Energy and Economic Growth
Applied Research Programme

EEG Policy Workshop- South Asia: Outcomes Report

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List of abbreviations

ADB	Asian Development Bank
AEPC	Alternative Energy Promotion Centre
CEEW	Council on Energy, Environment and Water
CEO	Chief Executive Officer
CO_2	Carbon Dioxide
EEG	Applied Research Programme on Energy and Economic Growth
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
ICIMOD	International Centre for Integrated Mountain Development
IEA	International Energy Agency
MW	Megawatt
NEA	Nepal Electricity Authority
NGO	Non-Governmental Organisation
kWh	Kilowatt-hour
SAARC	South Asian Association for Regional Cooperation
US$	United States Dollar
USAID	United States Agency for International Development
WEC	Water and Energy Commission, Government of Nepal

1 Introduction

On September 28th 2016, the Applied Research Programme on Energy and Economic Growth (EEG) held a policy engagement workshop in Kathmandu, Nepal. The workshop brought together more than 50 participants from Afghanistan, Bangladesh, India, Myanmar, Nepal and Pakistan. Senior energy policy-makers, researchers and representatives from the private sector, NGOs and donors in South Asia discussed the energy challenges facing the region, and considered policy relevant research questions that could address these constraints. To supplement the learnings from the workshop, the EEG Programme Directorate met separately with senior energy policymakers, researchers and private sector stakeholders.

This report is structured around four key themes that arose during the policy workshop and corresponding meetings: the tension between energy access and energy for economic growth; the challenge of reliability; the importance of regional cooperation and electricity trade; and the need for better data and forecasting. Under each of these themes, the following section provides an overview of the participants' hypotheses and explores research topics that could influence EEG's forthcoming State of Knowledge papers and future research. Box 1 below discusses the key findings from the workshop and meetings and highlights the main research topics that emerged that could shape EEG's research agenda. The workshop programme, a list of meetings, and a list of workshop attendees are provided in Appendices 1 through 3, respectively.

Box 1: Key findings from the workshop and meetings

Dr. Bindu Lohani, former Vice President of the Asian Development Bank, opened the policy engagement workshop in Kathmandu with a call to action: "Intuitively, we all know that energy is linked to economic growth. But when you make policy, we want to know the exact link… EEG could generate tremendous knowledge in these areas." He challenged policymakers to take advantage of the opportunity to provide inputs into EEG's research agenda. Participants responded by revealing a series of research gaps in South Asia.

A number of highly relevant research questions were raised concerning the relationship between electricity and productivity: Does electricity drives GDP growth, or vice versa? Is there a trade-off between promoting electricity access and electricity for growth; and if so, how should public funds be invested to maximise socio-economic benefits? What are the pre-conditions that enable electricity access to have an impact on household incomes and productivity? EEG Research Director Prof. Wolfram explained that unpacking the nuts and bolts of this relationship will help us to better plan energy investments.

Participants highlighted the various challenges facing South Asian electricity grids that have led to widespread load shedding. In many nations, political instability and inappropriate institutional and policy structures have led to chronic underinvestment in generation. The seasonality of hydropower in Nepal, coupled with a lack of storage reservoirs, reduces supply in the dry season – a challenge that may be exacerbated by climate change. Participants also pointed to the challenge of non-technical losses, and the potential for smart grids to identify the core areas of losses and the extent to which billing is inaccurate.

The workshop identified great opportunities for regional energy cooperation and electricity trade – optimisation of regional load factors, better utilisation of endowed energy resources, improved energy security and reduced environmental impact. Dr. Dhakal and Dr. Shrestha – Coordinator of Energy and Professor Emeritus at the Asian Institute of Technology, respectively – stated that unrestricted cross-border electricity trade in South Asia could save US$226 billion in electricity supply costs from 2015-2040 and reduce CO_2 emissions from the power sector by 8%.

Lastly, the workshop and meetings highlighted the inadequacies of data collection and analysis in South Asia, and the importance of more accurate demand forecasting. Mr. Sharma, former Secretary to Nepal's Ministry of Energy, worried that the low demand forecasts of Nepal Electricity Authority are a self-fulfilling prophecy, and encouraged ambitious development in the energy sector.

The policy engagement workshop and meetings in Nepal succeeded in bringing EEG researchers together with key energy stakeholders and decision-makers in South Asia, and identifying a series of research gaps that could shape EEG's research agenda going forward.

2 Key themes

2.1 The tension between energy access and energy for economic growth

"Other things being equal, the degree of cultural development varies directly as the amount of energy per capita put to work." Leslie White, anthropologist.

With this quote, Suman Sharma, former Secretary to Nepal's Ministry of Energy, opened his keynote address. Empirical data shows that both energy consumption and electricity consumption are strongly and linearly related to income per capita. South Asian nations rank near the bottom on both metrics (fig 1). "Nepal uses less than 130 kWh per person per year." Mr. Sharma stated. "That's extraordinarily low." He explained that Bangladesh, India and Pakistan rank at 760, 447, and 280 kWh per capita, while the Asian average is 893.

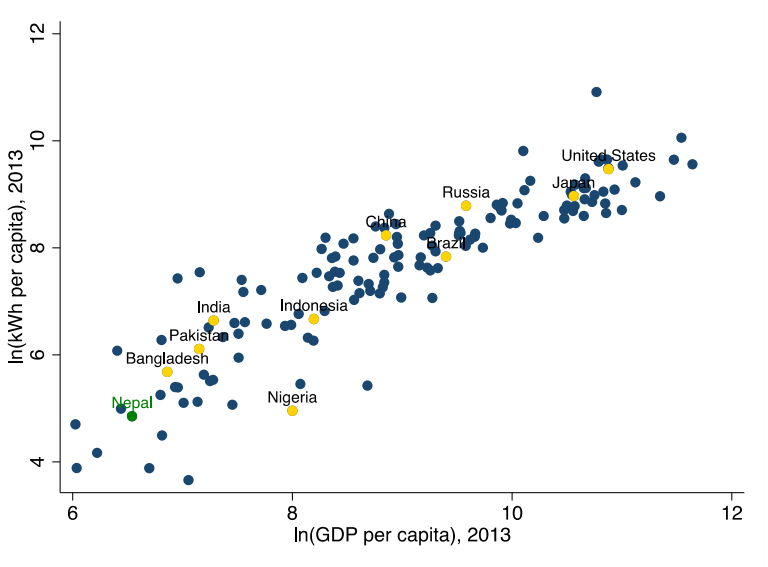


Figure 1. Electricity consumption is strongly correlated with economic development (Wolfram, 2016)

What we do not understand is whether energy drives GDP growth, or vice versa, and through what mechanisms. Prof. Wolfram explained that unpacking the nuts and bolts of this relationship will help to better plan energy investments: "If you have a dollar to spend as an energy investment, is it better to put it in the industrial sector, households, or schools? Where is the biggest bang for your buck?"

In South Asia, some 400 million people lack access to electricity, and 1.1 billion people lack access to clean and safe methods of cooking. In Nepal, a major barrier to rural electrification is its mountainous topography. Isolated power stations powered by hydro, and a few others powered diesel and solar, have been instrumental in providing electricity to areas that are difficult to reach with transmission lines (ADB, 2015; NEA, 2016).

The socio-economic benefits of household electrification are unclear. Prof. Wolfram presented her research in Kenya, which found that providing households with an electricity connection does not seem to lead to increased consumption levels or children's test scores, though she emphasised that different socioeconomic conditions might generate different impacts.

Prof. Nathan said that household energy decisions are closely linked to gender equality in South Asia, showing that the value of women's labour is a strong predictor of the type of energy a household uses for cooking. Prof. Wolfram questioned the causal direction of this relationship

citing research showing that when households get access to electricity, it drives female labour force participation; not the other way around.

Given the tenuous impact of household electricity access on development, Prof. Wolfram questioned whether public funds would be better spent on energy for healthcare, education or industry. Dr. Asad Gilani, the Secretary of Energy for the Government of Punjab, said that improved electricity systems could significantly improve productivity in Pakistan. Punjab state is losing an estimated 2% of production per year due to a lack of electricity, he said, especially in manufacturing.

In Nepal, very little production is powered by electricity. Electricity contributes only 3% of the total energy consumed (fig 2). Nepal's residential sector remains the largest consumer, despite low levels of access. Industry ranks second. However, most of industry's energy needs are met through other means: 72% of the energy it consumes is coal for heating and boiling processes in the production steel, brick, lime and cement (IEA, 2016; ADB, 2015). Agriculture, which employs roughly 76% of the nation's workforce, accounts for only 2% of the electricity consumed (ICIMOD, 2010). Mr. Sharma explained that promoting productive uses of electricity is a cross-cutting issue, "We need an agriculture policy, an industrial policy and a transport policy that are conducive to energy development. It has to come in all policies."

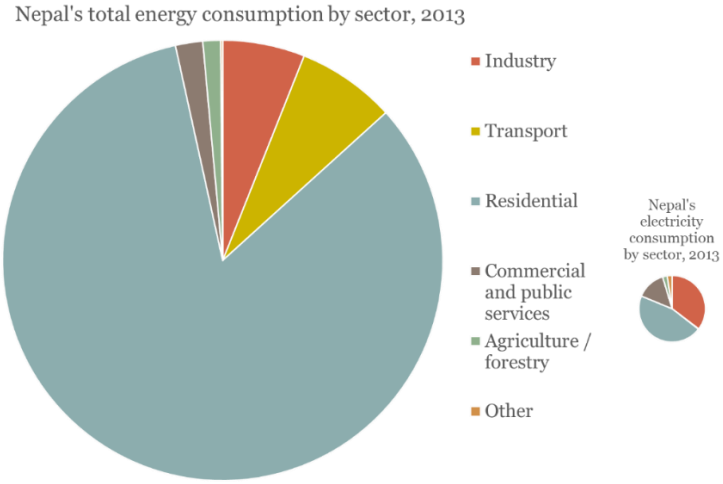


Figure 2. Breakdown of Nepal's energy and electricity consumption by sector. The volume of the pie graphs indicates the relative quantity consumed. Nepal's total energy consumption in 2013 was 10,173 ktoe. Electricity contributed about 3% of the total energy consumed, 303 ktoe or 3529 GWh. (Data from IEA, 2016).

Dr. Aditi Mukherji, from the International Centre for Integrated Mountain Development (ICIMOD), agreed that there is a need for energy policy to be synchronised with policies in other arenas. She argued that agriculture has not been focused on enough in Nepal's energy plans: "In India, agriculture consumes between 20-30% of electricity. If you look at agriculture's energy consumption worldwide, it might not be great, but in this part of the world it is. Electricity could open up opportunities for Nepal to be food self-sufficient. Agriculture is barely factored into estimates." With ICIMOD, Dr. Mukherji is conducting research on the financing of solar water pumps for irrigation.

Satish Gautam, the National Programme Manager of Nepal's Alternative Energy Promotion Centre (AEPC), highlighted the challenges of promoting productive uses of electricity in rural areas. In 1975, Nepal's King proclaimed that all the districts should have electricity access so that industries could develop. Many were provided mini-hydro plants. These alone did not kick-start economic development. In rural areas, lack of ownership, conditions of roads, availability of finance and technologies, and distance from markets all present obstacles to productive uses of energy. Only after 40 years are economic activities—including agro processing mills, tree based factories, bakeries, etc—beginning to occur.

Such micro-enterprises are vital to the commercial viability of micro hydro, because they generate a continuous stream of revenue. Many micro hydro power plants are not functioning because they cannot generate revenue from just lighting, said Vishwa Amatya, from Practical Action.

Key takeaways for EEG

- Does energy demand drive growth, or vice versa? What should policy aim to achieve, in each case?
- What factors enable electricity access to have an impact on household incomes and productivity?
- What is the ability and capacity of consumers to pay for electricity?
- At what level of demand and/or consumption does economic activity kick in?
- How could policymakers go about balancing the objective of economic growth be balanced with the obligation to provide electricity to the poorest people?
- What positive case studies exist on expanding off-grid or mini-grid energy production in South Asian countries? How can those best practices be tailored for other contexts?
- What policies can support a shift from rudimentary cook stoves to more efficient (and affordable) stoves, paying particular attention to the incentives facing women?
- Who is impacted by tariffs, and what is nature of this impact?
- How do political and institutional factors influence tariffs?
- What factors condition- and could help to build- the political will to implement technical solutions?

2.2 The challenge of reliability

South Asian nations remain mired in unreliable electricity grids that constrain productivity and leave households in the dark. Workshop participants reported that Kathmandu can experience over 90 hours of load shedding per week.

Part of the challenge is chronic underinvestment in electricity generation. In many South Asian nations – Afghanistan, Nepal and Myanmar – underinvestment has resulted from political instability. Dr. Swarnim Waglé, from Nepal's National Planning Commission, explained that 15 years' of hydro development were lost in Nepal due to the civil conflict.

Dr. Gilani explained that Punjab, Pakistan has recently made rapid progress in delivering reliable by investing heavily in generation capacity. It addressed a power shortage of 6000-7000 MW by investing in thermal power plants and some of the largest utility scale power plants in the world. Much of the progress has been driven by foreign direct investment. Dr. Gilani explained that Punjab has strong political will, good governance, transparent and efficient procurement systems, and positive macroeconomic indicators (high foreign exchange rates, low inflation, etc.). As a result, he argued, investors are attracted to the Pakistani market.

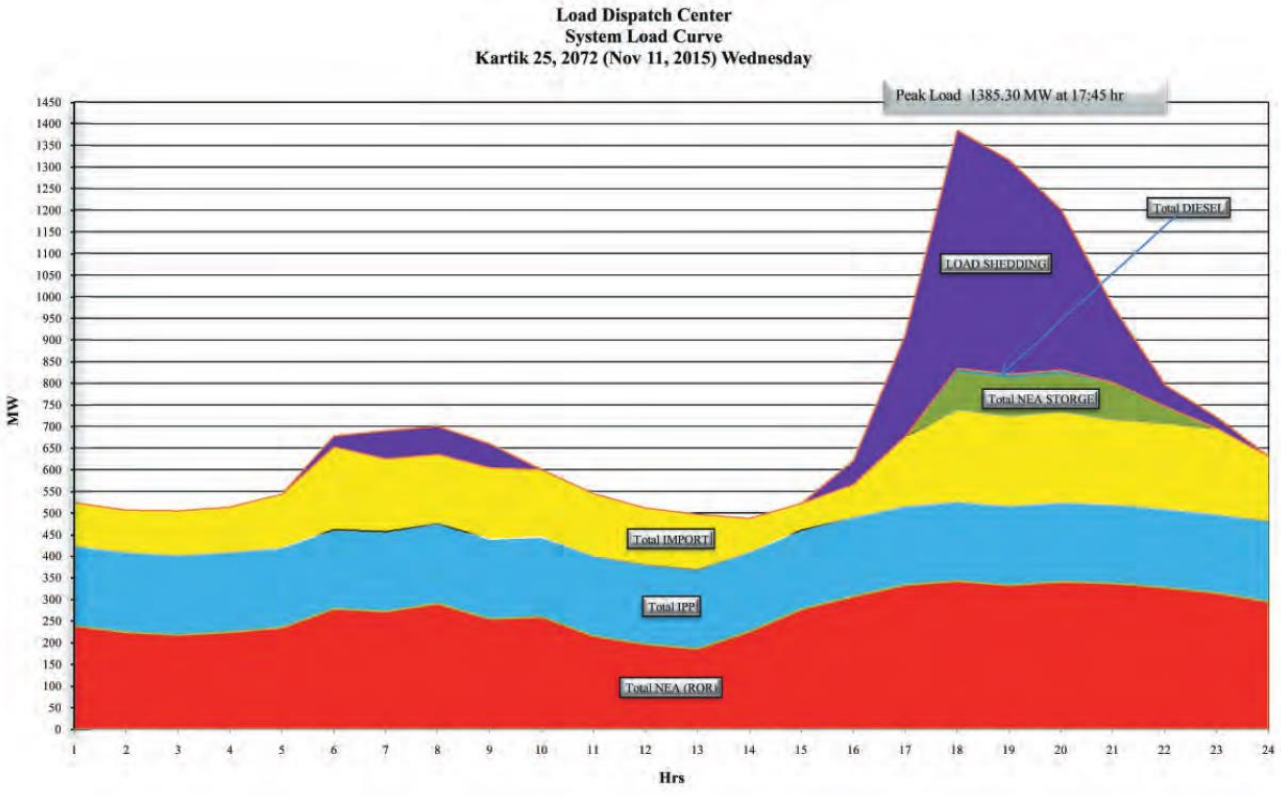
In other countries, institutional and policy structures have inhibited private investment. Min Zarni Lin explained that as Myanmar transitions from military to civilian government and from a central economy to a market economy, it is aiming to attract FDI into its energy sector. Myanmar launched

it's a new electricity law in 2016 to enable investment. However, he argued that to attract private investment, the county must reform its electricity Public Private Partnership framework and tariff structure. The electricity tariffs charged to consumers are at 2.8 cents per kWh, while the average in other countries in the region is 11 cents. Although the government provides more than US$200 million in subsidies to the electricity sector, such an unsustainable tariff structure is likely unconducive to private investment.

Rajib Rajbhandari, Director of Butwal Power Company, said that policy makers should think like developers, who are risk averse. Developers want a clear legal framework and assurance that the same rules will apply over the entire concession period. In Nepal, the concession period is 35 years; 40 years including development. If the regulations change half way through, it is problematic. Mr. Rajbhandari acknowledged that progress must happen, but that if it does and the internal rate of return or concessional period is changed, there must be mechanisms for redress.

A further factor affecting reliability in Nepal is the inconsistency of its hydroelectricity supply. As explained by Mr. Sharma, the South-West monsoon delivers roughly 80% of Nepal's rainfall in the rainy season between June and September. Most of Nepal's hydro power plants are run-of-the-river (ADB, 2015). In the dry season, without reservoirs to enable storage, Nepal's supply of electricity falls far short of peak load (fig 3). The NEA has been forced to impose widespread load shedding during these months, particularly in the evening hours when demand is highest (fig 3).

Figure 3. Nepal's electricity system load curve. Legend: red = electricity supplied by the NEA; blue = electricity supplied by independent power producers (IPPs); yellow = imported electricity; yellow/purple = electricity released from NEA's storage capacity; purple = unmet demand due to load shedding. (NEA, 2016)



Nepal declared a 'national energy crisis' in 2008 after a flood of the Kosi River destroyed a key transmission line importing electricity from India, and drought in another part of the country reduced supply (World Bank, 2011). Similar extreme events, and the inconsistency of Nepal's hydro resources, may be exacerbated by climate change. While the impacts remain uncertain, likely effects include changes to patterns of precipitation and glacial retreat. Projections show that

Nepal's runoff could decline by as much as 14% due to climate change, reducing the generation capacity of existing plants, and the economic feasibility of new ones (Pathak, 2010).

"We have to have storage projects," Mr. Sharma said. "There is no harm in having extra reservoirs… There should be a 30-40% mix of storage projects." However, hydro reservoirs, like other types of large-scale power generation, create additional social and environmental considerations. Kenichi Yokoyama, Country Director of the Asian Development Bank and Dr. Michael Boyd, Senior Advisor at USAID, explained that there has been significant opposition to hydro projects in Nepal from anti-hydro groups focused on environment and social implications. Min Zarni Lin reported that similar resistance has delayed implementation of coal and hydropower projects in Myanmar.

Lastly, it was agreed that increased generation capacity is only step required to improve South Asia's electricity systems. Yash Khaitan, CEO of Gram Power, explained that another important challenge is managing the electricity infrastructure already in place. Each year, India's power sector loses $18 billion in revenue, he said, equal to six years' of free power in Bangladesh. The primary cause is non-technical losses: power theft, billing errors, mismanagement of infrastructure, etc. Distribution companies are frequently forced to impose load shedding to manage demand from non-paying customers. By installing smart meters on transformers in Bihar, India, Gram Power has helped to significantly curtail non-technical energy losses by identifying the core areas of losses and the extent to which billing was inaccurate. "By reducing losses, the technologies pay back for themselves," he said.

Key takeaways for EEG

- How can efficient power distribution be made into a viable business option, given the amount of money that is typically lost to theft, errors, infrastructure degradation etc?
- What are the true economic costs of technical and non-technical losses?
- What particular challenges and solutions face countries with mountaineuos topography, in terms of delivering reliable energy?
- What are the causes of non-technical losses, and what policy options may be effective in reducing them?

2.3 The importance of regional cooperation and electricity trade

"South Asia is one of the least economically integrated regions," said Dr. Lohani in his opening remarks. "The most obvious gain you can make is with the energy sector."

The promise of regional electricity trade in South Asia was made clear by Dr. Shobhakar Dhakal, from the Asian Institute of Technology. He argued that electricity trade could promote better utilisation of endowed energy resources and improve regional energy security by reducing imports fossil fuels for thermal power. South Asian nations have different peak load profiles (see fig 4), so electricity trade would enable better load management. Indeed, Nepal already imports 23% of its electricity from India (IEA, Nepal, 2016). Dr. Waglé said that these imports have already helped reduce load shedding caused by the seasonality of Nepal's hydropower supply.

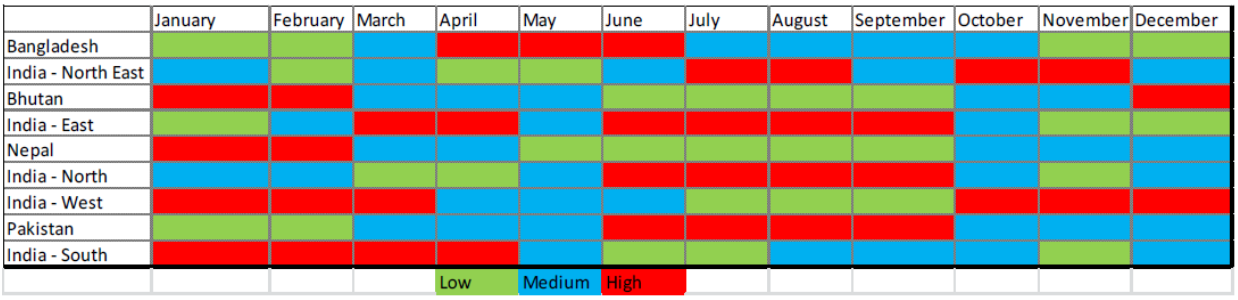


Figure 4. Seasonal complementarity in electricity load profiles across South Asian grids (Timilsina et al 2015, The World Bank)

Furthermore, Dr. Dhakal argued regional electricity trade could reduce environmental costs. Nearly 80% of the energy in the region is derived by fossil fuels, mostly coal, which has negative impacts on health, water and climate change. Interconnected grids that move electricity from one place to another as needed can more easily integrate intermittent renewable sources, such as solar and wind. Dr. Waglé explained that enabling export of electricity to India and Bangladesh could also help tempt foreign investment in Nepal's hydropower resources, displacing coal power. Nepal's total technical potential to generate hydropower is estimated at 83,000 MW, enough to meet its own projected needs and to export to neighbouring countries. However, it has only harnessed 1% of this potential (IEA, Nepal, 2016).

Dr. Dhakal and Dr. Shrestha cited a World Bank study (Timilsina et al 2015) stating that unrestricted cross-border electricity trade in South Asia could save US$226 billion in electricity supply costs from 2015-2040 and reduce CO_2 emissions from the power sector by 8%. The benefit cost ration of unrestricted electricity trade would be 5:1, Dr. Shrestha estimated.

Given the benefits of regional trade, the South Asian Association for Regional Cooperation (SAARC) signed a Framework Agreement for Regional Cooperation in 2014 in Kathmandu. The details still need to be spelled out. However, Article 4 of the SAARC Framework states that countries should allow all authorised/licensed producers and buyers, traders of each country to engage in cross-border electricity trading. Additionally, there are bilateral energy trading agreements in place, including between Nepal and India.

With these agreements in place, participants asked, what is holding back electricity trade in South Asia? A variety of barriers were identified: limited trans-border transmission infrastructure and domestic energy infrastructure, other regulatory and institutional barriers, and political disputes and mistrust. Mr. Sharma argued that the one big factor is that India is now a power surplus country, with 300,000 MW and a well-connected national grid. "If we're going to connect electricity, everything has to connect through India," Mr. Sharma stated. "There's no other way to connect regionally. They need to take the lead." If we look at China's experience, India will still have a very big appetite for energy going forward, he said, and they will slowly replace their reliance on imported coal. This means that there is a market for Nepal's hydropower, and that it can be commercially viable.

Dr. Prasoon Agarwal from the Global Green Growth Institute argued that the workshop should not limit discussions of regional cooperation to hard power pooling. Other softer things can be shared – know-how, lessons, tech transfer. Finally Dr. Mukherji emphasised that the interests of the mountain people often do not figure into these discussions. She argued that most hydro potential is in the mountains, and mountain people should benefit from their development.

Key takeaways for EEG

- What political, economic, geographical and technological factors contribute to successful power pools?
- What evidence exists on the benefits or costs of energy trade between countries?
- What are the potential gains (and/or losses) from energy trading, at the macro and micro level?
- How can the integration of renewables be facilitated?
- How do issues of trust and energy security impact upon prospects for regional energy cooperation?
- How can governments weigh up the costs and benefits of energy imports as opposed to local production? In what circumstances would imports be appropriate? What types of imports?

2.4 The need for better data and forecasting

Throughout the workshop and meetings there was a cry for more accurate data and forecasting on both electricity supply and demand. “We throw a lot of numbers around, and if you look closely, they often disagree,” said Dr. Lohani. “There is not enough data sometimes. We need real facts. In this country, there is no basic household data. If you really want to be a nation and calculate GDP… It’s got to be evidence based.”

Dr. Arunabha Ghosh, CEO of the Council on Energy Environment and Water (CEEW), said that his organisation is working to remedy this lack of data. CEEW has just published the largest report on access in India, from a multidimensional perspective – connections, affordability, durability, etc.

Ahmad Zubair Fattahi, a public policy consultant, explained that Afghanistan has an acute need for research and evidence to support its policy makers make decisions. Evidence is needed to tailor success stories from elsewhere to the Afghan context: for example, how can programmes supporting off-grid energy technologies be introduced in Afghanistan, when initial populations lack the initial capital investment?

Mr. Fattahi suggested evidence was also needed to determine whether solar pumps, though a great success in Hellman Valley, have led to a tragedy of commons, with farmers over pumping water leading to a drop in the water table. Dr. Gilani reported that solar irrigation may have also led to an overconsumption of water in Pakistan, because the marginal cost of water withdrawal with solar is near zero. Interestingly, Dr. Mukherji, reported the opposite. She found that solar irrigation has led to an under consumption of water, because the solar panels are not as powerful as electricity grids or diesel generators, which has created a flood risk.

A number of participants suggested that data was required on the impact of energy systems on climate change and the environment. Coal power plants and large scale-hydro projects were of a particular concern. Dr. Lohani said it is clear that Nepal needs hydro power plants with storage capacity, but asked where do you build a reservoir? More data is needed to pick the best site. Keshab Dhoj Adhikari, Joint Secretary of Nepal’s Water and Energy Commission (WEC), revealed that WEC will prepare plans for all of the country’s river basins in the coming 3 years to address this uncertainty.

Beyond the lack of data, conference participants called for more accurate energy demand forecasting. Prof. Wolfram highlighted the challenges in her keynote address by showing that historically, the US Energy Information Administration's has consistently under forecasted growth of energy demand in India.

In Nepal, however, many participants felt that the NEA also underestimated future growth in demand. Mr. Sharma, the former Secretary to the Ministry of Energy, argued that the NEA projection is not necessarily wrong, but it is based on the constraints in the energy sector: lack of transmission lines, low demand. Sameer Ratna Shakya, from Nepal's Department of Electricity Development in the Ministry of Energy, agreed: the NEA forecasts demand based on their own capacity to develop the electricity system. He explained that the National Planning Commission also forecasted demand, taking into account GDP growth, etc., and the outcome was much higher.

Mr. Sharma worried that the low forecasts are a self-fulfilling a self-fulfilling prophecy: "We are not enthusiastically building projects for 20 years, because we are not sure about the market. Someone needs to step in and say, 'No! Demand can drive growth, but growth can also drive demand.' Once growth hits, and consistent supply, then energy demand will definitely shoot up."

3 Next steps

The following concrete next steps were identified in the course of the workshop and the meetings. We anticipate that several more follow-up actions will be taken, beyond those listed here.

- Invite a few high-value participants to invite to the EEG Research and Matchmaking Conference on 3rd/4th November
- Follow up with MCC and World Bank about evaluations plans for upcoming investments in microhydro sites and smart meters, respectively.
- Pursue and consolidate early-stage partnerships that show promise as potential research collaborations
- Communicate with IGC Pakistan and Dr. Asad Gilani, Secretary Energy, Department of Energy, Government of Punjab, about a potential impact evaluation
- Work with ICIMOD to identify EEG-related research opportunities in their 8 member countries
- Work with SunFarmer (grid-scale solar company operating in rural Nepal) to scope out potential impact evaluations
- Connect State-of-Knowledge paper authors to resources mentioned during the workshop and meetings (e.g. MCC reports on constraints to economic growth)

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Annex A Workshop programme

Energy and Economic Growth Programme: South Asia Policy Workshop

28th September
Hotel Annapurna, Kathmandu, Nepal

Programme

Time	Activity
9:00	**Welcome by Workshop Chairperson** *Dr. Bindu Lohani, Distinguished Fellow and Board of Trustees, Institute for Global Environmental Strategies, Japan*
9:15	**Keynote: Energy policy in Nepal: opportunities and challenges** *Mr. Suman Sharma, Former Secretary, Ministry of Energy, Government of Nepal* (As of September 2016 Mr. Sharma is Secretary, Ministry of Peace and Reconstruction)
9.45	**Keynote: Addressing energy policy challenges in South Asia through EEG** P*rof. Dr. Catherine Wolfram, EEG Research Director & Faculty Director of the Energy Institute at Haas, University of California, Berkeley*
10.15	**Workshop Overview** *Dr. Shobhakar Dhakal, Associate Professor and Coordinator of Energy, Asian Institute of Technology, Bangkok*
10.30	**Coffee break**
11.00	**Session #1: <u>Energy access and supply</u>** *This session will explore centralized and decentralized approaches to increasing energy access, including the value of power reliability, the cost of non-technical losses (including theft), and returns to investments in urban vs. rural electrification.* Moderator: Dr. Arunabha Ghosh, Chief Executive Officer, Council on Energy, Environment and Water • Dr. Asad Gilani, Secretary Energy, Department of Energy, Government of Punjab • Mr. Satish Gautam, National Program Manager- Renewable Energy and Rural Livelihoods, Alternative Energy Promotion Centre, Nepal • Prof. Dr. Dev Nathan, Institute for Human Development, New Delhi • Dr. Robyn Meeks, Assistant Professor, School of Natural Resources and Environment, University of Michigan • Mr. Vishwa Bhushan Amatya, Head of Energy Portfolio, Practical Action Nepal • Mr. Yash Khaitan, Chief Executive Officer, Gram Power, India
13.00	**Lunch**
14.00	**Session #2: <u>Regional cooperation for energy security</u>** *This session will focus on the role of regional cooperation in optimizing energy generation, transmission, and use. We will discuss potential policy frameworks for thinking about the issue, including energy trading, power pools, and cross-border investments.* Moderator: Mr. Rameshore Khanal, Former Secretary, Ministry of Finance, Government of Nepal • Mr. Keshab Dhoj Adhikari, Joint Secretary, Water and Energy Commission Secretariat, Government of Nepal

	• Mr. Md Mahbubur Rahman, Director- IPP Cell-3, Bangladesh Power Development Board • Dr. Prasoon Agarwal, Senior Energy Specialist, Global Green Growth Institute, Seoul • Prof. Dr. Ram Shrestha, Professor Emeritus, Asian Institute of Technology, Bangkok • Dr. Aditi Mukherji, Theme Leader- Water and Air, International Centre for Integrated Mountain Development (ICIMOD), Nepal
15.30	**Session #3**: **Enabling Environment** *This session will consider the tools policymakers have to promote well-functioning energy sectors (i.e. policies, regulations, incentives, etc.). We will discuss obstacles to the effectiveness of these tools, as well as the value of research in informing more cost-effective policymaking.* Moderator: Dr. Anant Sudarshan, India Director, Energy Policy Institute at Chicago • Mr. Rajib Rajbhandari, Director, Butwal Power Company & Chair, Nyadi Hydropower Company Ltd. • Mr. Ahmad Zubair Fattahi, Independent consultant, Afghanistan • Mr. Khadga Bahadur Bisht, President, Independent Power Producers Association Nepal (IPPAN) • Mr. Nirjan Rai, Executive Director, Niti Foundation, Nepal • Mr. Min Zarni Lin, Deputy Team Leader, Centre of Economic and Social Development, Myanmar
17.00	**Closing Remarks** *Dr. Bindu Lohani, Distinguished Fellow and Board of Trustees, Institute for Global Environmental Strategies, Japan* *Dr. Shobhakar Dhakal, Associate Professor and Coordinator of Energy, Asian Institute of Technology, Bangkok*

Background & Objective

The Energy for Economic Growth (EEG) programme is an exciting new research initiative led by Oxford Policy Management and the Center for Effective Global Action at the University of California, Berkeley. The programme is funded by the UK Government, through UK Aid.

EEG brings together world-class academics to produce new evidence on the links between energy and economic growth in low-income countries. This evidence will be specifically geared to meet the needs of policymakers, filling in the knowledge gaps that obstruct their ability to develop sustainable, reliable and inclusive energy systems. For more information on EEG see here.

This policy workshop aims to bring together senior energy policy-makers, researchers and representatives from the private sector, NGOs and donors in South Asian countries discuss the energy challenges facing the region, and consider policy relevant research questions that could address these constraints. The lessons learned from this workshop will shape the EEG research agenda and help the programme to deliver its objective of policy impact. This is the second policy workshop under the EEG programme: you can read about the workshop in Dar es Salaam, for East African countries, here.

Format

The workshop will focus around three sessions, in which panellists will deliver 6-minute speeches and then engage in facilitated Q&A and discussion with the audience.

Logistical information

- **Venue**: Hotel Annapurna, Durbar Marg, Kathmandu, Nepal
- **Timings**: the workshop will start at 9am and finish at 5pm
- **Catering**: lunch and refreshments will be provided.

Annex B List of meetings

Table 1: Meetings between EEG Team and senior energy policymakers, researchers and private sector stakeholders

Date	Stakeholder(s)	Organisation
29/09/2016	Usman Naeem, Country Economist, International Growth Centre, Pakistan	International Growth Centre, Pakistan
29/09/2016	Aditi Mukherji, Prakash Bhave, Eklabya Sharma, David Molden (Director)	International Centre for Integrated Mountain Development (ICIMOD)
29/09/2016	Kenichi Yokoyama, Country Director	Asian Development Bank, Nepal
29/09/2016	Min Zarni Lin	Centre of Economic and Social Development, Myanmar
30/09/2016	Michael Boyd, Senior Advisor	USAID
30/09/2016	Swarnim Waglé	National Planning Commission, Nepal
30/09/2016	Sameer Ratna Shakya	Department of Electricity Development, Ministry of Energy, Nepal
30/09/2016	Rabin Shrestha, Senior Energy Specialist, and Barsha Pandey, Operations Specialist	World Bank, Nepal

Annex C List of workshop attendees

S.N	Name	Job Title	Organisation
1	Rajib Raj Rajbhandari	Director	BPC
2	Sandip Shah	General Manager	Himal Power
3	Ganesh Shah	Former Minister	
4	Anant Sudarshan	Director	EPIC University of Chicago
5	Min Zarni Lin	Deputy Team Leader	CESD Myanmar
6	Annika Olsson	Economic Advisor	DFID
7	Suman Basnet	Independent Consultant	
8	Vishwa Bhushan Amatya	Head of Energy	Practical Action
9	Dr. Shree Raj Shakya	Deputy Director	CES/IOE/TU
10	Rana B Thapa	Program Manager	AEPC
11	Hari Gapal Gorkhali	Senior Director	Centre for Rural Technology, Nepal
12	Bibek Chapagain	Enery Advisor	Royal Norwegian Embassy
13	Khadga Bahadur Bisht	President	IPPAN
14	Dr Asad Gilani	Secretary	Energy Department , Government of Punjab
15	Sameer Shakya	Director General	Department of Electricity Development, Ministry of Energy
16	Aditi Mukherjee	Team Leader Water & Air	ICIMOD
17	Bhishma Pandit	Senior Consultant	Energy consultant, Nepal
18	K.D Adhikari	Joint Secretry	Water and Energy Commission Secretariat
19	HD Shakya	PSS	OMCN
20	Dr Arnab Gosh	CEO	CEEW
21	Yash Khaitan	Chief Executive Officer	Gram Power India
22	Michael Boyd	Senior Energy Advisor	USAID
23	Srijana Panday	Head Corporate Bank	Nepal Investment Bank
24	Hitesh Chaniyara	Director (Power & Utilities)	GRID, Pricewaterhouse Coopers INDIA
25	Kunal Singhal	Associate Director	PWC INDIA
26	Satish Gautum	National Program Manager	Renewable Energy and Rural Livelihood, Alternative Energy Promotion Center Nepal
27	Jiwan Kr Mallik	Solar Power Expert	RERL/AEPC
28	Suman Tiwari	Loan Manager	Sanima Bank
29	Kushal Gautum	Technical Officer	Sun Farmer
30	Duke Ghosh	Researcher	Global Change Research
31	MD Mahbubur Rahman	Director	Bangladesh Power Development Board
32	Dipendra Bhattarai	Researcher Consultant	University of Michigan
33	Shreeya Rana	Student	Asian Institute of Technology

34	Nawa Raj Dhakal	Director	AEPC
35	Ram B Shrestha	Emeritus Professor	Asian Institute of Technology Bangkok
36	Rameshwor Khanal	Professor	SAIM
37	Nirjan Rai	Ex Director	Niti Foundation
38	Bindu Lohani	Dishtinguished Fellow and Board of Trustee	Institute for Global Environmental Strategies Japan
39	Ivan Damnjanovic,	Manager	Sunfarmer
40	Mark Turain	Consultant	CPG
41	Somish Biwar	Consultant	CPG
42	Suman Prasad Sharma	Former Secretary to the Ministry of Energy and Secretary to the Ministry of Peace and Reconstruction	Government of Nepal
43	Catherine Wolfram	Research Director, Energy and Economic Growth Programme	University of California, Berkeley
44	Shobhakar Dhakal	Associate Professor and Coordinator	Asian Institute of Technology
45	Dev Nathan	Professor	Institute for Human Development, New Delhi
46	Robyn Meeks	Assistant Professor	School of Natural Resources and the Environment
47	Dr Prasoon Agarwal	Senior Energy Specialist	Global Green Growth Institute
48	Ahmad Zubair Fattahi	Independent consultant, Afghanistan	
49	Carson Christiano	Director of Partnerships and Innovation	Center for Effective Global Action, University of California, Berkeley
50	Marcela Tarazona	EEG Interim Programme Director	Oxford Policy Management
51	Ryan Hogarth	Consultant	Oxford Policy Management
52	Felicity Le Quesne	EEG Programme Manager	Oxford Policy Management