Climate Compatible Growth

COP28

CCG COP28 POLICY BRIEF SERIES

Financing green grids is critical to support a Paris-aligned energy transition

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Summary

Investment in electricity grids, including transmission, distribution, and interconnection projects, will be key to scaling renewable electricity supplies needed to meet national development goals as well as Paris decarbonisation goals.

This policy brief highlights the role that climate finance can play in helping scale grid investments. It focuses particularly on emerging and developing economies. In many cases these economies have high projected growth in electricity demand, which could be met cost-effectively with renewables, but the necessary grid investment may be excluded from current climate financing rules because of high levels of fossil fuels in their existing generation mix.

Changes are therefore required to how green grids are defined in these contexts. In some cases, this will require the use of energy systems analysis to help determine the economic and carbon benefits of projects. We share experiences of how this can be done in an inclusive way using open-source tools in collaboration with key stakeholders.

Key Policy Recommendations

- Development finance institutions need to further prioritise grid infrastructure investment to help emerging and developing countries meet national energy development goals and achieve Paris-alignment.
- International finance organisations and climate funds need to ensure that climate finance can be accessed in emerging and developing economies, where the need is greatest and barriers currently exist.
- International agencies need to agree harmonised approaches to system modelling of grid projects' economic and carbon benefits to help direct climate finance.

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The grid investment challenge

As COP28 takes place, the international community will once again reflect on the urgency of speeding up the energy transition. It has long been recognised that what will underpin this transition will be the scaling of a low-carbon, renewable-dominated electricity system. What has gained less attention to date has been the role of grids in transmitting and distributing that electricity to where it is needed, and the enormous investment challenge to build the pylons and wires.

The Climate Compatible Growth Programme (CCG) has been supporting the Green Grids Initiative (GGI) to explore how this investment challenge can be met. More broadly, work has been undertaken to define what the climate benefits are of such investments, notably in interconnecting electricity systems together, in addition to increasing transmission capacities within electricity systems. Interconnection has the benefit of taking large amounts of renewable electricity generated in a country with large solar, wind or hydro potential and supplying that to countries with high demand. Crucially, such interconnected systems can create carbon benefits by displacing fossil heavy electricity and providing flexibility services.

> *"In my view, grids are the blind spot today. Policymakers put a lot of attention into building renewable power generation, but they forget that electricity needs to be transferred."*
> Fatih Birol, IEA Executive Director [1]

Globally, forecasts suggest that to meet net zero CO_2 emissions by 2050, investment in grids will need to double. This equates to at least $21.4 trillion worth of investment, with $4.1 trillion required to sustain existing grid infrastructure and the remaining $17.3 trillion to expand the grid to accommodate new electricity generation and consumption [2]. Much of this investment is needed within emerging and developing economies (EMDEs), with the International Energy Agency (IEA) suggesting that grid investments will need increase by approximately five times by 2035 (relative to 2022 levels) under a net zero scenario [3]. Without this investment, there is a risk that grids become a critical bottleneck to transitioning to a clean energy system [4].

However, several barriers have led to a stagnation or even decline in investment for EMDEs since 2015. Some countries are perceived as high risk; there is uncertainty around return on investment and around the regulatory situation; domestic budgets are limited; and levels of private sector investment locally are modest. These challenges have been further compounded by the COVID-19 pandemic.

The need to mobilise green finance

In recent years, there has been a growing willingness among investors and International Finance Institutions (IFIs) to provide funding that is focused on clean energy projects and therefore counted as 'climate finance'. However, to define grids as 'clean' or 'green' is not straightforward. They supply electricity from generation plants to end users so in of themselves do not reduce emissions directly but rather can be enabling infrastructure. As grid-based electricity can be from both fossil and renewable sources, identifying which grid project investments can be designated as 'climate finance' is challenging.

This question of definition has been addressed by financing organisations, who have adopted different approaches to designating grids projects as 'green' or not.

The two main approaches are: i) the EU Taxonomy [5], adopted by the Climate Bonds Initiative (CBI) and ii) the Common Principles for Climate Mitigation Finance Tracking [6], adopted by Multilateral Development Banks (MDBs). Although these approaches are necessary and welcome, both use criteria that risk constraining grid investment in EMDEs. Other key finance sources such as climate funds are still developing their approaches of how to designate grids as being 'green', to enable funds to be released to support investment in this sector.

Two research papers by CCG, Climate finance for grid investments in emerging and developing economies [7] and Mobilising climate finance for grids: taking stock of current financing approaches [8] in collaboration with the GGI Working Group on Finance, have made a number of recommendations to increase the role of and access to climate finance. For approaches using the EU taxonomy, a recommendation is that designation of project climate finance should not be based on current grid carbon intensity or on recent historical renewable capacity additions, but rather adopt forward-looking criteria focused on planned future renewable investment. This could increase eligibility of grids, particularly in EMDEs, where carbon intensity of current grids is currently high. The Common Principles approach, which uses the future share of low carbon generation as a key criterion, could be changed to award systems based on the share of capacity additions that are renewable, over that same period.

In addition, climate funds have been identified as having a particularly important role to play, as providers of much needed concessional finance, often required for grid project financing in EMDEs. However, the above approaches such as the Common Principles EU Taxonomy, are insufficient, notably as such funders need to estimate the emission reductions associated with a new project to release funds.

Developing the evidence to support financing

CCG, with partners TransitionZero, Simon Fraser University (Canada) and Dartmouth College (USA), have been exploring the use of energy systems analysis to inform approaches to climate financing grids, notably interconnection projects. A system perspective, using scenario modelling, is crucial for understanding the implications of new projects, due to many different factors that need to be accounted for, from new electricity generation plants, the size of the interconnector, and changing electricity demand across multiple power systems. All these factors will impact CO_2 emissions from the electricity system, informing the carbon intensity of the grid.

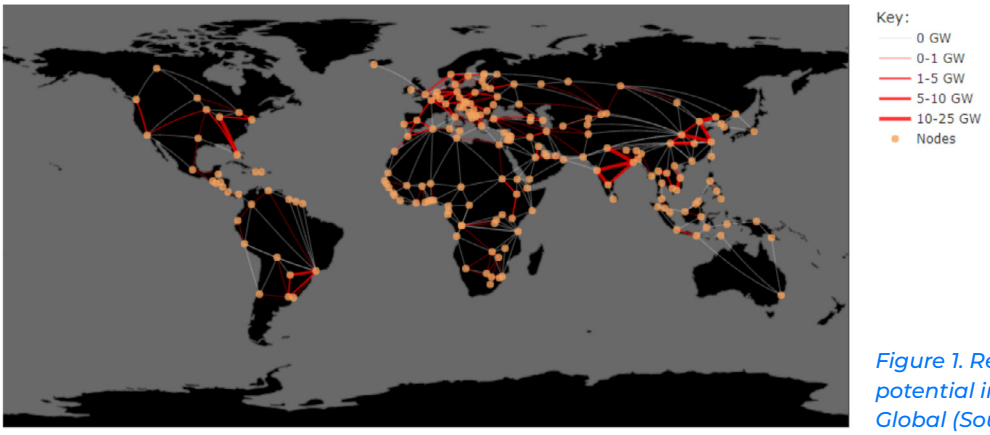

Figure 1. Representation of current and potential interconnectors in OSeMOSYS Global (Source: TransitionZero)

This approach is therefore particularly important for climate funds who can provide much needed concessional finance but require an understanding of how a project can reduce CO_2 emissions. Modelling analysis could also be used by countries (governments, utilities) or regional entities (power pool organisations) who would like to request finance from climate funds. Such analysis can also be used by other IFIs to provide project screening, based on insights on electricity transmission of renewable electricity and investment requirements.

An example of the application of this approach was a study using OSeMOSYS Global [9] – which in turn used PLEXOS-World [10] as a starting point – to assess the impact of an interconnection between the Gulf region and India [11]. In this study, a techno-economic analysis and financial analysis were used to examine an interconnection project between the Gulf States and large demand centres in India. Based on 75 different scenarios, it was found that there is a clear techno-economic case from a system perspective for the development of an interconnector. In 64 of the 75 scenarios it was cost optimal to construct an interconnector across the region, alongside carbon emission reduction benefits across a range of scenarios.

Building on this approach, the OSeMOSYS Global model is currently being used to explore the climate benefits of a set of cross border interconnectors between Zimbabwe, Zambia, Botswana, and Namibia, collectively known as the ZiZaBoNa interconnector project. All four countries are part of the Southern African Power Pool (SAPP), a framework for regional electricity trade between twelve countries, extending up from South Africa to the Democratic Republic of Congo.

In a further application, OSeMOSYS Global is also being used for a global interconnector study, led by TransitionZero, in collaboration with CCG, Dartmouth College and Simon Fraser University to estimate the cost and emission savings of interconnection and transmission and to identify those specific interconnector and transmission projects with the greatest potential benefits. A key motivation behind these developments is the drive to build an open-source evidence base on key interconnection corridors to further enable, accelerate and structure investment for grids, specifically within EMDEs.

Conclusion

Climate finance can be an enabler of investments in grids, but further development to financing approaches could help ensure that EMDEs have greater access to much needed funding.

In addition, modelling should be further integrated into approaches used by climate funds to help scale concessional finance critical for de-risking grid investments, alongside monitoring to ensure emission reductions are achieved, and assessments of the transformational economic impact that could result.

Ultimately, as IFIs and other funders continue to refine the approaches used, they need to keep in focus the need to massively scale financing in this crucial sector if energy systems are to be decarbonised and clean energy is to reach the people who need it.

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Climate Compatible Growth

COP28

ACKNOWLEDGEMENTS:

The funding for the work described in this policy brief has been provided through the FCDO-funded Climate Compatible Growth Programme (CCG), with support from partners including the Green Grids Initiative (GGI) and TransitionZero.

We would like to acknowledge the GGI Working Group on Finance, who have provided extensive input on the direction of this research. We would like to acknowledge the guidance and input to this work provided by the GGI team of Marcus Stewart, Lucy Pearson and Will Blyth. We would also like to thank Marcus and Will for reviewing this paper.

CCG brings together leading research organisations and is led out of the STEER centre, Loughborough University. CCG is funded by UK aid from the UK government. However, the views expressed herein do not necessarily reflect the UK government's official policies.

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CITATION: Pye, S., Osei-Owusu, S., and Shivakumar, A. (2023). Financing Green Grids is Critical to Support a Paris-aligned Energy Transition. Climate Compatible Growth Programme COP28 Policy Brief Series. Available at: https://climatecompatiblegrowth.com/wp-content/uploads/Financing-Green-Grids.pdf.

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