Conceptual and Institutional Prerequisites for Guiding Equitable Progress towards Universal Rural Electrification

Setu Pelz,[abc] Elina Brutschin,[‡] and Shonali Pachauri[‡]

1. Motivations underlying the research

Rural electrification is a means to improving the socio-economic conditions and living standards of those living in rural areas. Yet, as global rural electrification efforts accelerate under the Sustainable Development Goals 7 (SDG 7), most policies and programs continue to solely target and be evaluated on extending connections, with mixed results.

Despite increasing efforts to improve access to modern energy services in rural areas, progress is lagging and, in some cases, falling behind population growth. In fact, recent research suggests that even while new connections maybe provided, household access to essential energy services will still be very unequal even by 2030 without additional efforts. The few studies that have assessed recent cross country and within country variation in rural electrification performance using econometric techniques find this is linked with political systems, indicators such as corruption and government effectiveness and the institutional environment. As we approach the 2030 mark set under the UN SDGs, the IEA continues to project a severe deficit under the current policy scenario. More work must be done to understand drivers of rural electrification successes and transfer these lessons to countries where the deficit prevails despite ongoing efforts.

Conceptual developments in energy access and energy poverty measurement encourage us to look beyond connection-based indicators towards improvement across distinct multi-dimensional supply attributes linked with energy services. Indeed, past work has shown that connection-based indicators fail to capture inequities in supply reliability, affordability and use. Moreover, there is very little precedent for linking rural electrification efforts with wider socio-economic and environmental impacts that ultimately justify the implementation of these policies. This is not limited to academic discourse, rather, the SDG 7.1 target itself speaks to the provision of reliable and affordable access to modern energy services for all. Further work is necessary to understand the limitations of connections-focused programs and suggest ways forward.

2. A short account of the research performed

We conduct both quantitative and qualitative analysis of longitudinal and cross-sectional electrification datasets and country case studies. We begin with exploring the importance of multi-dimensional energy access measurement approaches and the need to assess progress at the sub-national level using sub-national cross-sectional rural electrification datasets. We then analyze the relationship between the capacity of institutions and the efficacy of rural electrification policy using a linear regression model applied to longitudinal cross-country electrification data. Finally, we conduct a narrative review of three exemplary rural electrification policy country case studies to draw broad transferable lessons for policy development.

Our work shows that national connection rates describing rapid progress are complicated by inadequate supply reliability and sub-national disparity in infrastructure provision. Similarly, while policy implementation has objectively increased following the inclusion of energy access under the SDGs, effectiveness of these in driving progress in rural electrification is uncertain. Our analysis shows that rural electrification policy efficacy is positively modified by institutional capacity, aligning with prior work describing the effects of government quality and corruption on electrification outcomes. Reflecting on

a Corresponding author. Email: pelz@iiasa.ac.at.
b Reiner Lemoine Institut gGmbH, Berlin, D-12489, Germany.
c International Institute for Applied Systems Analysis, Laxenburg, A-2361, Austria.

policy case studies in Brazil, India and Morocco, we find similarities in center-led efforts combined with regulatory controls and the integration of targeted pro-poor subsidies and decentralized electrification technologies. Nevertheless, even among these exemplary policies, evaluation remained weak beyond merely counting connections and financial oversight.

3. Main conclusions and policy implications of the work

Drawing on the quantitative and qualitative evidence presented, we argue that next generation rural electrification policy formulation must consider the following elements: (1) measurement of distinct multi-dimensional supply attributes at higher regional granularity, (2) considerations of local institutional capacity constraints and (3) independent evaluation mechanisms.

A lack of data is not a binding constraint in the development of rural electrification policy. Rather, disaggregate data collection across distinct attributes of supply is necessary for independent evaluation and effective regulatory control of these policies, as well as improving their design and targeting.

Combining a standardized set of survey questions together with utility reported data and recent advances in earth observation data processing is a promising pathway to improve the quality and frequency of data updates. This can reveal and thereby help mitigate sub-national differences in institutional capacity that have been shown to modify the success of central electrification policies.