Policy memo

Energy policy roundtable on Friday, 23 September | 09:00-10:30

Bangladesh: What kind of policy can support scalable uptake of distributed generation?

Ethiopia: How can Ethiopia shift away from a reliance on biomass energy while achieving energy access?

Ghana: Does the revised tariff structure improve the productive use of electricity in Ghana?

Pakistan: Can policymakers promote the relocation of climate migrants from dangerous informal settlements in cities?

Pakistan: How can vulnerabilities in the electricity sector be addressed?

What kind of policy can support scalable uptake of distributed generation?

Policy challenge

Land intensity of solar power (~3.5acre/MWp) makes large-scale solar parks an unattractive proposition in Bangladesh. In such scenario, distributed generation and net metering can be an alternative to solar parks. However, mass adoption of distributed generation is necessary to produce a significant amount of electricity.

According to the country's nationally determined contributions (NDCs), drafted by various stakeholders including the Ministry of Environment, Forest and Climate Change, Bangladesh needs to increase its capacity by more than three times to reach 4100 MW of renewable energy by 2030. Solar is anticipated to play a major role by contributing 55% of the renewable energy target for 2030. However, competing demand for land (a scarce commodity) is highly prevalent in Bangladesh. Distributed generation is therefore interesting to policymakers committed to reaching NDC goals.

The higher cost of renewables has made them unattractive to state-run service providers such as the Bangladesh Power Development Board, who are unwilling to buy electricity at very high prices. The Bangladesh Energy Regulatory Commission (BERC) decides the price of electricity for end consumers and would also be interested in a low-cost solution to meeting energy targets

Current research

Economic research on the cost of distributed generation is minimal. The 2018 revision of Power Sector Master Plan is instructive in understanding Bangladesh's future plans for the sector. Also in 2018, a paper evaluated the role of investment support and electricity prices on success of net metering schemes and microgrids.

A review of Bangladesh's net metering policy was published in 2020. Another paper evaluated the role of mini-grids in Bangladeshi context, but this was published when the electrification rate in rural Bangladesh was at around 60% as opposed to 100%, where it is today. The paper highlighted how mini-grids might be a form of higher-tier energy services than solar home systems. But research on distributed generation beyond solar is needed.

Policy interventions

Bangladesh government has established one small-scale solar park in Sirajganj and has two other parks with installed capacity of 200MWp in the pipeline. However, recent discussions with policymakers suggest that solar parks are no longer prioritised by the government due to land intensity and low solar irradiation. The Ministry of Power, Energy & Mineral Resources (MoPEMR) published guidelines on draft net metering in 2017 and on grid integration of solar irrigation pumps in 2020. So far, only 46 MWp of installed capacity has been added to the grid under rooftop solar net metering scheme. IDCOL, a government owned non-banking financial institution, has a mandate to finance installing of 300MW by 2024. In recent times, policymakers have talked about importing hydropower from Nepal via India to increase the share of renewables in the country.

Data availability

The Bangladesh government hosts a national renewable energy database which contains up-to-date information on current and upcoming renewable energy projects.

How can Ethiopia shift away from a reliance on biomass energy while achieving energy access?

Policy challenge

Ethiopia is the most biomass-dependent country in the world. More than 92% of Ethiopia's population still rely on biomass for energy. It is the country with the highest use of biomass and combustible waste as percentage of energy supply (oil (5.7%) and hydropower (1.6%) account for considerably less). Such heavy dependence on biomass, almost exclusively of firewood and charcoal, is not sustainable as it leads to deforestation and it is generally expensive to gather, transport, and store.

Many households rely on income from the production and trade of firewood and charcoal. Firewood and charcoal contribute for more than 25% of overall carbon emission in Ethiopia. The key policy challenges for government and other stakeholders include identifying cost-effective ways to mediate the issues and pursue a more climate-resilient energy system while meeting development objectives. The government is seeking to know how investments in alternative energy sources (e.g., solar, wind, geothermal) may help improve energy access and reduce emissions from biomass use in households for heating and cooking.

Current research

Electricity access in Ethiopia is among the lowest in the world with just about 50% of the overall population having access to electricity (World Bank, 2022). The access is even more limited (less than 38%) for the rural population, which accounts for close to 80% of the overall population. According to the latest 'energy progress' report (2021), Ethiopia is the third largest electricity deficit country. Even those with electricity access, mostly located in urban areas, use electricity almost exclusively for lighting.

Currently, a large proportion of rural and urban residents rely on biomass – firewood and charcoal – for cooking and heating even with increased fuelwood-saving cookstoves (e.g., MM Adane, 2021; Daniel et.al., 2021; Yibeltal & Wuyiwa, 2021). More literature on transitioning Ethiopia from reliance on biomass is needed.

Policy interventions

The government of Ethiopia believes that the 'Great Ethiopian Renaissance Dam (GERD)' will soon solve the electricity access problem. The GERD, Africa's largest hydro-electric project with projected capacity of 6,500 megawatts is still under construction with only 2 of the 13 turbines so far started generating power of about 750 megawatts. In addition, to counter the negative effects of biomass production, since 2019, through PM led 'Green Legacy' initiative, Ethiopia has so far planted more than 18 billion tree seedlings even though this is for the medium to long term.

Data availability

While there are generally limited data availability in the area, there are a few mainly collected by the Ethiopian Policy Studies Institute (PSI) and Environment and Climate Research Center (ECRC) from the Energy for Development initiative.

Does the revised tariff structure improve the productive use of electricity in Ghana?

Policy challenge

In August 2022, the Public Utilities Regulatory Commission (PURC) announced a 2022-2025 multi-year major tariff review. Under this review, the PURC revised the electricity tariff structure in favour of small and medium-scale enterprises. The old tariff was structured in a manner that heavily taxed enterprises (non-residential consumers) to cross-subsidise residential consumers of electricity, apparently contributing to the loss of competitiveness of Ghanaian SMEs.

While the policy objective of the revised tariff structure is obvious, it is not certain whether and to what extent it will encourage productive use of electricity relative to residential consumption. The revised tariff structure is far from perfect as it still cross-subsidises life-line consumers. There is thus a need for research to shed light on the effect of the revised tariff structure and to proffer recommendations to improve the tariff structure further.

Current research

Electricity tariff structures across the developing countries such as Ghana and India embed cross-subsidies with commercial and industrial users paying more, which in turn reduces the tariff for residential customers (Foster & Witte, 2020). A direct implication of cross-subsidy tariff structures is that they increase the cost of production, which may limit the productive use of electricity and hence a country's growth. Other research also suggests a reform of tariff structures has welfare and energy poverty implications (Pacudanab & Hamdan 2019).

In the case of India, Moerenhout, Sharma & Urpelainen (2019) surveyed the perspectives of commercial and industrial consumers on electricity tariff reforms. Their report suggests commercial and industrial users believe a reform of the tariff structure will increase productive use of electricity, output, and overall productivity gains. There is need for research to shed light on the effect of the revised tariff structure and to offer recommendations to improve the tariff structure further. It is not certain whether and to what extent the tariff structure change will encourage productive use of electricity relative to residential consumption.

Policy interventions

This topic is of high interest to policymakers at both the PURC and the Energy Commission of Ghana. The PURC has already changed the tariff structure. There is an opportunity to research the differences in tariff structures and their impact on consumption by both households and industries.

Data availability

Currently no data is publicly available, but with a strong relationship between IGC and the Electricity Company of Ghana, an opportunity for partnership to access their customer data is present. This has been done in previous engagements with the Ghanian government via IGC for research activities in the energy sector.

How can vulnerabilities in the electricity sector be addressed?

Policy challenge

Extreme weather events such as stronger and more frequent storms can reduce the supply and fuel quality of energy, reduce the reliability of renewable sources (e.g., water, wind, sun, biomass), and damage infrastructure. More extreme heat events mean that electric demand for cooling on especially hot days would increase. These changes in electricity production demand patterns, make meeting Pakistan's energy goals more uncertain. NEPRA, DISCOs, NTDC (National Transmission and Despatch Company) and GENCOs (generation companies) are all departments in the country interested in pursuing action to meet efficiency and emissions reduction goals. Pakistani policymakers urgently want to identify electricity sector vulnerabilities and adaptation options available.

Current research

Evidence shows a significant relationship between extreme hot temperatures and electricity demand in Pakistan (Ali et al, 2013). T&D lines are highly sensitive to high temperature and storm damage. With more frequent and intense heat waves, reliability and efficiency of the electricity systems is threatened. Climate change can impact reliability and efficiency of hydel and fossil-fuel plants and damage physical infrastructure (Athar et al, 2017) highlighting the need for adaptation and a holistic approach comprising technological, behavioural, and institutional approaches. Research suggests a critical role for the government in ensuring energy security and adoption of a "state-of-the-art" climate policy to mitigate and adapt (Hussain et al, 2020). Research on climate change impacts to South Asian energy infrastructure remains limited, with only few studies on Pakistan. In similar countries, resilience interventions have been investigated to determine cost, effectiveness, and second order impacts.

Policy interventions

Pakistan's energy goals include increasing energy access and decreasing associated emissions. Temporary policy interventions to cope with widening shortages during heatwaves have included limiting operating hours of large commercial establishments and the imposition of a five-day work week. The government has also launched an Indicative Generation Capacity Expansion Plan (IGCEP) to optimise energy generation costs, which is planned to be data-based and updated annually to meet future energy demands. Smart net metering has also been launched. The provincial government in Sindh has established its own power authority to utilise its value chain of energy resources — coal, solar, wind and others — for power generation, and wheel it through the transmission network of the Sindh Grid Company. Energy projects under China-Pakistan Economic Corridor (CPEC) plan to increase energy generation as well as diversity generation capacity (Opitz-Stapleton et al, 2021). Pakistan has not created an overarching resilience plan for the energy sector that could also support energy related investments under other large initiatives. With a lack of resilience strategies several on-going energy projects remain at risk of reduced generation due to extreme weather patterns (two such projects include the Engro Thar and Quaid-e-Azam energy projects). Other regions, have deployed under-ground wiring and microgrids, integrated resource planning, provision of cooling to thermal generation and adopting specialised weather forecasting, as examples of power sector resilience upgrades.

Data availability

Sensitive physical infrastructure data is needed but is not publicly available. NTDC (transmission operator) and GENCOs (generation companies) could be relevant partners for data collection and stakeholder engagement.

Can Pakistan encourage RE adoption by redesigning power purchase agreements (PPAs)?

Policy challenge

Pakistan's electricity distributors, as power purchasers, have currently inked long-term contracts with fossil-fuel based Independent Power Producers (IPPs), reducing demand for solar from distributors locked into contracts, averaging 15 to 20 years for coal plants. Reliance on fossil fuel-fired generation causes carbon lock-in within Pakistan's grid, inhibiting an immediate transition to renewables. The dramatic increase and volatility in electricity prices has increased the demand for longer fixed-price electricity sourcing arrangements and the need to invest in the green economy. Interrogating the role PPAs can play in incentivising renewables, enhancing grid stability, and contributing to power system flexibility is a key priority for Pakistan's energy sector. Economic uncertainties remain a challenge, particularly with a rise in fossil fuel prices and energy demand. Through PPAs, the government has committed to making minimum payments to power plants throughout the life of these agreements, even if lower-cost power options become available. In a competitive market, such projects would have been shelved. Operational efficiencies that could drive down the cost of energy in Pakistan are not materialising, leading to massive circular debt. A part of the solution has been renegotiation of PPAs with IPPs and adoption of solar to reduce future costs. Relevant stakeholders include the Private Power and Infrastructure Board (PPIB), National Transmission and Despatch Company (NTDC) and National Electricity and Power Regulatory Authority (NEPRA).

Current research

The interest towards renewable energy (RE) PPAs has increased recently as the economics of RE generation substantially improve, increasing in price competitiveness against fossil fuel power generation. RE generation has now become a priority for private and public investment but different business ownership models such as third-party investors or Fee-for-service are practically non-existent in Pakistan. In a growing number of markets including Australia, South Africa, Chile, and the US, RE project owners are allowed to enter bilateral electricity contracts. These corporate or private PPAs can be either for a share or all a project's output and provide a potential new pathway to maintaining bankability for new RE projects. This remains an under-explored topic. The PPAs with solar are currently too small to make impact in the RE space and subsequently no research on the Pakistan case has been undertaken.

Policy interventions

Under the World Bank's PACE (Pakistan Program on Affordable and Clean Energy) loan series, Pakistan has committed to reducing generation cost by renegotiating PPAs, as well as other policy approaches. Long-term contracts remain common in the foreseeable future, although growing demand for flexibility may require certain changes in the structure of these agreements. Policymakers may consider introducing PPAs with special clauses to increase flexibility, including various price levels and market risks targeted for different investors and RE technologies. Developers of hydropower projects could be rewarded for providing flexibility (i.e., to ramp output up and down) by introducing time-of-day or seasonally differentiated tariff schedules within PPAs. PPAs may be offered to RE developers where equity is a higher share in the capital structure. Policymakers could establish different PPA types, including a standard fixed-price agreement for more risk averse investors (or less dispatchable technologies), as well as more complex and variable pricing structures for investors willing to take on more market and revenue risk

Data availability

NEPRA posts the agreed power purchase tariffs with all IPPs on their website. This data is available for public use.