibly without solving the deeper problems of the main supplier, allowing for assessment against classic (capital and capacity) constraints?
5	What has been the experience in successful transition countries? – full reform of the central system or more piecemeal decentralised solutions, and the possibility of "n^{th}-best" solutions and "working with the grain" in the power sector and managing expectations.
6	How can research be designed to support findings or principles that are transferrable from one context to another?
7	How do external actors (like DFID) balance the desire to 'work with the grain' without supporting the interests of individuals or groups that are, at best, apathetic, about development outcomes?
Theme 3: Electricity supply and energy efficiency measures in supporting sustainable urbanisation	
1	Are electricity supply problems a major constraint to the productivity and growth of cities? Are there special n^{th} –best market and governance solutions which can work (like separate mini-municipal power authorities or companies)? Are there barriers to supply to specific groups, if so what mechanisms are best utilised to overcome these?
2	What have been the historical experiences in successful cities/ in LIC-MIC transition counties? Is there a menu or mix of options for cities with constrained supplies? How can this energy provision be delivered to the poorest and disadvantaged?
3	What method is best used to ensure energy efficiency in an urban context, both point of generation, distribution and end use? Which sectors are best targeted for efficiency gains (excluding transport) building stock, end user etc? Where are the trade-offs? Which sector is best for delivering benefits to the urban poor and disadvantaged?
4	What are the main barriers to achieve access and efficiency in urban areas, pricing regulation, consumer behaviour, access to goods etc? Subsidies generally act as a significant disincentive for energy efficiency investments and limit the scope and profitability of energy services companies. What effective measure/successful examples have there been to address these issues which can be replicated in the developing world.

5	Is there an Energy Efficiency Gap in developing countries? Some research suggests that the size of the gap is overestimated for failing to account for all costs and neglecting particular types of economic behaviour. Is this the same for the urban context and in developing countries?
6	Does a rebound affect happen in the context of the urban poor, and does it contribute to economic growth?
7	What are the legal, institutional and co-ordination arrangements needed to scale up Energy Efficiency in developing countries, and ensure Energy access in urban context, and at what level (national regional, municipalities)? What are the barriers including from a political economy perspective?
Theme 4: Constraints in the use of Large-scale Renewable Energy Sources or Greener Energy Sources	
1	What are the main causal factors behind real or perceived (economic and non-economic) barriers and challenges to successful deployment of large scale renewable energy? What measures have been taken to address these and what is the evidence for success?
2	What policy mechanisms and planning tools are needed, or are available, to encourage use of renewables, including 'green growth policies', such as pricing and regulation to internalise environmental capital costs and why they have had limited application?
3	How can the disparate performance of international/regional power pools be explained and what lessons can be drawn out for LICs entering such agreements?
4	What are the opportunities to learn from and transfer knowledge from successful pools to poorer performing pools in SSA and SA. Building on the experience of international power pools, what are the opportunities for large scale renewable energy development and how can these be applied in the context of LICs?
5	What approach is needed and what are the requirements for building familiarity and access to knowledge on large-scale renewable energy development in SSA and SA?
6	What tools and technologies are available for renewables to challenge coal and other hydrocarbon energy sources in energy mix and how would these be applied in LICs?
7	How can large-scale renewable energy development increase energy access for the poorest and maximise the economic benefits for equitable growth?
Theme 5: An improved understanding of the role of extractives in electricity/energy provision and sustainable development	
1	Is there any general relationship between the discovery and exploitation of hydrocarbon fuels and cheaper fuels and/or electricity in the local market?
2	Where hydrocarbon endowments seem to allow cheaper fuel and/or electricity in the local market, how significant are the benefits? Do large hydrocarbon discoveries always cause "Dutch Disease" and reduce the competitiveness of other industries or can cheaper energy stimulate competitiveness and growth?;
3	Can we identify historical experiences of countries which have capitalized on cheaper energy?

4	Are there critical institutional differences which seem to help explain why some countries convert natural resource discoveries into economic diversity and competitiveness and some move in the opposite direction? Are initial institutional differences, large or small, and is there any institutional "taxonomy" which can be offered and evidenced?
Theme 6: Innovative and appropriate design of larger-scale, centralised energy infrastructure to respond to evolving demand and support inclusive growth	
1	Utilising modular or phased approaches for scaling up infrastructure.
2	Reducing generation, transmission and distribution inefficiencies.
3	Design options for lower voltage supplies.

D2: Instructions for EEG paper authors

These instructions were sent via email. Paper authors had already been made aware of the conference and of their presentations through their contracts, and earlier discussions with the EEG Programme Directorate. Further, as academics they are very familiar with presenting their research. Therefore the EEG PD felt there wasn't a need to present as comprehensive guidance to them as to the policymakers and practitioners. The following information was sent by the CEGA Programme Manager:

"I'm writing with instructions for presenting your State-of-Knowledge papers at the conference. First, please take a look at the attached agenda and let me know right away if you have any conflicts with the timing of your presentation (or anything else for that matter).

Each of you will have 15 minutes to speak, followed by 5 minutes of Q&A. We ask that you limit your presentation to 10 slides, and respect the following guidelines:

- Slides should be concise, JARGON-FREE, and targeted to a diverse audience
- Figures are Ok, but please do not include tables
- We encourage you to use photos and illustrations to make your presentation engaging and relatable
- Be sure to highlight your key findings, including 1) what we already know about the topic, 2) what we don't know, and 3) how you think EEG research can help fill these gaps (this should set the stage for policymakers to respond during the policy panel...)

Keep in mind that this conference is an opportunity to identify potential partners on future EEG research. To this end, we encourage you to share specific examples of the type of research (impact evaluation, cleantech R&D, data analytics, and so on) that you think will be most valuable in filling relevant gaps in knowledge. Feel free to invite those who are interested in your topic to approach you during coffee breaks and over dinner to brainstorm.

Happy to answer any questions. And please plan to share your slides with me (even if they are still rough) by **Monday, October 31st** at the latest."

D3: Roles and responsibilities for conference

This document was prepared as an online Excel spreadsheet and shared within the team.

EEG DC Conference Staff Roles.xlsx

File Edit View Insert Format Data Tools Add-ons Help Last edit was made on November 4 by Carson Christiano

Time

A	B	C	D	E	F	G	H	I	J	K	L
Time	Session	Paul	Catherine	Carson	Ken	Ale	Marcela	Felicity	Stacey	Ryan	CSIS Staff
DAY 1											
8:00 AM	Registration			GREET		REG	GREET	GREET	REG		
8:30-9:00AM	BREAKFAST			GREET		REG	GREET	GREET	REG		CATER
9:00-9:10AM	Welcome					REC					
9:10-10:00 AM	Opening Remarks					PHOTOS					
10:00-10:15 AM	CO-Hosts										CATER
10:15-12:00 PM	Session 1: Themes 1 & 6										
10:15-11:20 AM	Research Panel Room A: Theme 1							MIC		NOTES	
	Research Panel Room B: Theme 6			NOTES/MIC		NOTES					
11:20 AM-12:30 PM	Policy Panel Room A: Theme 6							MIC		NOTES	
	Policy Panel Room B: Theme 3			NOTES/MIC		NOTES					
12:30-2:00 PM	LUNCH/KEYNOTE SPEAKER					PHOTOS					CATER
2:00-2:15 PM	Session 2: Themes 1 & 6										
2:00-2:45 PM	Research Panel Room A: Theme 4							NOTES		MIC	
	Research Panel Room B: Theme 1			NOTES		MIC					
2:45-4:15 PM	Policy Panel Room A: Theme 4							NOTES		MIC	
	Policy Panel Room B: Theme 5			NOTES		MIC					
4:15-4:55 PM	COFFEE									INTERVIEWS	CATER
4:55-5:00 PM	Closing Remarks										
5:30-8 PM	Conference Dinner					HOTEL			Ken		
DAY 2											
8:30-9:00	Check In										
9:00-9:30 AM	Opening Remarks					PHOTOS					
9:30-10:00 AM	Briefing on Federal Policy							NOTES			
10:00-10:15 AM	COFFEE			INTERVIEWS						INTERVIEWS	CATER
10:15-12:30 PM	Session 3: Themes 2 & 3										
10:15-11:00AM	Research Panel Room A: Theme 3							MIC		NOTES	
	Research Panel Room B: Theme 2			MIC		NOTES					
11:00-12:30PM	Policy Panel Room A: Theme 3							MIC		NOTES	
	Policy Panel Room B: Theme 2			MIC		NOTES					
12:30-1:30 PM	LUNCH			INTERVIEWS		PHOTOS				INTERVIEWS	CATER
1:30-3:30	Session 4: Priorities & Next Steps										
	Room A			NOTES							
	Room B					NOTES					
	Room C							NOTES			
3:30-4:00 PM	Closing Remarks										

Annex E: Keynote Speeches

E1: Catherine Wolfram – Opening Remarks

How electricity affects economic growth is complicated: It's a function of what people give up to get that electricity (e.g. school fees?), what people use the electricity for, how reliable the connection is, etc.

There is a strong correlation between electricity and economic growth, but we need to dig in to understand the relationship better.

The EEG programme has produced 18 papers focused on 6 core themes and 3 crosscutting themes. Authors will present the papers today, and policymakers will provide feedback.

At the Regional Policy Workshops we heard a number of key research areas:

- How do you prevent political influence in tariffing process?
- How do you prevent excessive influence of unions in preventing power sector reform of large state-owned monopolies?
- How do we improve power sector data and forecasting?
- What is the potential for large-scale generation and regional trade? How do we solve the policy gridlock and attract financing?

What do we mean by co-creating research with policymakers?

- In 2013, we formed a relationship with the Kenyan Rural Electrification Authority. The project, in collaboration with the utility, explored the following research questions:
  - What is the last mile opportunity?
  - What is the demand curve for power?
  - Economies of scale in mass connections?
  - Social and economic impacts?
- The project established a representative sample of 150 transformers. Households within a 600 m radius could be connected. Kenya power could connect all households for $400 each. (average income = $800). Within 600, 95% of households were not connected. These households are not 'off-grid', but 'undergrid'.
- We conducted a randomised control trial. Different groups were offered different levels of subsidy. The demand dropped dramatically as price to homes increased.
- Consumption of electricity did grow over time, but consumption remained very low: on average 17 KWh per month. To put this in perspective, the average US household consumes 22 KWh per day.
- In the follow up study, we addressed questions about the impact on health, happiness, incomes, political awareness, employment, etc. and children's reading and math scores.
- Results:
  - Connection rates and spending on electricity went up
  - Employment levels did not increase
  - Consumption of other goods did not increase
  - No change in health, political awareness,
  - Increase in life satisfaction
  - Increase in female employment
  - Hours spent on chores declined
  - No difference on children's test scores
- Questions:
  - What might happen if we go back in another two years? Maybe people need time to buy appliances. However, similar research, where NGOs have given households $1000 in cash, have shown tremendous changes over two years.
  - The grid suffered from terrible reliability. 20% of transformers were down for a median of 4 months. What impact did this have on the outcomes?

- What are the development benefits of electrifying small businesses, health centres, schools, and factories?
- For households, should we consider smaller scale interventions like SHS instead?
- Kenya Power expected different results in other parts of the country. Higher income levels might enable higher appliance ownership and consumption.

In following sessions on papers, think about how to make the research actionable.

E2: Mo Qayoumi – Keynote on Afghanistan's energy opportunities and challenges

Slide showing the relationship between the energy and the economy tells the story. Africa has twice the population as the US that does not have electricity.

Electricity is a convenient and clean form of energy, but it is not something that you cannot mine. You need another source of energy to produce electricity. It is capital intensive. And it is not something that you can store easily, so supply and demand must be similar at all times.

Afghanistan considered the role of electricity within its economic growth plan as a whole.

Two years ago, despite over half a trillion dollars having being spent in Afghanistan, not a single kW of renewable electricity had been built in the country. They had built a lot of diesel generators. If you look at a country of 30 million in population, having exports only at $40 million makes it difficult to keep people employed. Our goal was to make Afghanistan self-reliant.

4 Questions:

- What can Afghanistan grow?
- What can it extract?
- What can it trade?
- What can it manufacture?

Based on this approach to growth, we developed our infrastructure plans. Electricity was a key part of that.

What can Afghanistan grow?

- For a long time, we were a food exporter, prior to the years of conflict. Now we are a food importer. We are importing $3.5 to $4 billion of food.
- What should we grow? Grains, where would not have a competitive advantage, or should we grow specialty foods, like pine nuts, saffron, etc.? In the latter, irrigation becomes key. Also, with the weather pattern changes, snow melts 3 weeks earlier than it did 30 years ago, which means that irrigation dams and water storage are important.

What can Afghanistan extract?

- Key assets: Water: Afghanistan is the upper riparian for five of its six neighbours (except for China). We only have a riparian agreement with one country.
- Moving water becomes very energy-intensive itself.

What can Afghanistan trade?

- Key location. Transit country for energy, goods and data.
- Afghanistan has about $3 trillion of natural resources around the country. Hydrocarbons are the resources that you can usually get the quickest returns out of. Afghanistan has natural gas and coal, in particular.
- Construction materials: marble, metals/iron ore. Each require a good amount of energy to access.

What can Afghanistan manufacture?

- Textiles require energy: Pakistan has between 10-15 thousand MW of electricity needs for their textile industry. Could be a $100 bn enterprise. The most economical way that Pakistan can get its energy is from hydro in Central Asia, including Afghanistan.

Hydro, wind and solar potential.

- 33k MW potential of hydro
- 17k MW potential of wind
- 20k MW of solar
- 20-30 MW of geothermal

Current projects:

- Transmission that connects Kyrgyzstan through Afghanistan to Pakistan
- 2000 -4000 MW of power sharing between Turkmenistan, Afghanistan and Pakistan

First step for Afghanistan to develop domestic interconnection, because the power grid is currently operated in islands. Also need to focus on rural electrification.

India-Afghanistan friendship dam was started 40 years ago and finished last June. It's only 2 MW, but also key to irrigation. Holding 650 mn cubic meters of water.

In addition, we have started developing about 20 hydroelectric dams in the country. One developed will add 100 MW, and a 100 mn cubic meters of water for irrigation. We also have a 50 MW and 100 MW natural gas projects.

In the last 6 months we have raised over $800 million of private sector investment for energy projects.

We also have 20 small wind and solar projects, which collectively will be about $20 million.

Key challenges:

- Previous method of looking at energy issues did not systematically connect them to economic development.
- Previous consulting firms did a horrible job. Their view was that GDP would grow 3-4%. It had no connection to the specific economic needs of the country. The plan was that in the first 15 years, Afghanistan should only focus on imports, which is why we import so much today. And that's why we import so much of our energy today in the form of diesel, which is a horrible idea. WE cannot afford it.
- WE need to drive more private sector investment and attract grant money and longer-term debt.
- We lack technical staff
- Tariffs become more political, rather than following basic laws of economics, which makes attracting private investment difficult, or subsidies become more important.
- Non-technical losses are terrible, at 30-40%, and need to come down.
- Also need to decide on the balance between irrigation and hydropower.
- We need to bring online some thermal electricity.
- Governance and organisational corruption is also a challenge. For some, the only way to get power is to bribe somebody.
- The cost of not having high quality appliances is another challenge, as Afghanistan is a dumping ground for low-quality products.

We need to convince people that investing in the power system is important for economic growth. Businesses are relying on their own diesel generators, which makes them uncompetitive.

We also need to look at the demand-side. In Kabul, we are promoting LED lights which will have energy savings of 130 MW.

E3: Todd Moss – Day 2 Opening Remarks on Power Africa

Energy is trendy. Many international programmes are focused on increasing energy access (Power Africa, UK, France, World Bank, EU). USAID has a programme called Power Africa. CGD working to shape and monitor the Power Africa initiative.

This presentation will cover the results of our monitoring: How is Power Africa doing, and what can we expect in the future?

Report Card for Power Africa:
Good

- Came out of a series of meetings with Africa officials, to determine what they want.
- Clear measurable targets: MW and connections
- Not about the US going in a building things. It's about helping countries to get projects over the line – could be public funds, could be technical advice, etc.
- Good at crowding in private capital.
- Extraordinary at being transparent.
- Navigated renewables vs coal lobby: Investments – 2/3s natural gas and hydro, plus an array of other renewables.
- Potential transactions in 28 countries. FT harsh on Power Africa – Only 800 MW developed – only 3 of 14 years in. Takes time to develop big projects. 5000 MW have reached financial close.
- OPEC has surpassed its original investment target.

Bad

- Questions about attribution.
- Data provided is inadequate.
- Of 7 billion investment commitment, 5 billion was supposed to come from the Export-Import Bank. OPEC is a development agency. Ex-Import Bank to develop US jobs.
- Ex-Import Bank unlikely to hit 5 billion investment target any time soon. Might be not a big deal, given its mandate to support US business.
- OPEC – outdates structure. Not able to provide equity capital, only debt. Needs more flexibility.
- Concentration in a few countries.
- Interagency coordination is ad hoc and unstructured. Brings questions about it sustainability post Obama administration.

Goals:

- New administration should pledge continues support for Power Africa.
- Relaunch OPEC as a full service development institution.
- Leadership of Power Africa should be more structured for the next administration.

The Obama administration just launched a working group to design roles for Power Africa leadership into the next administration.

E4: Harold Wilhite – Gender and Energy

Gender refers to a system of socially defined roles, privileges, attributes and relationships between men and women. Gender roles tend to be very robust and slow to change.

When lights are turned on in a home, it has an enormous impact. Other changes take time to roll out. Depends on socio-economic status, ability to purchase appliances, etc.

Why is gender important? Women have greater responsibility for the tasks involved in the production of energy services (light, heat, cooling, cooking, and cleaning) in homes. Yet women are underrepresented in the governance structure and businesses involved in planning, producing, and delivering energy.

One of the most widely circulated GE advertisement (displayed on screen) shows woman cleaning and using electric appliances, man outside cleaning car. Our gender roles are clearly defined.

Practical benefits of energy access:
- Saves time (better time management)
- Reduces heavy physical work
- Improves health
- Improves physical security
- Provides better communication

Empowerment: Providing women with the capacity to exercise agency and control over their lives. Examples:
- Laws and regulations aiming at securing women's rights
- Increased participation in political processes
- Increased access to education and information
- Expanding work opportunities and improved work conditions.

Energy's empowering potentials:
- Education
- Work opportunities and incomes
- Access to information on rights and benefits through electronic media

Closing the gaps in energy-gender research:
- Much of the research has been on rural, small-scale electrification. More attention is needed on the gender consequences of large scale and urban electrification.
- Identifying the informal economies in which energy, gender and family are implicated
- Sharpening confidence in causal relationships between energy access and specific benefits (health, work, education)
- Coordinated research designs deploying mixed methods and longitudinal studies.

E5: Eric Masanet - Energy Data Systems

Increasing needs for tracking energy demand, production and consumption. Energy ties into the SDGs, SE4All, UNFCCC Paris Agreement, Green Growth Indicators, Investment Impact tracking, etc.

Data disaggregation, down to the unit consumption levels, is costly.

Most countries track energy use in various sectors. There is a need to disaggregate data. Residential sector energy use is increasing. As we disaggregate the data, we see that residential use per capita is flat. Based on energy use per capita per floor area, it has actually declined.

Countries that invest in data matching (integrating data from multiple datasets) can extract even greater insights – E.g. UK needs dataset, matched datasets from property, tax bureau, energy efficient project data, etc. – to show energy efficiency.

Energy needs to be an important policy priority to enable data systems. There has to be legal authority to get the data, and enforcement to make sure it is collected. Needs right funding, training, etc. Needs institutional arrangements, survey designs and capacity building, IT infrastructure.

Issues are more pronounced in developing country context.

Many modern energy systems use devices that store energy use data. These are a treasure trove of data that are currently untapped. Deployed for demand response, payment mechanisms.
- Could provide unprecedented levels of disaggregation data.

They are not being deployed for data generation, and they may not be designed for it.

E.g. Smart homes – collect heating, times per day, vehicle data – charges, times, km travelled. Smart irrigation – monitors soil moistures, communicates with a computer for weather forecasting, to maximise crop yield. Potentially a smart data set for water use, and food production.

Literature is sparse on smart systems for national data. We know the potential is there on the technology side, but little research has been done on how the technology is being taken advantage of.

Key challenges and barriers

- The big data problem: Too much data that is overwhelming, and can't extract key insights.
- Privacy and confidentiality problems
- Cost and infrastructure
- Complexity and unchartered territory

A roadmap for leveraging smart systems in national energy data systems:

- Develop and propose a taxonomy of components, institutions, stakeholders and information flows.
- Identify opportunities and technical data characteristics for maximum synergies
- Identify major barriers (technical, economic, legal, behavioural and policy)
- Roadmap to identify data gaps and facilitate data transfer.

E6: Mark Henstridge – Research Uptake

Economic Development and Institutions – another OPM managed DFID research project that aims to provide a body of evidence and insights into institutional changes and their impact on economic development.

EDI is a little further ahead than EEG. It is moving into implementation at the moment. It has big questions: how institutional change conditions economic growth and economic development?

One of the requirements we've been presented with from DFID is to include a number of RCTs into institutional change and its impact. RCTs are powerful instruments for statistical analysis, but not a natural bedfellow for the softer processes of institutional change.

One reason to mention the EDI example is that it is also in partnership with CEGA. CEGA will support the roll-out of a request for proposals that evaluate institutional change using RCTs. The relevance for EEG is that this was in part set up through a matchmaking workshop. One difference is that it didn't present so much of the research; the EDI conference was just about matchmaking.

What they're both trying to contribute to, is building a partnership between people in governments wresting with challenging questions, and serious academics looking to evaluate those using rigorous and powerful identification techniques with randomization.

Another way in which research can be a strong supporter or influencer of the way in which policy can be implemented is through an approach to data. Policy debate often takes place in a relatively data poor environment. If you can work together with organisations who are increasingly generating data and information, you can help shape rigorous policy developments and the framing of policy choices.

There are other considerations that are quite clear: are you doing something that you can map onto a policy choice? Are you working with an actor who leads on policy decisions? Can you understand the levers available to a policymaker and the constraints in which they operate? You need a good understanding of the policy context up front, particularly if you are to deliver impact.

That's why it's so good to see people from several academic disciplines – there are engineers, economics, political scientists – and also people who are not academics. This is the sort of gathering that can help solve the challenge of a multi-objective research program and make it happen.

Lai (Yahaba) made a point yesterday about the timing and the sequencing. When you have someone like Lai in a room with a political scientist (Michale) and people who can look at data from a comparative perspective (Samson in Kenya) and concrete experience from a consulting and World Bank world; when you have these relatively unique combinations of people, you have a good chance of taking on such a big challenge.