The Rockefeller Foundation

The Green Power Gap

Achieving an Energy Abundant Future for Everyone

Executive Summary

Planning for Energy Abundance

Today, there are still 3.8 billion people across 72 countries living with insufficient electricity to access modern opportunity and prosperity. Those "energy-poor" countries will not and should not sacrifice their well-being for the planet's. As a result, the low-power users of today will be larger power users—and emitters—tomorrow. For those billions, and the good of everyone on the planet, we must plan for a future of energy abundance that avoids triggering a climate crisis.

While emerging economies saw their consumption increase by nearly 4,000 kilowatt-hour (kWh) per annum over the past 50 years, energy-poor countries only saw a 500 kWh increase. If these countries follow emerging economies' power trajectory over the coming decades—and there are signs that this is already happening—they will nearly quadruple their electricity usage by 2050.

In this report, The Rockefeller Foundation and Catalyst Energy Advisors have determined the "Green Power Gap," an estimate of how much clean power must be deployed in energy-poor countries to create a future of energy abundance for those who have so long gone without while avoiding the worst consequences of climate change.

The Green Power Gap

We've found that 8,700 terawatt hours (TWh) of clean power must be deployed in these 72 countries by 2050—approximately twice the U.S.'s current annual generation—to close the Green Power Gap. We believe quantifying this gap can be the first step towards collective action needed to address it.

To reach that number, we assume that the world must aim for the Paris Agreement goal of staying "well below" 2 degrees Celsius, which, in this analysis, we interpret to mean stabilizing global temperatures below 1.75 degrees Celsius. We also assume that the 55 advanced and 66 emerging countries will achieve net-zero emissions in 2050 and 2060, respectively.

Based on those calculations, the remaining 207 gigatons (GT) carbon budget allows considerable room for the 72 energy-poor countries to grow. Focusing on the power sector alone, fossil fuel generation can grow moderately in the near term, but in the long term, green power must become dominant. For example, in 2030, about two-thirds of the total generation could still come from fossil fuels in energy-poor countries. But by 2040 that share would need to fall to 30%, and net zero must be achieved by 2070.

Green Leapfrogging

Getting there will not be easy. While an energy transition has already taken hold in many advanced and emerging markets, the energy-poor cohort that is most in need of investment and clean power deployment are being left behind.

The good news is that this group has incredible solar availability in terms of resource quality and seasonality—far superior to the resource quality in most advanced and emerging countries. They are also often endowed with complementary renewable energy resources such as wind, hydro, and geothermal, creating the potential for diverse, flexible power systems.

Taking advantage of this potential presents a "green window of opportunity." These countries can break free from the costly and inefficient trajectories of power system development in advanced economies and "leapfrog" onto nimbler power pathways enabled by modern technology. But they will need partnerships and investment to do so.

Green Power Pathways

There is no one-size-fits-all answer to a future of clean energy abundance.

In this report, we have provisionally identified four possible pathways based on existing power system assets and the availability of renewable energy resources in these countries.

These are:

1 GRADUAL GRID GREENING

This pathway is appropriate in countries like India that have developed grids and considerable centralized fossil fuel generation assets.

2 MIXED GRID RENEWABLE EVOLUTION

This pathway is appropriate in countries like Nigeria with limited grid and generation capacity but higher population density.

3 DECENTRALIZED SOLAR STORAGE

This pathway is appropriate in countries such as Burkina Faso, which have excellent solar resources but where grid development and access to other renewable resources are limited.

4 DECENTRALIZED RENEWABLE MIX

This pathway is suitable for countries such as the Democratic Republic of the Congo with limited grid and generation assets but with diverse high-quality renewable resources available.

In future analysis, we will explore these divergent pathways in greater detail.

Conclusion

It won't be enough for wealthy countries to usher in their own energy transitions if energy-poor countries develop their economies through fossil fuels. The world needs to close the Green Power Gap. Doing so will require mobilizing financial, technical, and technological resources to the markets where they are needed most. But more than that, it will require an understanding that unless everyone has the green power they need, no one can escape climate change's worst.

Foreword

Everyone on earth deserves the opportunity to lift themselves up, whether they live in Boston, Bangkok, Berlin, or Bamako. This was true in the days when the primary energy source was fire, and later wind sails, steam locomotives, and actual horsepower. In the modern globalized digital economy, opportunity comes through an electrical cord and outlet.

Today, access to electricity is the best predictor of whether someone is poor or able to escape poverty. The average American uses about 11,000 kWh of electricity each year to power their dreams—but 3.8 billion people in 72 countries, nearly all of which sit in continental Africa or Asia, have to scrape by on less than 1,000 kWh, while 675 million still live completely in the dark. That is not enough to compete in the modern economy, much less prosper.

Those billions of people need enough energy to thrive, and—unless another option is widely available—they will rely on fossil fuels that are already warming our planet. This report, developed by The Rockefeller Foundation and Catalyst Energy Advisors, seeks to explain how much power energy-poor countries need to ensure billions of people have access to the opportunity they deserve and how much of it must be generated from clean energy to avoid climate catastrophe.

What we call the "Green Power Gap" is a considerable challenge. Closing the gap will require energy-poor countries to deploy 8,700 terawatt-hours of clean energy capacity by 2050. That's roughly twice the United States' annual total power generation. Unfortunately, last year, 90% of global renewable capacity additions occurred in advanced economies, China, and just 3.5% in energy-poor countries, including India. That is not only a moral wrong, it's potentially catastrophic for our planet. If energy-poor develop through fossil fuels, they will likely become the source of 75% of global emissions by 2050.

Still, the Green Power Gap is closeable. Today, renewable technologies are cheaper and more available than ever before, and energy-poor countries should no longer have to follow the default fossil fuel pathways laid out before them. For that reason, this report also identifies new ways for countries to develop through clean energy, ensuring their people can enjoy a high-power, low-emission future.

These paths require more of all of us. Today, estimates suggest these sorts of energy transitions will cost $4 trillion per year for decades, triple the current investment. These initiatives will also necessitate policy and technological advances. For example, adapting grids to support additional renewable energy requires significant battery storage, but batteries are in such demand that they are often unaffordable or unavailable in less wealthy markets.

The good news is that the human and climate potential of green transitions is leading to action. The Global Energy Alliance for People and Planet (GEAPP), a public-private-philanthropic partnership established by The Rockefeller Foundation, the Ikea Foundation, the Bezos Earth Fund, and others, has invested $464 million of active capital in nearly 100 projects in almost 20 countries. The World Bank and African Development Bank, working alongside GEAPP, have also recently committed to investing $30 billion to connect 300 million in Africa to electricity for the first time by 2030.

Getting from where we are today to a more prosperous, sustainable future for billions of people in energy-poor countries will require even more ambition, innovation, and—above all—urgency. Because the Green Power Gap makes clear the world has no time to waste.

Onwards,

Dr. Rajiv J. Shah
President,
The Rockefeller Foundation

Introduction

Nations at COP28 in Dubai in late 2023 committed for the first time to transition away from the fossil fuels that have created and driven the climate crisis. But the reality is that energy-poor countries—where electricity reliability and access are insufficient for modern living or powering a competitive and prosperous economy—will continue to pursue a future of energy abundance regardless of whether that future is powered by renewable energy or fossil fuels. If the world intends to prevent climate catastrophe and build a better future, it must find a way to enable that growth sustainably.

For the purposes of this report, we've sorted countries into one of three categories:

1 ADVANCED ECONOMIES

On one end of the spectrum, "advanced economies" are 55 countries defined as high-income by the World Bank.[i]

2 ENERGY-POOR COUNTRIES

On the other end of the spectrum these countries have an average per capita energy usage that falls below the Modern Energy Minimum (MEM)[1] or have surpassed the MEM threshold but still have significant portions of their populations living well below the MEM.

3 EMERGING ECONOMIES

As grouped in this report, "emerging economies" represents the 66 countries falling between the advanced and energy-poor groupings. In other words, the countries that are above the MEM but not classified as high-income.

72 countries—more than half of them in Africa and nearly a quarter in Asia—fall within the energy-poor grouping. They are home to about 3.8 billion people who have thus far been excluded from the energy transition.[2]

1. Defined as an average annual per capita usage of 1,000 kilowatt hours (kWh) necessary to lift people out of poverty, create jobs, and drive economic development.

2. In the past, The Rockefeller Foundation has reported there are 81 energy-poor countries. In this report, we are no longer including countries with unreliable energy access in the grouping, hence the nine countries no longer considered energy-poor.

Our Four Scenarios report last year showed the ramifications of a scenario where energy-poor countries develop with fossil fuels. In that scenario, even where advanced and emerging countries reach net zero by 2050 and 2060, respectively, if energy-poor countries develop and industrialize predominantly with fossil fuels, the entire world will still exceed 2°C of warming and fail in its climate goals.

The result would be a worse future for everyone. Extreme weather events like heat waves, droughts, wildfires, and flooding would put an incredible strain on health, security, and well-being in high- and lower-income countries alike. For those in vulnerable communities—most of whom live in the energy-poor countries that bear the least responsibility for the climate crisis—the results would be dire.

This report is built on the fact that development is a right, a core part of human nature, and that pathways to energy abundance have long been seen as pathways to opportunity. Building an equitable, sustainable future requires us to develop credible pathways to generating clean energy for development goals essential for billions while staying within climate constraints crucial to everyone.

With that in mind, this report looks at how much renewable power is needed to reach that future. The 8,700 TWh gap we've identified, which we name the "Green Power Gap," represents the renewable energy capacity that must be generated by 2050 for energy-poor countries to meet development and climate goals. To put the size of that gap in perspective, the 8,700 TWh required is approximately twice the United States' total annual generation and nearly three times energy-poor countries' total annual power production today.[iiiii]

Closing that Green Power Gap needs to be a top priority. And that means the world has a lot of work to do and no time to waste.

A New Path to Energy Abundance

History has proven the potential for electrification to power progress. Today, energy access is considered a vital enabler of the Sustainable Development Goals, and work from groups like The Oxford Poverty and Human Development Initiative has highlighted the correlation between lack of electricity access and other poverty indicators related to health, education, and living standards.[iv]

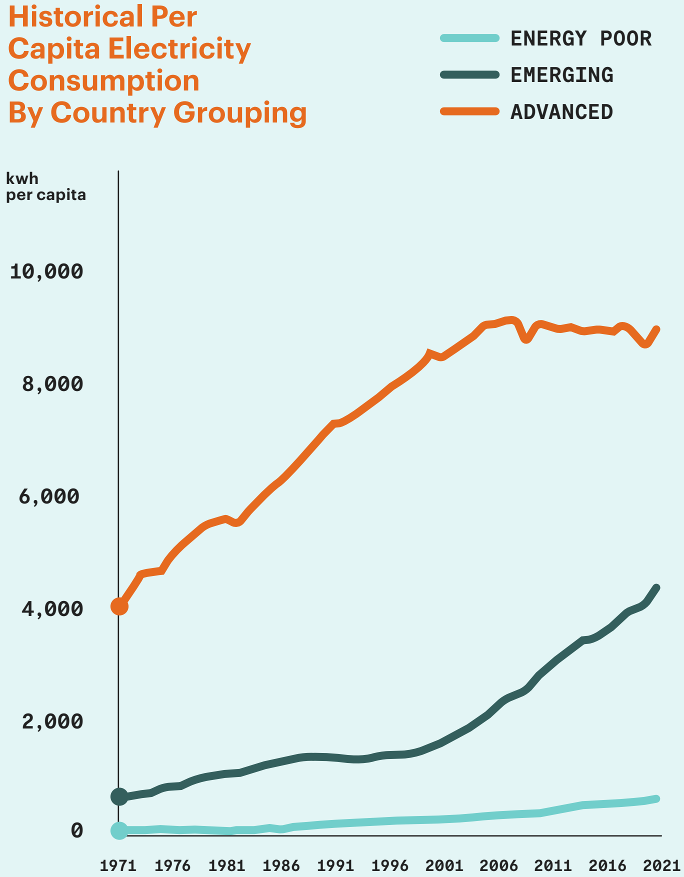
Since the dawn of electrification, wealthier countries have enjoyed explosive growth and higher living standards thanks to power generated mainly by coal and other fossil fuels. Advanced economies like the U.S., those in the EU, and many others have made investments and choices that ensured sufficient access to power prosperity for over a billion people throughout recent decades.

Over the past half-century, emerging countries (more recently industrialized countries such as China, South Africa, and Brazil) have pursued the path that worked so well for advanced economies. The economic trajectory of those emerging economies underlines what we already know: that increasing energy use is often a marker for increasing opportunity and well-being. Their dependence on coal and other fossil fuels has also made them significant contributors to global emissions.

Today, energy-poor countries are seeking the same path. Around 3.8 billion people in 72 countries lack reliable access to an annual 1,000 kWh Modern Energy Minimum (MEM). This report includes four countries that have recently surpassed the MEM threshold in the energy-poor grouping—India, Indonesia, Gabon, and El Salvador—where societal inequalities mean most of their populations still live well below the MEM.

The differences in energy usage by group have only grown starker over time. While emerging economies saw their consumption increase by nearly 4,000 kWh per annum over the past 50 years, energy-poor countries' average per capita electricity consumption only increased by about 500 kWh per annum in the same timeframe.

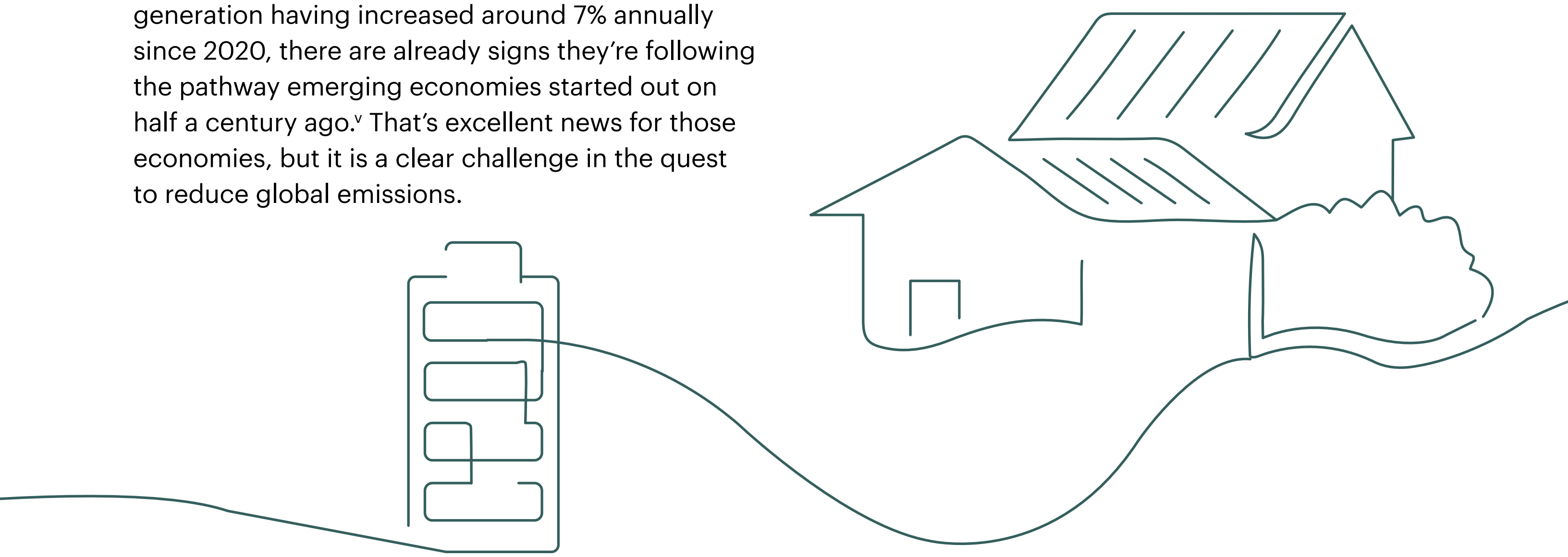
Historical Per Capita Electricity Consumption By Country Grouping



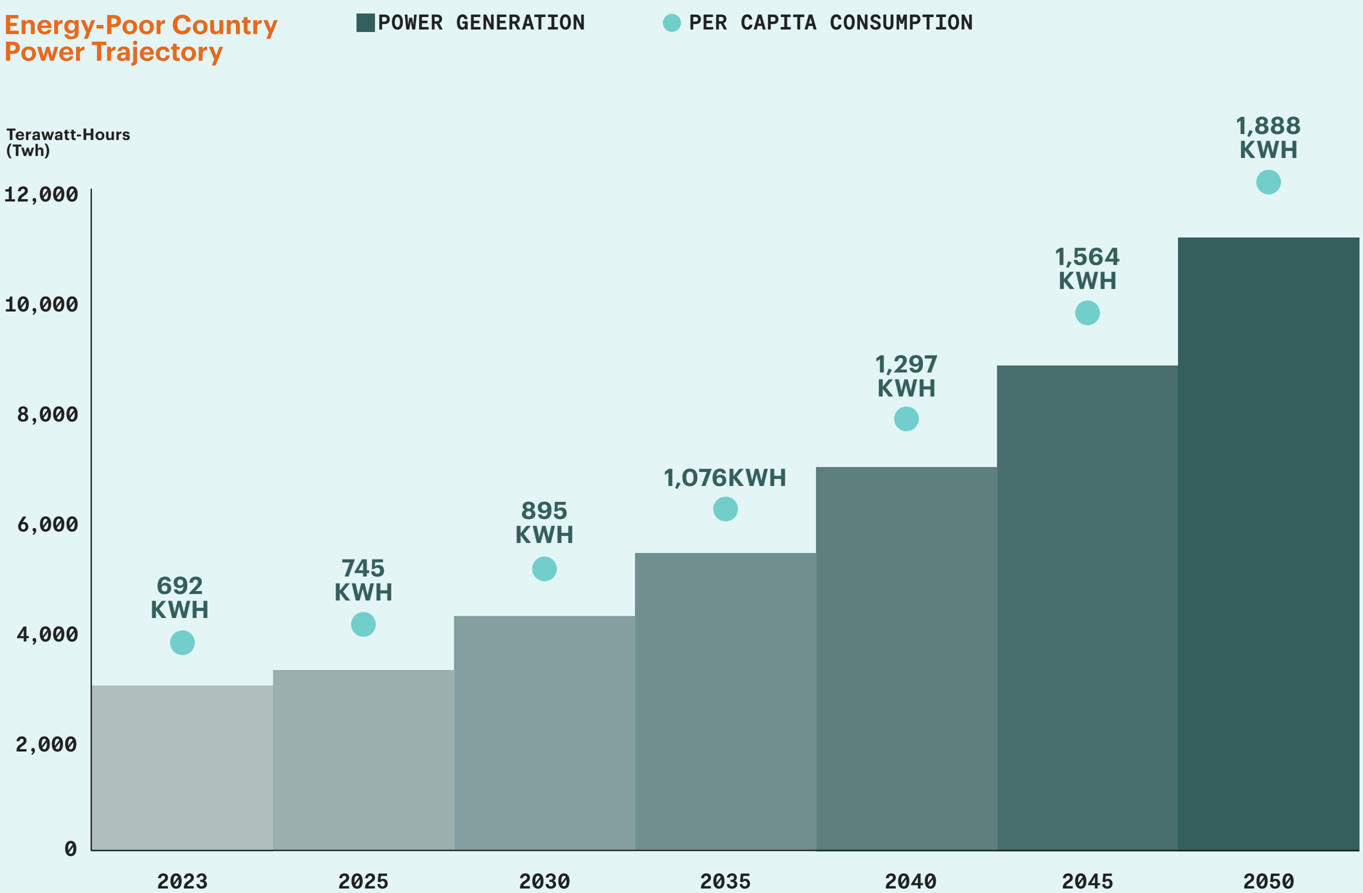
Source: Ember Electricity Data Explorer, IEA Energy Statistics Data Browser

Around 3.8 billion people in 72 countries lack reliable access to the bare minimum of electricity needed to light a classroom, power a small workshop, or cook a meal.

If energy-poor countries continue on the pathway emerging economies have followed since 1970, they will nearly quadruple their electricity usage by 2050; and with energy-poor countries' power generation having increased around 7% annually since 2020, there are already signs they're following the pathway emerging economies started out on half a century ago.[v] That's excellent news for those economies, but it is a clear challenge in the quest to reduce global emissions.

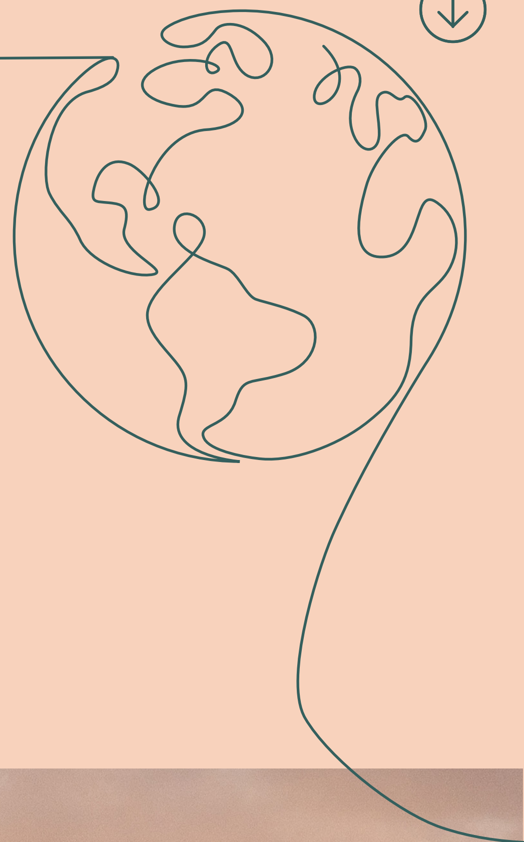


Energy-Poor Country Power Trajectory

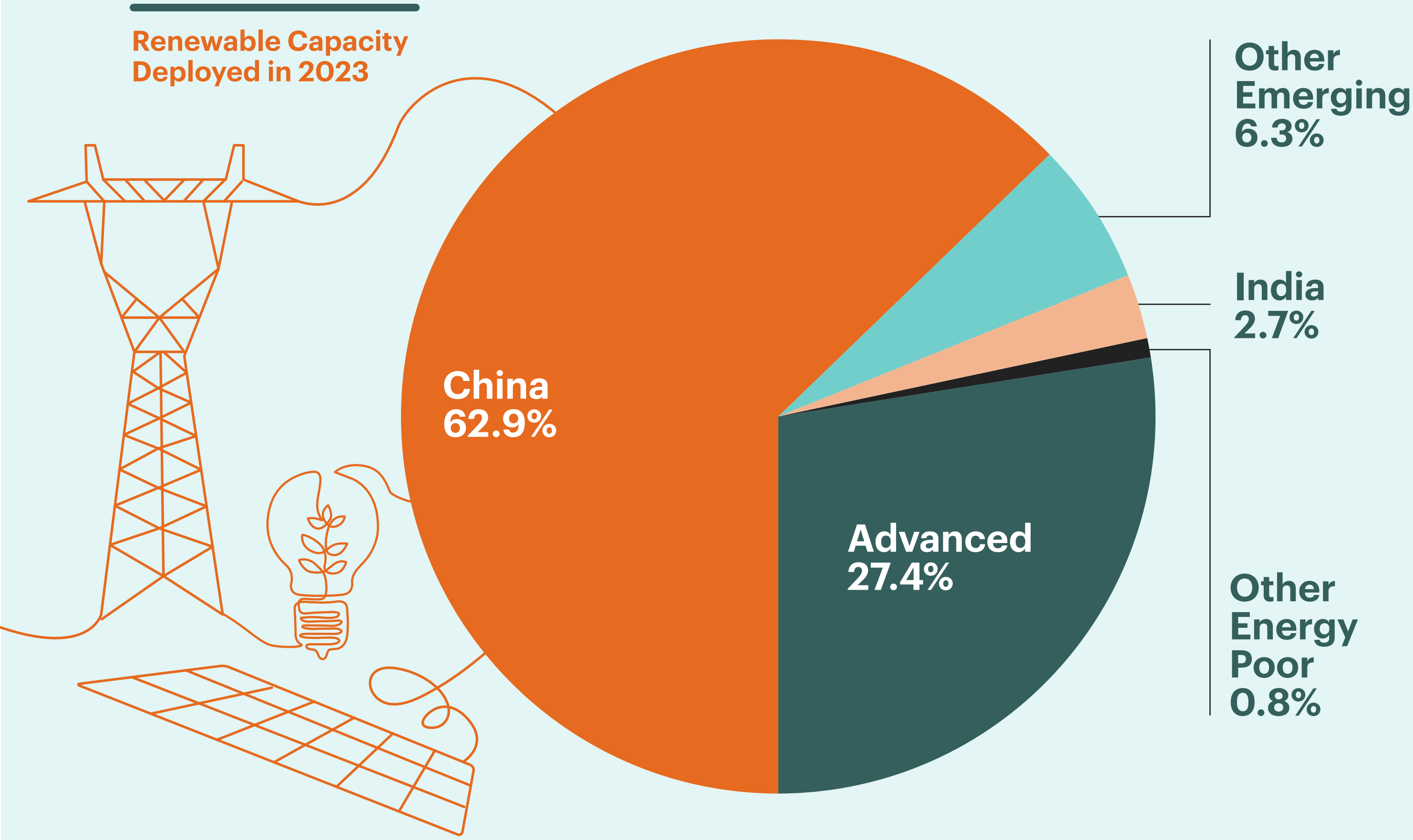


Source: Catalyst Energy Advisors Estimates

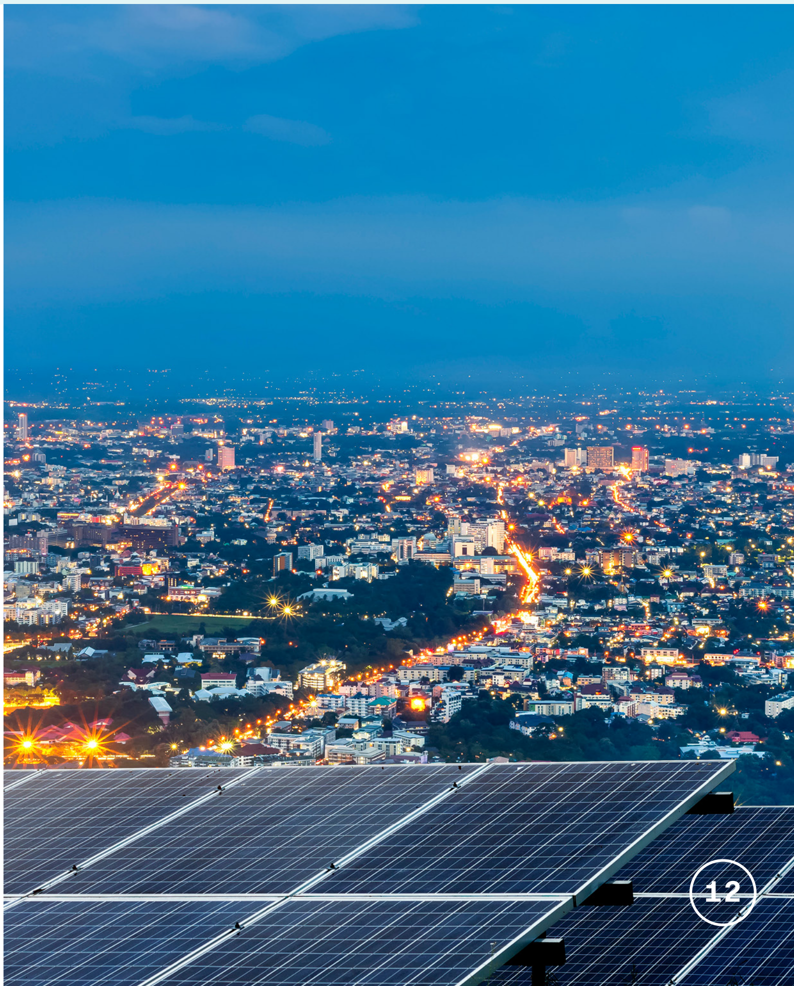
The Clean Power Haves and Have-Nots



The Green Power Gap reflects the necessity of meeting energy-poor countries’ increased power usage with clean technologies. However, those countries are once again being left behind by the developed world. So far, the distributionof renewable energy technologies has been highly uneven, resulting in haves and have-nots in the energy transition.



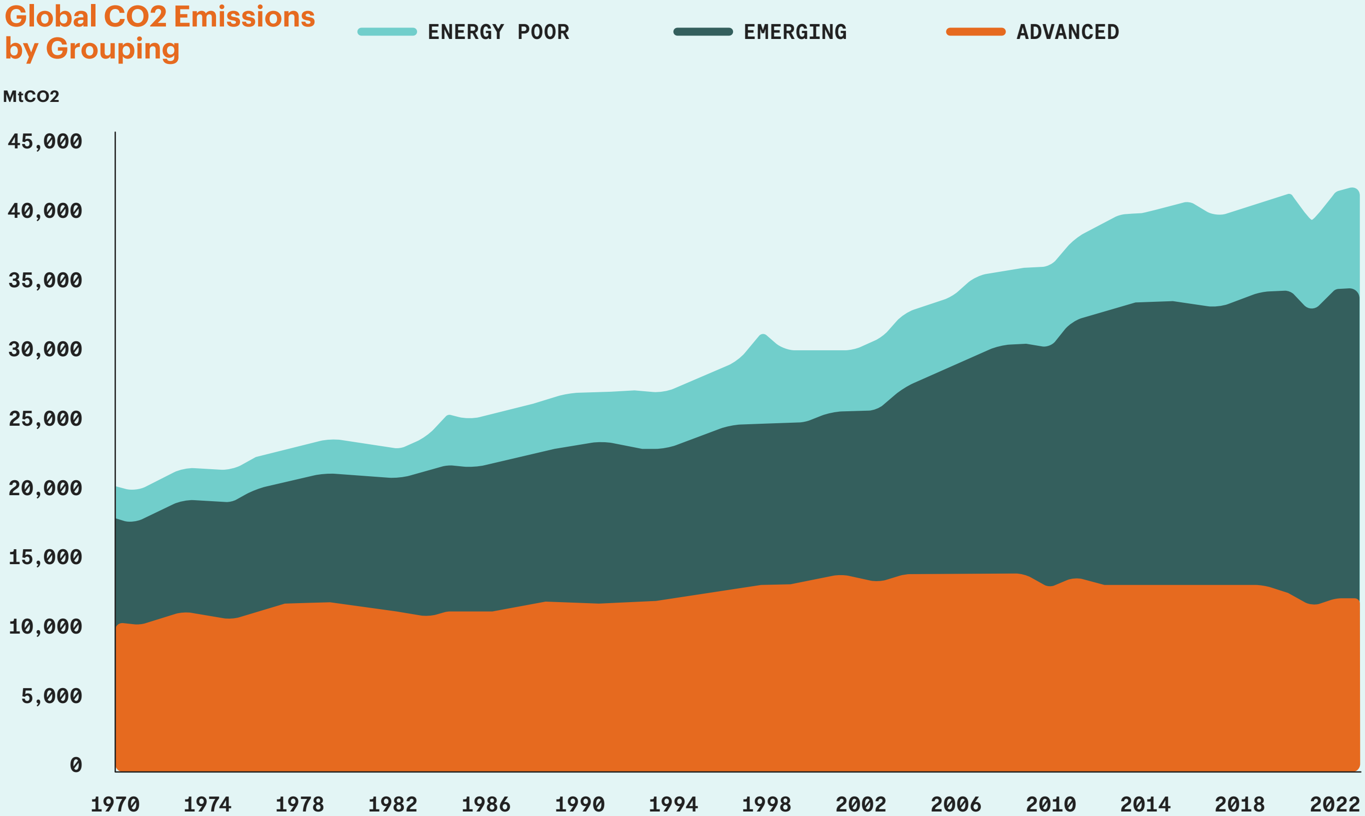
Source: IRENA Renewable capacity statistics 2024



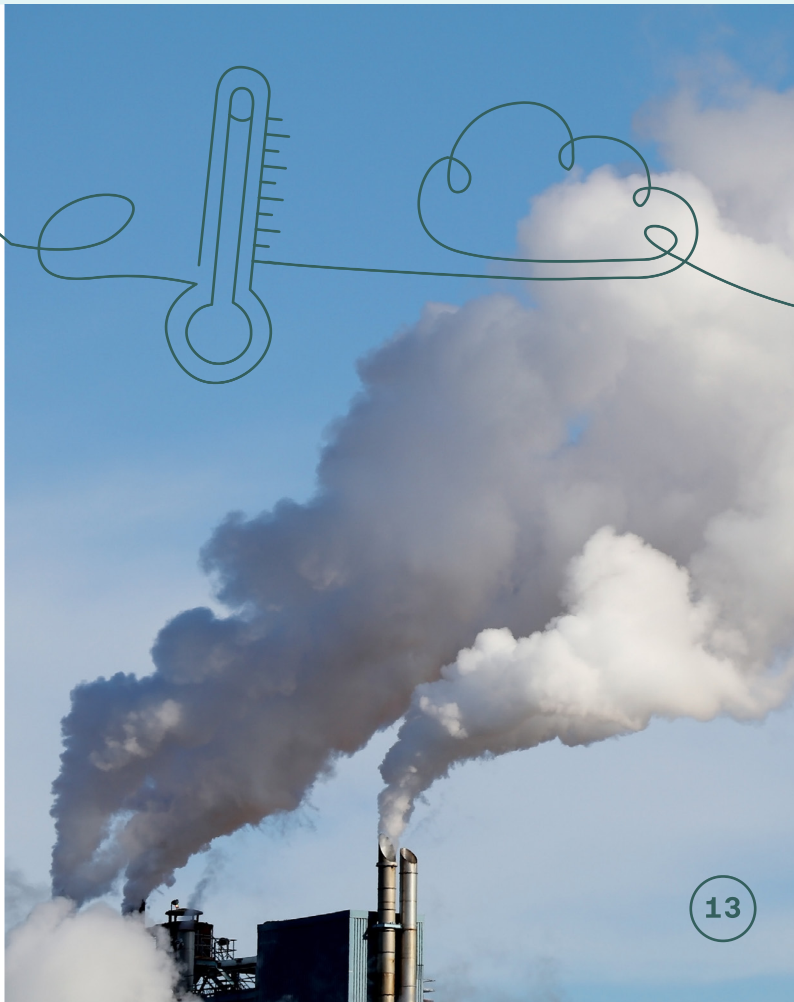
Wealthy countries have invested heavily in greening their own economies—in 2023, 90% of global renewable capacity additions occurred in advanced economies and China—but much of the developing world remains on the sidelines. Looked at by population, that disparity means a third of the world's citizens received the benefits of nearly all renewable energy investments, while the other two-thirds received just a sliver.

Global emission trends reflect the skew of clean energy deployment towards advanced economies and underscore how clean energy solutions will not be enough if applied in wealthy countries alone. While energy-related emissions fell by 4.5% within advanced economies in 2023, global emissions rose by 1.1%.[vi]

Global CO_2 Emissions by Grouping



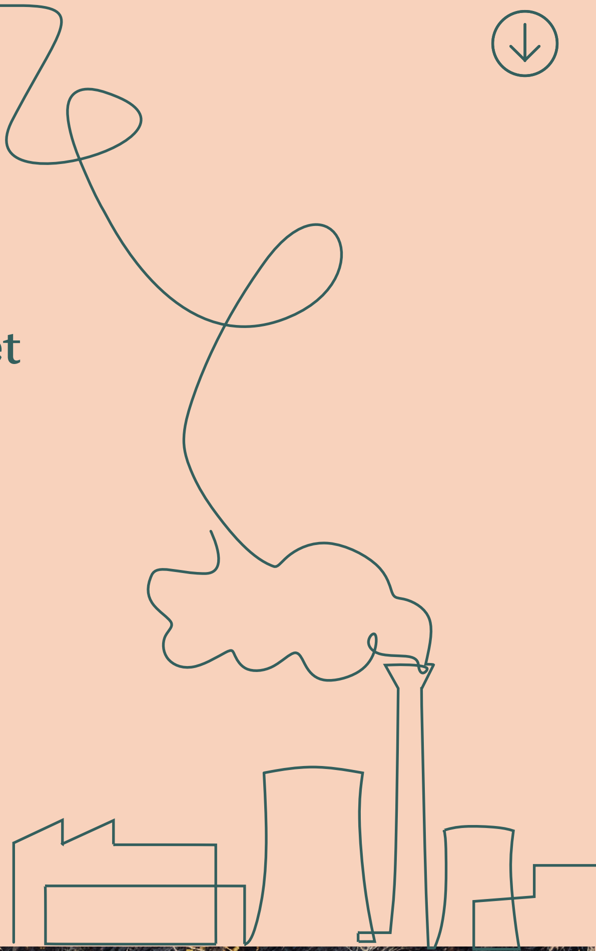
Source: Catalyst Energy Advisors estimates based on EDGAR and Friedlingstein et al.



Looking at total annual emissions by grouping, we can see emissions have peaked in advanced economies and are beginning to decline, while fossil-fuel-driven emerging economies are contributing an ever-increasing percentage of the total. If energy-poor countries follow the fossil-fuel pathway of emerging economies, we can expect their emissions to follow suit.

The Climate Constraint

A core question will hover over all deliberations as countries assess their energy futures: How much energy will they need in the coming years, and how much of that need can they choose to meet with fossil fuels without triggering a climate catastrophe? Even if developed countries were to fully meet their emissions goals in the coming decades, energy-poor countries following the same fossil-fuel pathway would result in the world exceeding a 2°C increase in global temperatures.



In the 2015 Paris Agreement, the world agreed to hold "the increase in the global average temperature to well below 2°C above pre-industrial levels" and to pursue efforts "to limit the temperature increase to 1.5°C above pre-industrial levels."[vii] Since then, the conversation around global warming has focused on the threshold of 1.5°C of warming above pre-industrial levels.

1.5°C was always an ambitious goal. Now that wealthy countries have largely spent the world's carbon budget over the last century, the pathway to an equitable and sustainable energy future looks narrower than ever.

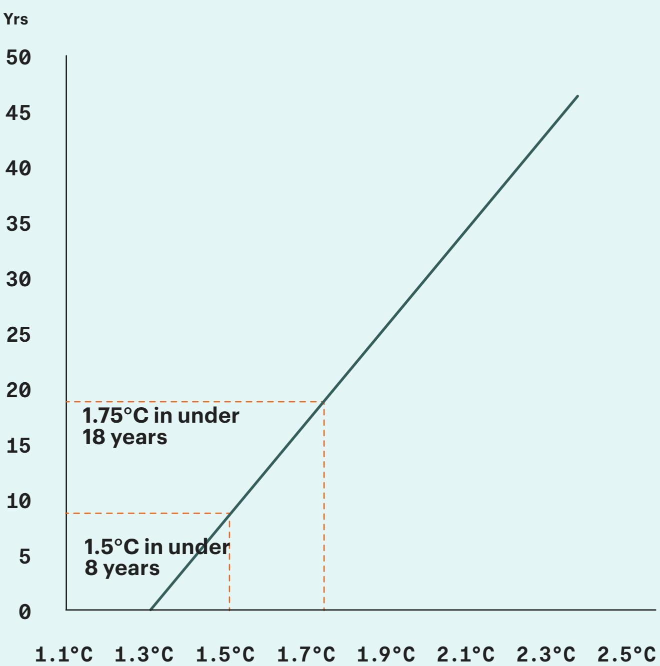
As the graphic below makes clear, the world's current level of emissions would deplete the carbon budget for a 1.5°C scenario in just eight years. Reducing global emissions enough to achieve the 1.5°C threshold looks increasingly unrealistic, especially when accounting for development goals in emerging and energy-poor countries, where most energy systems still rely on fossil fuels. Keeping planetary warming "well below" 2 degrees remains within reach but still presents challenges.

Even in an optimistic scenario where advanced economies achieve their net zero goals by 2050 and emerging economies by 2060, the 1.75°C target would allow for 207 gigatons (GT) of carbon emissions for energy-poor countries. This is the equivalent of about 40 years of annual emissions by the U.S.

If that seems like a generous amount, remember that would be the carbon budget allotted for a group of 3.8 billion people, which is over ten times the U.S. population. That group is forecast to reach 5.3 billion by 2050.[vii]

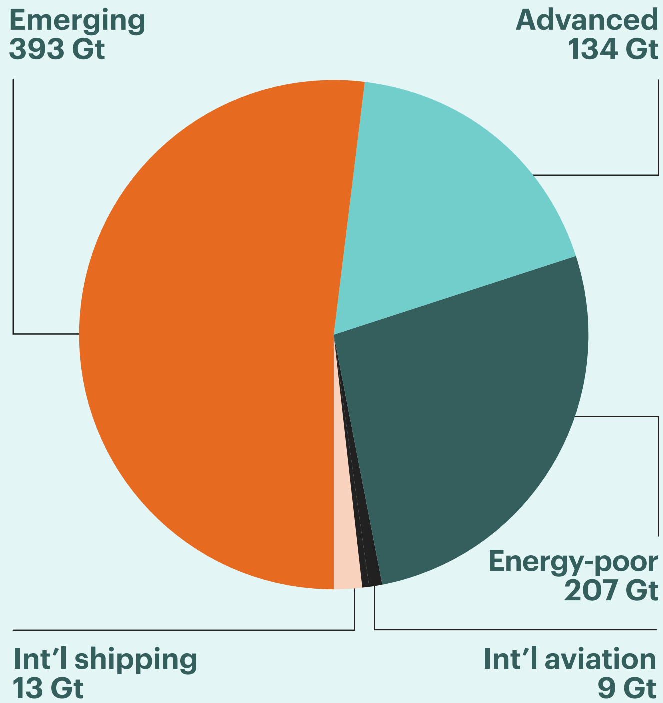
The 1.75°C target would allow for 207 gigatons (GT) of carbon emissions for energy-poor countries.

Years before Depletion of Carbon Budget for Different Temperature Targets at Current Emissions Levels



Source: Catalyst Energy Advisors estimates based on EDGAR and Friedlingstein et al. CO2 emissions data

Remaining Carbon Budget under 1.75°C Target by Grouping – 2024-2100



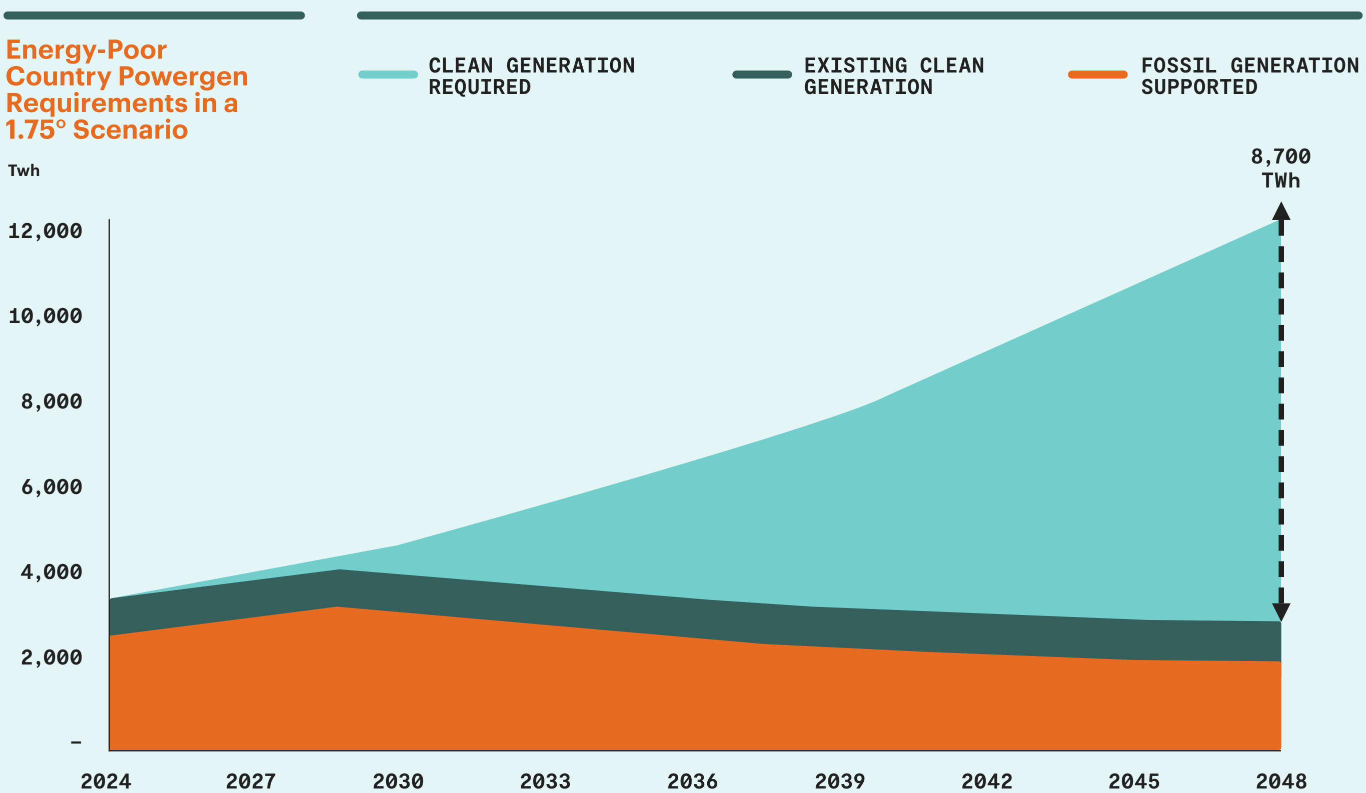
Source: Catalyst Energy Advisors estimates based on EDGAR and Friedlingstein et al. CO2 emissions data

This 207GT leaves space for these countries to transition from fossil fuels and allows for continued—and even increasing—emissions in the short term. It also highlights the difficulty energy-poor countries face in managing this constraint while fully embracing their energy ambitions.

Their challenge is magnified by the fact that, in energy-poor countries, the power sector accounts for little more than 25% of CO_2 emissions.[viii] While we anticipate the share of power sector emissions to grow, the remaining budget must be shared across emissions-intensive activities like industrial combustion and processes, transportation, and land use, land-use change, and forestry (LULUCF).

If we focus on the power sector alone, this budget will still provide considerable room for fossil fuel generation to grow in the near term. For example, in 2030, about two-thirds of the total generation could still come from fossil fuels. By 2040, that would need to be under 30%. By 2050, it would be 15%. And so on until energy-poor countries hit zero around 2070.[ix]

Taking all of the above into account, by 2050, energy-poor countries will need to deploy clean energy assets capable of generating 8,700 terawatt-hours of power per year, aka the "Green Power Gap." This is still an ambitious goal—8,700 TWh is approximately three times what currently exists in energy-poor countries today—but it still provides significant leeway for near-term development goals.

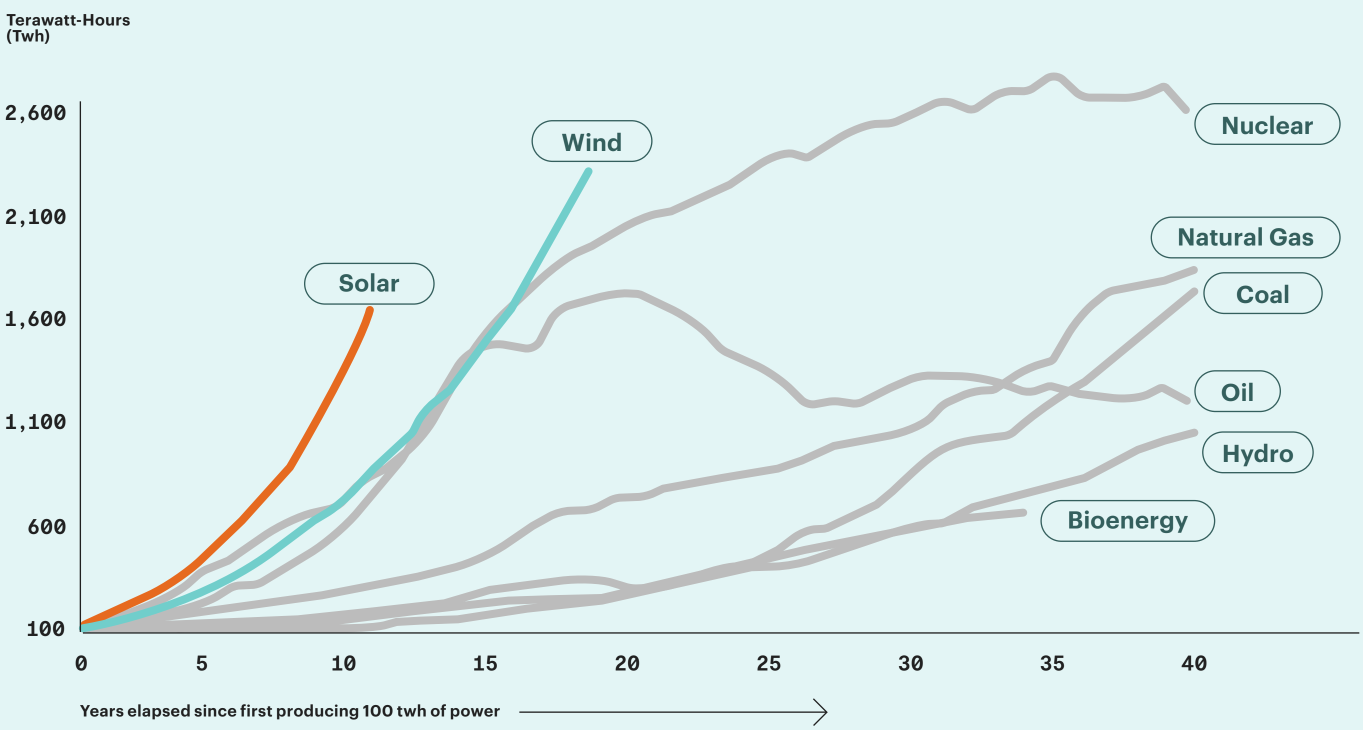


Scaling Clean Power

How could we close the Terawatt Gap? Where would this massive 8,700 TWh of green electrons over the next 25 years come from?

Though the Green Power Gap is considerable, there are reasons to be optimistic about the world's capacity to fill it. Renewable energy technology is now cheaper, more accessible, and deploying faster than ever. Solar photovoltaic (PV) is outperforming expectations and being deployed faster than any power generation tech in history.[x] At the same time, the next generation of maturing technologies is ready to be deployed, and plenty of exciting frontier technologies are on the horizon.

Global Electricity Generation By Technology/Fuel Type



Source: Ember; Pinto et al.; Nat Bullard

These tech developments are revealing opportunities for energy-poor countries to follow entirely different energy pathways than those that came before. What is clear today is there will be no one-size-fits-all solution to building the capacity to close the Green Power Gap.

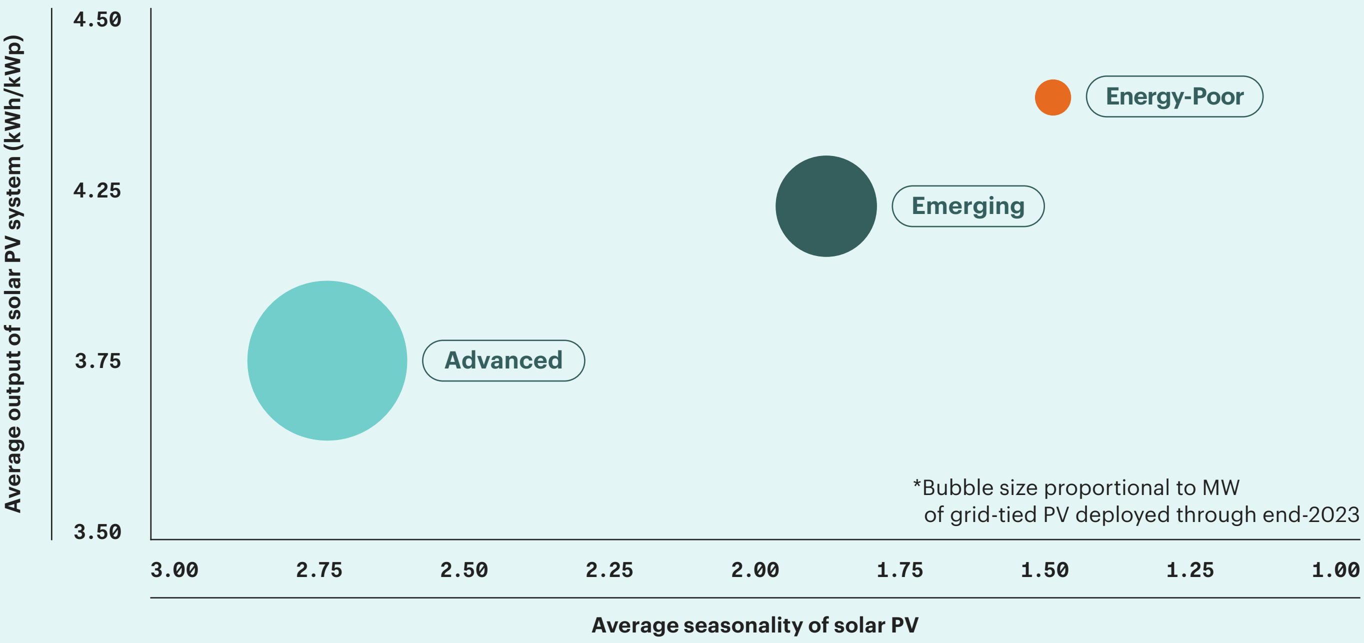
Transforming power systems in energy-poor countries will utilize many of the same ingredients—a blend of renewable energy, tapping indigenous resources, greening grid systems, and preparing for frontier technologies that have not yet come to market. Still, the final mixture balance can, and should, look very different from case to case.

For example, energy-poor countries' solar futures are looking bright. Across the board, they have incredible solar resources in terms of both resource quality and seasonality. Even in its lowest solar production month, the average energy-poor country still achieves 75% of its maximum potential solar output.[xi] On top of that, energy-poor countries are also often endowed with complementary renewable energy resources such as wind, hydro, and geothermal, creating the potential for diverse, flexible power systems.

That untapped potential and the challenges to unlocking it means planning for those countries' energy futures will require innovation and adaptability. Every energy-poor country has different incumbent power sector assets, different geographical distribution of populations, and different indigenous endowments that must be considered when planning their energy future. By playing to those needs and strengths, we will ultimately be able to reach more people quickly and sustainably.

PV Resource Quality by Country Group

Source: SolarGIS; IRENA



Leapfrogging in Action

Taking advantage of this potential presents a "green window of opportunity" for developing countries. Latecomers can break free from the costly and inefficient trajectories of power system development in advanced and emerging economies and "leapfrog" onto nimbler power system pathways enabled by modern technology. Think about how, rather than pursuing traditional landlines, mobile phones and cell towers connected underserved and remote parts of the world in a timelier and more efficient manner.

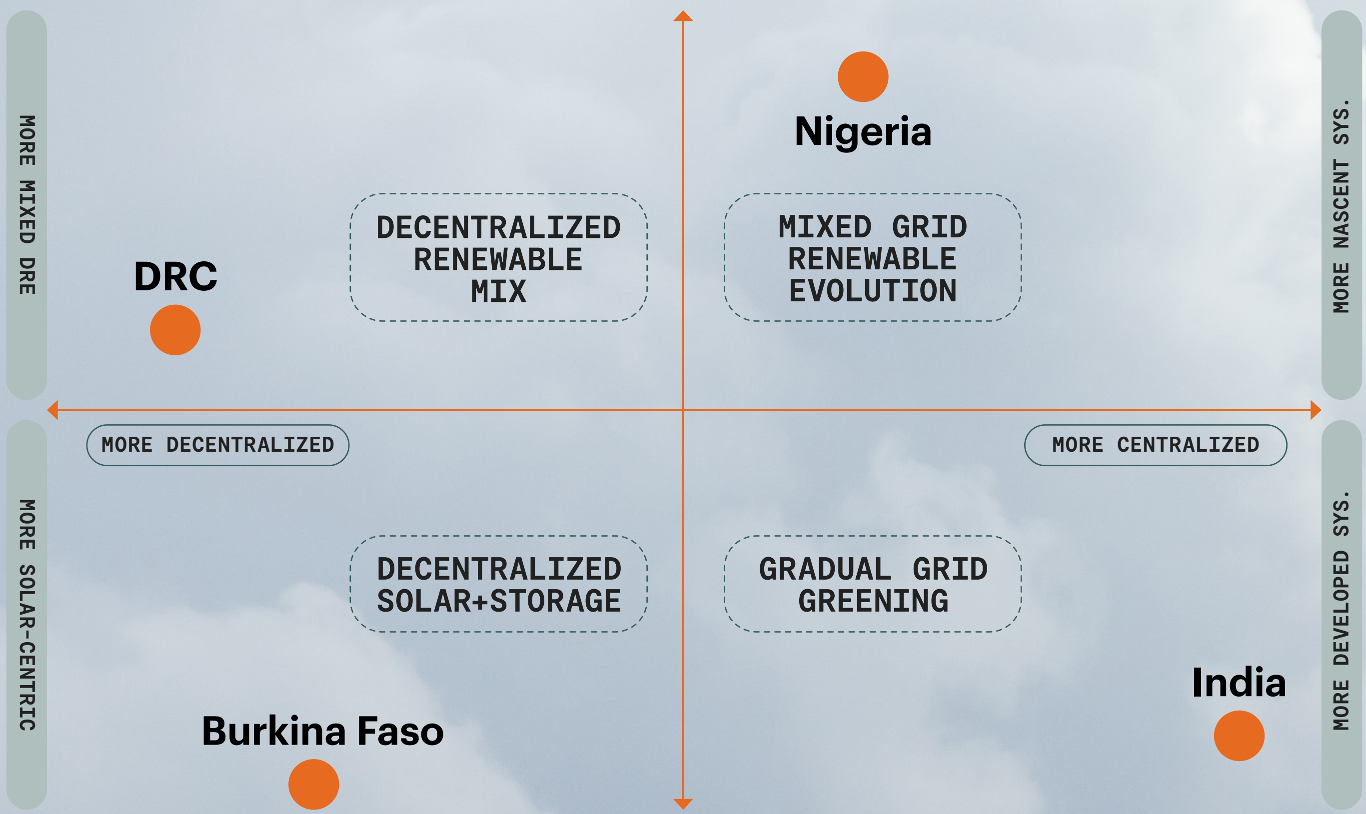
Modern energy tech can do the same thing. In countries with low electricity access rates, there is now enormous potential to follow decentralized pathways—for example, by creating localized energy systems through solar mini- or metro-grids—allowing countries to avoid the slow and costly expansion of transmission lines. In developing countries with more established grids, the opportunity lies in deploying specific renewable energy generation and storage technologies to green those grids.

As we've already stated, there is no one-size-fits-all solution. These new energy systems will require a blend of technology, but that blend will differ heavily from case to case, accounting for each country's resources and needs. Two main variables will determine which type of "leapfrog" opportunities present themselves: a country's current grid infrastructure and the quality of its renewable resources.

On this basis, we have identified four possible pathways to clean energy abundance:

1. **GRADUAL GRID GREENING**
2. **MIXED GRID RENEWABLE EVOLUTION**
3. **DECENTRALIZED SOLAR STORAGE**
4. **DECENTRALIZED RENEWABLE MIX**

Power Development Pathways & Examples



1 GRADUAL GRID GREENING

This pathway is appropriate in countries with developed grids and considerable centralized fossil fuel generation assets. The pressing question is how to ensure that grid power is delivered more cleanly and sustainably. That's the question many advanced economies are currently solving for as they deploy growing amounts of renewable capacity. This approach requires integrating widespread deployment of clean generation and battery storage technologies within the grid while phasing out fossil fuel-based generation.

Since it relies on existing grid infrastructure, this approach does not necessitate leapfrogging to entirely new energy systems. Still, it provides ample opportunity for technological leapfrogging—in other words, the early deployment of newer clean technologies (such as green hydrogen) as they become commercial.

One prime candidate for this pathway is **India**, which already has an extensive grid system that reaches 99.2% of residents, but three-quarters of its power generation comes from coal.[xii] Putting India on a pathway to a clean, high-growth future will require widespread deployment of clean generation and storage technologies integrated with their grid, alongside a gradual phaseout of coal.

2 MIXED GRID RENEWABLE EVOLUTION

This pathway is appropriate in countries with limited grid and generation capacity but higher population density. It involves building out a power system centered around renewable generation and storage solutions, bypassing heavy investment in fossil-fuel-fired power plants and avoiding significant lock-in of CO2 emissions.

In densely populated countries with limited grid coverage, where the grid serves major cities but not all rural areas, centralized electrification may still be the most cost-effective way to provide access to most residents in the long term. In the short term, decentralized systems such as mini-grids can provide immediate energy access for rural areas until the grid reaches them.

One candidate for this approach would be **Nigeria**, Africa's most populous country. Since Nigeria's grid and generation assets remain limited, the country has the potential to build a renewables-centric power system even faster than advanced economies. In the short term, the quickest way to provide electricity access to thousands of villages will be by deploying mini-grids. Indeed, the average construction time of renewable energy and battery storage systems is less than half that of fossil alternatives.[xiii] In the medium term, there may be a growing incentive to interconnect these mini-grids and absorb them into the national grid as local power demand grows, and there is potential to tap into a diversity of renewable energy resources.

3 DECENTRALIZED SOLAR STORAGE

This pathway is appropriate in countries with limited grid development but excellent solar resources and limited other renewable options. In these cases, extending the grid is a huge bottleneck to achieving universal electricity access. Fortunately, distributed renewable technologies, including smaller-scale battery storage, offer an alternative, lower-cost pathway. The heavy deployment of decentralized PV tech combined with battery storage can harness that potential and meet much of those countries' energy needs.

One example is **Burkina Faso**, where solar is the only meaningful indigenous renewable resource. Fortunately, its solar potential is staggering and thanks to the declining cost of PV systems and batteries, it can follow a solar-paved pathway to energy prosperity. Generation through solar-powered mini-grids, metro-grids, and standalone solutions could directly serve much of the population and avoid the need for costly and slow grid extensions.

4 DECENTRALIZED RENEWABLE MIX

This pathway is also suitable for countries with limited grid and generation assets but favors those where a diversity of high-quality renewable resources exists. It relies heavily on decentralized systems, but, in this case, they are powered by various renewable energy sources, such as solar, hydro, wind, and geothermal. Blending those systems based on individual countries' resource endowments allows for flexible systems to emerge to meet energy demand cost-effectively and resiliently.

One such example is **The Democratic Republic of the Congo (DRC)**, where grids exist around some major population centers, but 80% of the country's population is still unelectrified. A sizeable share of the 76 million people without energy access will be best and most quickly served by decentralized power systems. The country has abundant hydro resources, which already account for 97% of grid-connected generation.[xiv] New decentralized systems could be focused on a blend of solar and small hydro.

Bottomline

Each pathway and "archetype" country—India, Nigeria, Burkina Faso, and the DRC—account for differences in incumbent power sector assets, grid development, natural resources, etc. As we dig deeper into what solutions are feasible with existing technologies and what might come with foreseeable frontier technologies, we plan to flesh out these and other country-specific case studies in the coming months.

Conclusion

Closing the Green Power Gap is in every country's interest. It is not enough for developed countries in the Americas, Europe, and Asia to muster the capital to usher in their own energy transitions, nor is it enough for emerging economies like China to do the same. Wealthy countries will suffer the consequences of the climate crisis—whether they reach their net zero goals or not—unless they take steps to close this gap for everyone.

At COP30 in Brazil in 2025, each nation will release revised, more ambitious pledges of action, or what are known as their nationally determined contributions (NDCs).

Making pledges is easy, but implementing them will be a monumental task. Countries will wrestle with complex webs of issues in drafting energy transition plans, aligning stakeholders with different interests, designing investment-grade regulatory environments, and building institutional capacity and local expertise. The reality is that no country's citizens, voters, business owners, or political leaders will want to transition away from fossil fuels unless they are confident they will have the reliable and affordable power they need to grow and prosper.

Identifying the Green Power Gap is a start to building that confidence. Knowledge of what's necessary is the first step in making it possible. Now the right combination of technologies, financing, and policies must fall into place to make renewable energy a reliable path for progress. Only then can the world's energy-poor countries leapfrog traditional power systems, forgo fossil fuel pathways, and build efficient and sustainable systems.

In the coming months, we will release additional chapters examining the market and frontier technologies needed to bring this revolution about, as well as the required policy and financing moves. All of this is designed to enrich and inform the broader discussion as countries prepare to put forward their own plans in 2025 to get a grip on the increasing threats of our warming planet.

Appendix

The 72 energy-poor countries assessed for this report include the 68 that fall below the MEM, alongside India, Indonesia, Gabon, and El Salvador, where significant proportions of their populations still live well below the MEM.

AFRICA

1. **Angola**
2. **Benin**
3. **Burkina Faso**
4. **Burundi**
5. **Cabo Verde**
6. **Cameroon**
7. **Central African Republic**
8. **Chad**
9. **Comoros**
10. **Congo**
11. **Côte d'Ivoire**
12. **Djibouti**
13. **Democratic Republic of Congo**
14. **Equatorial Guinea**
15. **Eritrea**
16. **Ethiopia**
17. **Gabon**
18. **Gambia**
19. **Ghana**
20. **Guinea**
21. **Guinea-Bissau**
22. **Liberia**
23. **Lesotho**
24. **Kenya**
25. **Madagascar**
26. **Malawi**
27. **Mali**
28. **Mauritania**
29. **Morocco**
30. **Mozambique**
31. **Niger**
32. **Nigeria**
33. **Rwanda**
34. **Sao Tome & Principe**
35. **Senegal**
36. **Sierra Leone**
37. **Somalia**
38. **South Sudan**
39. **Sudan**
40. **Tanzania**
41. **Togo**
42. **Uganda**
43. **Zambia**
44. **Zimbabwe**

ASIA

1. **Afghanistan**
2. **Bangladesh**
3. **Cambodia**
4. **India**
5. **Indonesia**
6. **Kiribati**
7. **Micronesia**
8. **Myanmar**
9. **Nepal**
10. **North Korea**
11. **Pakistan**
12. **Papua New Guinea**
13. **Philippines**
14. **Samoa**
15. **Solomon Islands**
16. **Sri Lanka**
17. **Timor-Leste**
18. **Tonga**
19. **Tuvalu**
20. **Vanuatu**

LATIN AMERICA & CARIBBEAN

1. **Bolivia**
2. **El Salvador**
3. **Guatemala**
4. **Haiti**
5. **Honduras**
6. **Nicaragua**

MIDDLE EAST

1. **Syria**
2. **Yemen**

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