POLICY BRIEF

3

Renewable Technologies for Achieving Universal Electricity Access

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Abstract

While we enter the final decade to achieve the United Nations Sustainable Development Goals, there are roughly one billion individuals without access to electricity globally. However, the last decade has seen significant progress in the electrification process worldwide. This paper discusses the agenda of universal electricity access and the contribution of G20 countries towards achieving the same. It provides an overview of the existing definition of universal electricity access and delves into global electricity access trends. The paper also attempts to address the issue of access by looking at the synergies between electricity access, energy efficiency, and renewable energy.

Keywords: *Electricity access; Renewables; Rural Urban Energy divides*

JEL classification: *K32, Q40, Q41, Q49*

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Renewable Technologies for Achieving Universal Electricity Access

Amrita Goldar and Tarun

Key Messages

- **Global Progress:** There has been significant progress in the electrification process across the globe in current decade. The proportion of the global population with electricity access grew from 78 percent to 87 percent between 2000 and 2016, with the number of people living without access to electricity dipping below 1 billion.
- **Rural-Urban Divide:** Despite significant progress in the electrification rate, the rural-urban divide in electricity access has remained intact. While electricity access in urban areas is over 93 per cent in the majority of G20 countries, the rural access rate still lags as low as 67 per cent in 2017 for South Africa.
- **Regional Highlights:** There has been acceleration in the electricity access rate in all regions adopted by the G20 committee. In Sub-Saharan Africa, there has been significant progress since 2000 with 26 million people gaining electricity access annually, while several countries in the Asia Pacific have reached an electricity access rate of up to 95 per cent.
- **Centralised and Decentralised Energy Systems:** The correct choice for energy systems for a region or a locality depends on the distribution of population, resource endowments and geography of the location and accordingly, a mix of centralised and decentralised systems has proven to be an ideal intervention for improved electricity access globally.
- **Electricity Access, Renewable Energy, and Energy Efficiency:** There is a synergistic relationship between electricity access, energy efficiency, and renewable energy. All of these are important to attain the common goal of effective climate action and improved electricity access globally.

1. Introduction

In 2015, the global community adopted an ambitious sustainable development agenda to eliminate global poverty, achieve gender equality, and put more emphasis on agendas like universal energy access, climate action, etc. Later, in the same year, the Paris Agreement was adopted to improve the response of the countries to climate change. The Paris Agreement was also a roadmap for the achievement of Sustainable Development Goals (SDGs). Continuing the series, leaders at the G20 summit in Hamburg jointly agreed to the urgent nature of the Paris Agreement on Climate Action and the need to transform the world's energy system to pave low carbon pathways and build greater resilience to climate change. Additionally, the leaders also shared a common understanding of the existing diversity in the energy system of G20 countries. Hence, they opted to push for a transformation in the existing energy system while staying committed to sustainable deployment of cleaner and efficient energy technologies.

The promotion of sustainable energy and universal energy access have always been important for G20 countries. The Energy Sustainability Working Group of the G20 Summit this year focuses on a range of issues like energy security, efficiency, and universal energy access. According to the 2018 High-Level Political Forum (HLPF) review, between the years 2000 and 2016, the proportion of the global population with electricity access increased from 78 per cent to 87 per cent with the number of people living without access to electricity dipping below 1 billion, of which 50 per cent are in Sub-Saharan Africa alone. The HLPF report suggests that to achieve universal access to electricity by 2030 (SDG Goal 7), the required progress rate of electrification should be 0.8 percentage points per year.

G20 countries have made great strides in providing electricity to all their citizens. However, even within this group, some countries have not yet achieved universal electricity access. Countries such as India, Indonesia, and South Africa have proven to be an exception to most G20 countries that have touched 100 per cent electricity access. The situation is still discouraging with respect to clean energy access to all. There are efforts underway to make clean electricity available to everyone with solutions like a renewable mini- and off-grid energy systems, but more needs to be done.

Additionally, data shows a clear rural-urban divide in electricity access among G20 countries. Electricity access in the rural parts of G20 countries is much lower than that in urban areas. Moreover, it exhibits a pattern similar to the one seen in the context of global electricity access. To give an illustration, in a majority of G20 countries, the electricity access rate is over 93 per cent in urban areas; in rural areas, however, the access rate still lags behind with figures as low as 67 per cent for South Africa in 2017 (World Bank, 2019). Universal electricity access will not only help eliminate poverty but will also increase resilience to climate change, thus promising more sustainable societies. Achieving electricity access through renewable energy would be a win-win strategy for countries as this would balance not just sustainable development principles but also bring much-needed parity between rural-urban energy systems.

In this paper, we discuss in some detail the agenda of universal electricity access and the contribution of G20 countries towards achieving it. The paper is divided into two major sections. Section 1 of the paper provides an overview of the existing definition of universal electricity access and delves into global electricity access trends. It also discusses the progress of the universal electricity access agenda under G20 and the commitment of G20 countries towards achieving it. In Section 2, we try to address the issue of universal electricity access by looking at the synergies between electricity access, energy efficiency, and renewable energy.

2. Introduction to Universal Electricity Access

Since the adoption of United Nations agenda 2030, momentum towards achieving universal electricity access has increased significantly. However, it is difficult to measure electricity access of without a consensus on the definition of electricity access. Existing literature defines electricity access as a uni-dimensional concept, i.e., in terms of availability; however,

availability itself has multiple dimensions and is influenced by the quality and quantity of electricity used by end-users to meet their basic needs. While basic needs may be interpreted subjectively,[1].

Realising the multifaceted nature of electricity access, the World Bank's Energy Sector Management Assistance Programme[2] (ESMAP) defined electricity access, using a multitier framework, as follows: "The ability of the end-user to utilize energy supply that is usable for the desired energy services. Improvement in electricity access is achieved through the enhancement of the usability of the energy supply with improvement in attributes. Electricity access can be defined either inclusive or exclusive of the use of appliances. When defined inclusive of appliances, it is called access to energy services, and when defined exclusive of appliances, it is called access to energy supply".

However, the relationship between the two (energy service and energy supply) may vary across geographic and economic contexts. For instance, minimum yearly consumption for a rural household is 250 kilowatt-hours (Kwh) while it is twice as much for an urban household; this is expected to increase with time (IEA, 2017). Similarly, there exists significant disparity between rural and urban populations in terms of electricity access as well (see figure 1). While the pace of electricity access is improving globally, the rural-urban divide is still intact. According to World Bank data, the global urban population with access to electricity in 2017 remained as high as 97.36 per cent while the corresponding figure for the global rural population was around 78.6 per cent.

The disparity could be a result of several associated reasons. For example, in the Latin America and Caribbean region, widespread electricity theft and unwillingness to pay electricity bills in urban areas makes it difficult for governments to expand to rural regions (IEA, 2017). Similarly, low population density in Sub Saharan Africa is a barrier to expanding infrastructure to rural areas (Trotter, 2016). To bridge the gap between rural and urban areas, solutions should be iteratively tailored to regions to attain universal electricity access.

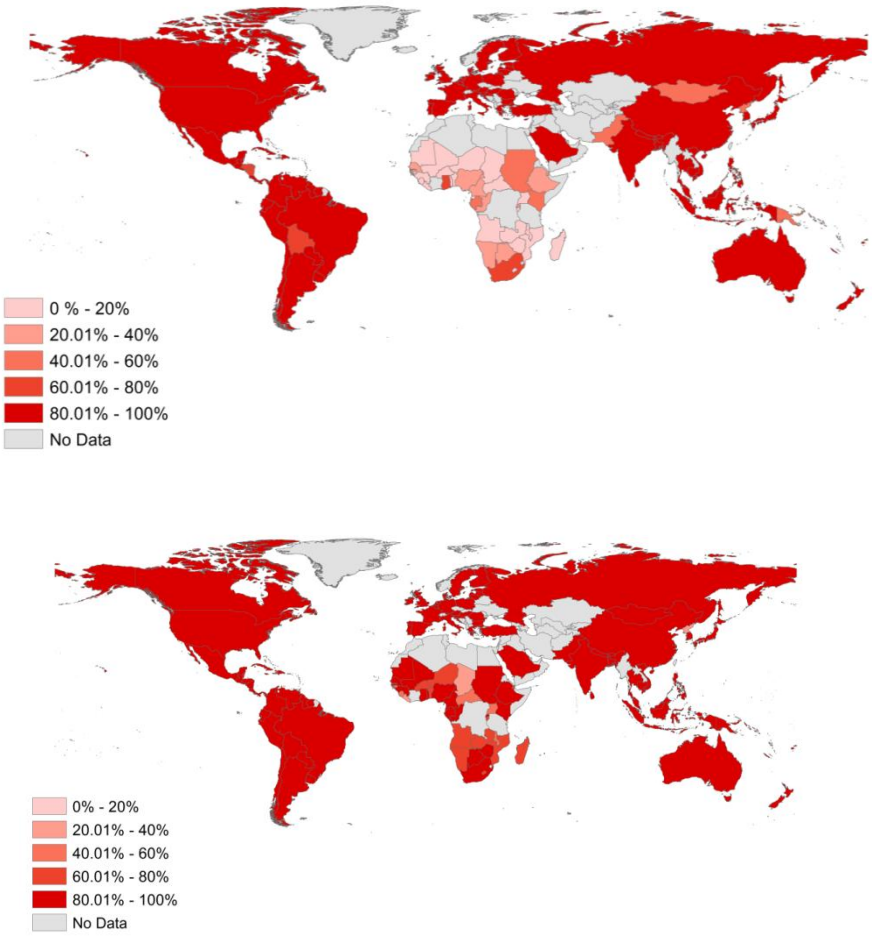
The relationship between electricity access, poverty alleviation, and economic growth is universally recognised (IEA, 2017; Barnes et al., 2011). Moreover, the issue of access to energy is not limited to achieving universal energy access (SDG 7); it is also crucial for other SDGs[3] like elimination of poverty, climate action, reducing inequalities, etc. In fact, the International Energy Agency (IEA) mentions it as an efficient tool to tackle poverty at the community and household level.

[1] Read more at http://documents.worldbank.org/curated/en/882331468179936655/pdf/997710english.pdf

[2] Read more at https://openknowledge.worldbank.org/bitstream/handle/10986/24368/Beyond0connect0d000technical0report.pdf?sequence=1&isAllowed=y

[3] Read more at https://sustainabledevelopment.un.org/sdgs

Figure 1: Share of Rural (Upper) and Urban (Lower) population with electricity access



Source: World Bank, 2019

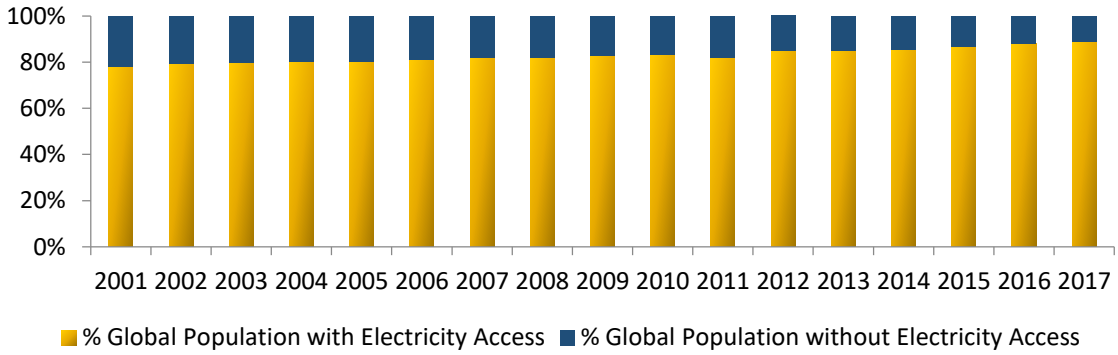
Note: Map not to scale and without prejudice of international boundaries.

Access to electricity is even more critical in the wake of Covid 19 pandemic since the effective functioning of health care and communication systems depends on it. The effects of the pandemic can be severe in regions like Sub-Saharan Africa, where only 28 per cent of the healthcare system has reliable electricity supply.

Universal electricity being an important asset for the society, the G20 countries in 2015 came to a consensus to "ensure access to affordable and reliable energy to all", acknowledging that lack of access to energy that is affordable, reliable, viable, sustainable and modern acts as a major obstacle to poverty elimination, economic growth, and social development.[4]

[4] Read more at https://www.ief.org/_resources/files/events/g20-energy-ministers-meeting-and-conference-on-energy-access-in-sub-saharan-africa/g20-energy-access-action-plan.pdf

Figure 2: Percentage of the global population with and without electricity access



Source: World Bank, 2019.

3. Electricity Access Outlook

Universal electricity access is one of the core priorities of the G20 accord. This thrust on universal electricity access is applicable not just to G20 countries themselves, but also to many still developing regions of the world that are not part of the G20. In this context, the G20 Voluntary Collaboration Action Plan on Energy Access[5] (2015 Summit) states, "Access of sustainable energy must be available to all". Every year since then, the G20 Voluntary Accord has looked at a specific geographical region and has aided their plans to achieve universal energy access.

3.1 G20 and Sub-Saharan Africa

The first phase of the "G20 Energy Access Action Plan: Voluntary Collaboration on Energy Access", which was adopted in 2015, focused on Sub- Saharan Africa where the problem was most acute. There are about 600 million people in Sub-Saharan Africa without electricity access (IEA, 2019). However, there has been significant progress since 2000 with 26 million people gaining electricity access annually.

Interestingly, while grid connections still serve as the most cost-effective solution to enhance electricity access in Sub-Saharan Africa, falling prices of decentralised energy equipment also play a major role in filling the gap. Grid connections are a more viable solution for those who are living closer to grids, but for populations living in remote regions, decentralised systems are better alternatives. Decentralised systems like mini-grids are effective in bridging gaps in urban areas by accounting for almost 50 per cent of the additional new connections (IEA, 2019). In rural areas, the type of system required (i.e., stand-alone, mini-grids) depends solely on the population density of the region. IEA predicts that decentralised systems can connect almost 450 million of the additional population in Sub-Saharan Africa by 2030. Achieving universal electricity access by 2030 will require tripling the current rate of total annual connections (IEA, 2019).

[5] Read More at https://www.ief.org/_resources/files/events/g20-energy-ministers-meeting-and-conference-on-energy-access-in-sub-saharan-africa/g20-energy-access-action-plan.pdf

3.2 G20 and Asia-Pacific

In the year 2016, the G20 accord decided to move its vision beyond Sub-Saharan Africa and to include Asia-Pacific countries. The Asia-Pacific is one of the most dynamic regions on the globe. Home to 60 per cent of the global population, it hosts a population of around 421 million people without electricity access (ESMAP, 2017). However, several Asia-Pacific countries have achieved significant progress in providing electricity to everyone. For instance, countries like India, China, Bangladesh, Nepal, etc., have been successful in providing electricity access to almost 95 per cent of its population (IEA, 2019). Despite the progress made by some countries, universal electricity access is still a long way off for Asia-Pacific countries.

Due to distinct variations in the geographic regions of Asia-Pacific countries, they rely on a spectrum of measures for providing energy to its population. While countries like India, China, and Nepal largely continue their on-grid densification to make energy accessible to a majority of their populations, island countries rely heavily on decentralised systems, i.e., mini-grids and stand-alone systems, for electrification.

3.3 G20 and Latin America & the Caribbean Region

In the third and fourth phases of the plan, the focus of the G20 accord was further extended to cover Latin America and the Caribbean region (LAC). The LAC region has a higher rate of electrification when compared with Sub-Saharan Africa or other developing Asian countries. However, about 21 million still lack access to electricity. Most of this population is located in either rural areas or urban slums (OLADE and IDB, 2018).

Unlike the earlier two regions, the problem the LAC region revolves round the issue of last mile connectivity. While a majority of countries in the LAC have an electrification rate of above 90 per cent, the remaining areas either have low population density or are geographically inaccessible. Extension of grids in those regions is not seen as a pragmatic or realistic option because of issues of economic viability. The solution to the problem lies in a combination of grid extension and decentralised systems. However, the thinness of market in the rural region makes decentralised systems fairly expensive. Thus, incentivising the process will promote increased use of such systems in rural areas.

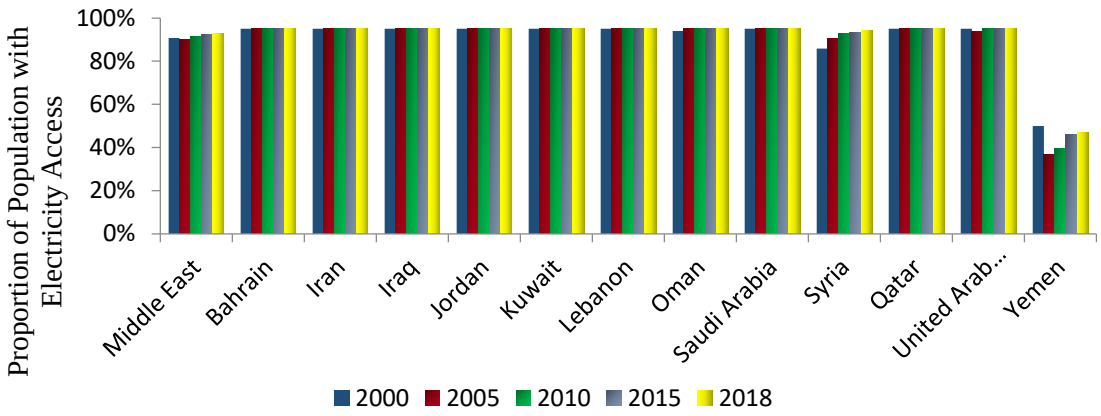
3.4 G20 and the Middle East and North African region

The latest region to be covered under the G20 accord is the Middle East and the North African region (MENA). The MENA region is often overlooked in energy poverty literature due to the abundance of vast oil and gas reserves in the region. However, a closer look reveals a different picture. In the Middle East, 93 per cent of the population has access to electricity (IEA, 2019). While most countries of this region have reached the goal of universal electricity access, Yemen is still a long way from universal access with 63 per cent of the population having no access to electricity yet (See figure 3).

The countries in the MENA region are divided into two broad categories – net energy importers and net energy exporters. While energy importing countries like Lebanon, Morocco, and Jordan rely heavily on energy exports from Gulf Corporation Council countries Iran, and Iraq the energy mix of energy exporting countries is dominated by non-renewable energy sources with little or no penetration of renewable energy sources. In contrast, renewables have been developed in most energy importing countries.

Of the total share of energy production by renewables, currently, hydroelectricity dominates the energy mix in MENA region followed by solar energy and wind energy. Although the region is geographically located in the Sunbelt, it is really surprising to note the underdevelopment in solar energy, reflected in its low production share. The heavy reliance of the countries in MENA region on non-renewable energy sources for energy production is indeed a huge challenge in achieving the goals of the Paris Agreement. Given the excellent potential that exists in the MENA region, global co-operation and concentrated efforts are needed to develop the region as a renewable energy. While countries with low electricity access rates like Yemen and Syria rely heavily on non-renewable energy sources like diesel to meet their energy requirement, the use of decentralised renewable energy options could help in 100 per cent electrification of these areas, besides providing them with a cheaper and reliable energy source.

Figure 3: Percentage of Population with electricity access in Middle East countries



Source: IEA 2019

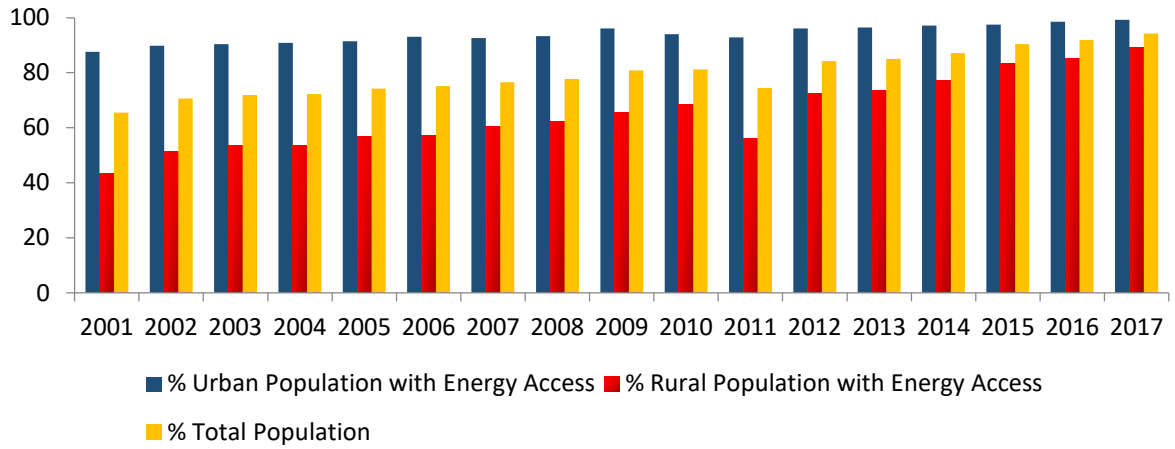
Acknowledging the problem of the MENA region, the Saudi Arabia G20 accord has prioritised the goal of achieving universal electricity access in the MENA region.

4. Electricity Access and India's Development

As a key G20 country, India too has made significant progress in making electricity accessible to a large section of its population. As of 2018, 95 per cent of India's population had access to electricity, up from 43 per cent in 2000 (IEA, 2019). While urban India enjoys

almost 100 per cent electricity access, rural India is still on the journey towards universal electricity access (see Figure 4).

Figure 4: Percentage of Population with Electricity Access



Source: World Bank, 2019

The government undertook multiple programmes that addressed both the demand as well as the supply side of electricity availability on the policy front. On the demand side, it tried to make electricity available at a cheaper rate to the poor via lower electricity tariffs for agricultural and residential connections. On the supply side, it tried to improve infrastructure for electricity distribution and making the grid extend its reach to remote hinterlands. In fact, in the year 2018, India celebrated the electrification of all of its villages. Despite this notable achievement, there remains a wide chasm between achieving electrification of all villages[6] and electrification of all households in villages. New efforts are, therefore, underway that strive to achieve electrification of all households.

India's electricity access policies largely originate from the Electricity Act of 2003. The provision of electricity to all areas including villages and hamlets through improvements in rural electricity infrastructure and electrifications of villages was seen as a joint responsibility of state and central government. In compliance with the Electricity Act 2003, the Rural Electrification Policy of 2006 endorsed the importance of grid connectivity for the electrification of villages. However, it also recognised the importance of decentralised systems as a more viable option for villages/habitations where grid connectivity is not feasible. The primary government initiative to achieve universal energy access in India was the "*Rajiv Gandhi Grameen Vidyutikaran Yojana*", which was relaunched as *"Deen Dayal Upadhayay Gram Jyoti Yojana* (DDUGJY)[7]" in the year 2015. DDUGJY covers feeder separation, strengthening and augmenting sub-transmission and rural electrification, incorporating both on and off-grid solutions.

6 A village is deemed as electrified if basic infrastructure such as transformers and distribution lines are provided in the inhabited areas. In addition, public spaces are required to be electrified. Another requirement is that at least 10 % of the households in the village must have an electricity connection.

7 Read more at http://www.ddugjy.gov.in/assets/uploads/1548234273fykio.pdf

Furthermore, to increase the focus towards household electrification, a parallel scheme called *"Pradhan Mantri Sahaj Bijli Har Ghar Yojana"*, also known as *Saubhagya* scheme was launched in late September 2017 to bridge the gap between rural and urban areas and to ensure last-mile connectivity. The scheme aims to establish an electric connection in 30 million households of which 25 million are in rural India. To date,[8] 99.93 per cent of the aimed rural households have been electrified under the *Saubhagya* scheme.

Notably, over 99 per cent of the people who gained energy access since 2000 got this benefit as a result of grid extension or densification (IEA, 2019). While grids/centralised energy are a favourable option in India, it remains unreliable in remote geographic locations. A report by the Council on Clean Energy, Environment and Water[9] (Jain et al., 2018) points out that despite significant improvement in 5 Indian states between 2015 and 2018, people still refrained from buying a connection due to concerns regarding unaffordability and unreliability. The report also points out that off-grid systems are an excellent solution with somewhat better reliability than grid connectivity. There are several decentralised energy policy measures announced by the Ministry of New and Renewable Energy (MNRE) to improve energy access in India (See Annexure 1).

Despite this, the use of off-grid solutions remains limited. This will help India achieve the goal of universal electricity access ahead of 2030.

5. How can G20 Contribute

G20 countries stay committed to achieving SDG 7 that "Ensures affordable and reliable energy for all". The Sustainable Energy for All (SE4ALL) initiative of the G20 led to the formulation of the Energy Access Action Plan for universal energy access. The action plan intended to complement existing global and regional initiatives in different regions. There are six major ways in which G20 countries can collaborate with the regions to facilitate their goal towards achieving universal energy access (see figure 5). The details of the six options suggested are discussed below:

1. Policy and Regulatory Environment: G20 member countries help governments at the country level in strengthening policy, energy sector planning, regulatory institution, and regulatory framework in order to improve their energy governance systems.
2. Technology Development, Dissemination, and Deployment: G20 member countries support the development, deployment, dissemination, and scaling up of innovative technologies and business models to help build affordable, reliable, and sustainable energy according to local circumstances and priorities.
3. Investment and Finance: Investment being one of the major hindrances in achieving universal energy access, G20 member countries work in collaboration with countries, financiers, and other stakeholders to facilitate investment in the regions.

[8] See https://saubhagya.gov.in/

[9] Read more at https://www.ceew.in/sites/default/files/CEEW-Access-to-Clean-Cooking-Energy-and-Electricity-11Jan19_0.pdf

4. Capacity Building: G20 member countries work in collaboration with countries to actively build their energy sector related technical capacity.
5. Regional Policy Integration: G20 members work in collaboration with national policymakers, energy regulators, and power pools to develop a locally suited energy policy to maximise sustainable usage of available resources. This may be combined with larger regional programmes underway.
6. Co-ordination and Collaboration: G20 member states work in collaboration with SE4ALL and other international organisations to enable co-ordination and promotion of programmes that aim to increase affordable, reliable, and sustainable energy for all.

While universal energy access is high on the G20 agenda, more concentrated and accelerated efforts are required to ensure the obtainment SDG 7.

6. Electricity Access and Renewable Energy

In 2015, 185 countries signed the ambitious Paris Agreement to limit the average rise in global temperature to below 2 °Celsius. However, the accomplishment of the Paris pact is not feasible unless a major transformation in energy scenarios takes place globally. While fossil fuels are responsible for 25 per cent of greenhouse gas (GHG) emissions globally (IPCC, 2014), it appears impossible to realise the objectives of the Paris pact unless the proportion of fossil fuels in energy production is substantially reduced. To reduce the proportion of GHGs produced via the energy sector, a combined global effort for the rapid introduction of renewables in the energy sector is required.

While the central role of renewables may appear to be limited to climate change mitigation, they also play an indispensable role in universal electricity access. Renewables offer a more favourable option when we think of decentralised energy. Since 2012, 34 per cent of the population that gained energy access did so via renewable sources (IEA, 2017). Renewables prove to be a favourable option for providing electricity to remote isolated areas where providing conventional supply is either too expensive or existing supply is irregular.

Deployment of renewable energy technologies will also promote a structural change in the energy sector of the country and aid their energy transition in line with their global commitment towards fighting climate change.

7. Interlinkages with the Energy Efficiency Agenda

In the past, a great deal of emphasis has been placed on the agenda of electricity access while energy efficiency has often been overlooked. Analyses undertaken by IRENA show that the adoption of renewable energy technologies along with energy efficiency provides a safe and reliable pathway for improving electricity access, while simultaneously aiding reduction of over 90 per cent of energy-related carbon dioxide emissions. Furthermore, universal electricity access can be achieved using 50-85 per cent less energy if energy efficiency is

improved.[10] While electricity access is predominantly considered a supply side problem, it is also a demand side problem, and addressing the demand side also attenuates the supply side needs (World Bank, 2017). For instance, the same absolute amount of energy yields a higher share of usable energy if the devices used are efficient.

While renewable energy systems provide a promising solution to achieve electricity access in remote rural areas where grid extension is difficult, the adoption of such systems coupled with energy efficiency ensures reliable and affordable energy for some time longer than average. While countries are progressing towards universal electricity access, including energy-efficient technologies at the bottom of the pyramid might help in accelerating the process. For instance, the *Unnat Jyoti* by Affordable LEDs for All *(UJALA) yojana* in India is the world's largest lighting replacement programme. According to the *UJALA* dashboard,[11] 362 million LEDs have been sold till now, completely transforming the energy efficiency scenarios for India. In addition to India, several other countries are pushing the agenda of energy efficiency forward through several policy interventions.

The benefits of energy efficiency mentioned above are often overlooked, and one of the major reasons for this is the higher up-front cost of energy-efficient appliances if locally produced and higher import duties if imported. Accounting properly for the synergy between energy efficiency, access, and renewables can provide an effective multifaceted solution to the situation. However, effective climate action and improved energy access using renewables and energy efficiency needs strong policy intervention to back it up.

8. Conclusion

The year 2020 marks our entry into the last decade of the achieving UN's Sustainable Development Goals. One billion people in the world still live in darkness and another billion live without a reliable source of electricity. While G20 member states are striving to improve access in regions with low electricity access rates, more efforts need to be made to address the root cause of the delay in attaining universal electricity access globally.

With the adoption of the Paris Agreement, the world economy is constrained by limited carbon growth opportunities. To overcome this difficulty, low carbon energy strategies and hence, wider adoption of renewables in the global energy mix, are of immense importance. While G20 countries account for 80 per cent of the renewable energy share globally, they can push for the promotion of renewable energy and energy-efficient technologies for the attainment to attain electricity access goals, which will help ensure global economic prosperity and strengthen the resilience of the global system.

[10] Available at: https://www.sierraclub.org/sites/www.sierraclub.org/files/0747_Clean_Energy_Services_Report_03_web.pdf

[11] Available at: http://www.ujala.gov.in/

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- Material Efficiency Approach Towards Reducing Emissions: G20 Experiences and Learnings for India

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Annexure 1:

Table 1: MNRE Policies for Decentralised Energy Systems[12]

Sl. No	Grid Connected	Solar Off-Grid
1	Development of Solar Power and Ultra Mega Solar Power Projects The scheme focuses on setting up at-least 25 solar power projects with a target production of 20000 MW, which was later enhanced to 40000 MW. The parks are to be set up by 2021-22.	Off-Grid and Decentralised Solar PV Applications Programme –III Aims installation of an additional of grid solar capacity of 118 MwP by 2020 by 1. Installing 3,00,000 solar street lights 2. Installing 25,00,000 solar study lamps 3. Constructing 100 MwP of off-grid power plants
2	Scheme to set up distributed grid-connected solar PV power projects in Andaman and Nicobar & Lakshadweep with a capital subsidy from MNRE. The scheme promotes the idea of developing carbon-free islands by phasing out the use of diesel for energy generation.	*Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyaan* The scheme aims to add solar and other renewable capacities of 25,750 MW by 2022 with the total central financial support of Rs.34422 crore. The scheme consists of three components: 1. Component A: 10000 MW of decentralised ground mounted grid connected renewable power plants of individual plant size up to 2 MW 2. Component B: Installation of 17.50 lakh standalone solar-powered agriculture pumps with an individual pump capacity of up to 7.5 HP 3. Component C: Solarisation of 10 lakh grid connected agriculture pumps
3	Central public sector scheme undertaking Phase –II of the setting up of 12000 MW grid-connected solar photovoltaic projects by the government producers with viability gap funding support for self-use or use by government/government entities, either directly or through DISCOMs. Aims to establish solar PV projects through government procedures using domestic cells in a compliant manner to facilitate national energy security and environmental sustainability for government purposes.	*Atal Jyoti Yojana* Install 3,04,500 solar street lights in the states of UP, Bihar, Jharkhand, Odisha, and Assam. Hilly states of Jammu & Kashmir, Himachal Pradesh, Uttarakhand, and North Eastern states including Sikkim Island territories Andaman & Nicobar and Lakshadweep
4	Grid connected solar rooftop programme The scheme aims to achieve a cumulative capacity of 40000 MW from rooftop solar by the year 2022.	Scale-up access to clean energy for rural productive uses Enhance reliable and affordable renewable energy for rural productive usage in un-served and under-served areas of Assam, Madhya Pradesh, and Odisha.
5		Off-grid and decentralized concentrated solar thermal technologies for community cooking, process heat and space heating & cooling applications in industrial, institutional and commercial establishments Promote off-grid applications of solar thermal systems to meet the targets set under the Jawaharlal Nehru National Solar mission

Source: MNRE

[12] Read More https://mnre.gov.in/solar/schemes

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