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Review on government action plans to reduce energy consumption in buildings amid COVID-19 pandemic outbreak

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ABSTRACT

The corona virus pandemic outbreak in 2019–2020 has almost touched everyone's life and is affecting every sector. The daily routine life has come to a standstill, many sector including businesses, finance, transport and many more critical industries has come to a halt. Only essential sectors like healthcare have been permitted to operate. Many G20 countries-imposed curfew, mandatory stay-in-home orders and lockdown of cities and countries. Among all these close down scenarios and locked down industries, utility companies and energy distribution sector were operational 24/7 round the clock providing uninterrupted power supply for a comfortable lockdown "stay in home". The success of Fighting COVID-19 and shutdowns is highly dependent upon uninterrupted power supply and power consumption by the building residents. This paper reviews the various actions taken by G20 member countries towards electricity consumption while in COVID-19 pandemic outbreak. This research work is an analysis of actions taken by governments under their jurisdictions towards building energy consumers. The outcome of this paper are energy policy recommendations that are based on the different governments responses and actions taken towards energy consumption in buildings.

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1. Introduction

The corona virus pandemic outbreak in first quarter of 2020 has not only affected economies of the world in a long-lasting way but also infected every sector in more than 213 countries. World Health Organization (WHO) reports, as of 24th April 2020 Corona virus has affected more than 213 territories, 175,000 confirmed deaths and more than 2.5 million positive cases worldwide. It has touched the lives of everyone on the planet in one or the other way. Complete cities and countries amid lockdown scenarios have come to a deadlock, the industries and manufacturing sectors have taken a complete halt. The countries and the government bodies that have imposed a complete mandatory "Stay in house", which would be successful only if uninterrupted supply of electrical power or energy would be provided to them. Without providing round the clock uninterrupted supply of energy the "Stay in house" would fail because residents seek out of homes to satisfy their basic energy needs. The domestic utilities must be continuously

kept alive round the clock without switching off. It is a challenging time for the local administration to keep alive; operations and distribution of electricity because the cost of running administration and energy distribution without any revenues.

The electricity demand of G-20 Countries is 80% of the global energy demand [27]. The data derived from Global Energy Statistical Yearbook 2019 [28], represented in Fig. 1 and Table 1, shows steady increase in energy consumption in the years from 2014 to 2018, Interpolating the values from Table 1 and Fig. 1 It can be forecasted that the estimated amount of electricity demand in G20 countries would not exceed 18000TWh in 2020 as shown in Fig. 2. The G20 member countries have planned to inject five trillion U S dollars to boost the G20 Economies [29]. It is estimated that most of the Industrial and manufacturing activities will resume Post COVID-19 and the energy consumption will be increased forecasted levels.

A study conducted in New York city showed that the industrial and commercial, overall energy consumption was decreased around 7% in pandemic time, But the domestic house hold consumption increased to about 23% in March and 10% in April 2020 [30]. This clearly indicated that in March 2020 and April 2020 the

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Domestic electricity consumption of G-20



Fig. 1. Domestic energy consumption Trend G20 Countries.

Table 2

List of countries with Energy action plans.

Sl No	Name of the country	Actions taken by the government	Supporting Literature
1.	Malaysia	The people of Sabah Province will get 30% discount on Electricity bill for 3 months starting from 1 April 2020.	[7]
2	Australia	Australian Government supports its energy customers with the help of third party like deferred payments of energy bills and arranged the option of finance, it ensured at the time of crisis none is deprived of electricity in homes and commercial buildings	[9]
3	Canada	It classified electricity sector under "National Strategy for critical infrastructure ". The Ontario energy board applied no administrative charges and suspension of service interruptions until Pandemic exists.	[10,11]
4	United states	There will be no service interruption while the prevalent pandemic times, the utility customers won't lose the service due to non-payment of bills	[12]
5	India	The Indian government announced a three months moratorium for state owned electricity distribution companies to make payments for their power purchased by them, it also reduced the payment security to 50% for future power purchases.	[17]
6	Argentina	Suspension of disconnection of electricity services for non-payment of bills up to three consecutive bills or alternate bills, starting from 24 March 2020	[19,25]
7	France	For all business establishments, from midnight of 16 March 2020 for a period of 30 days Suspended all utility bills including electricity bill.	[26]
8	Germany	For those who effected from Loss of income can defer electricity payments till 30 June 2020.	[20]
9	Italy	Article 4 of Decree No.6 suspends all electricity bills until 30 April 2020	[21]
10	UK	No power interruption for energy users, the energy supply is ensured with support and initiatives from Government of UK.	[8]
11	China	The government reduced the prices of electricity.	[24]
12	Indonesia	Free electricity for the poor people starting from 24 April 2020	[22]
13	Japan	Japanese government requested all the electricity companies to present a bill on providing moratorium for bill electricity bill payment for 3 months.	[23]

Table 1

Domestic electricity consumption G20 Countries.

SL No	Year	Electricity (TWh)
1	2013	14,946
2	2014	15,176
3	2015	15,456
4	2016	15,991
5	2017	16,488
6	2018	17,086

residential electricity consumption globally was high leading to increase in economic and financial burden of families [30].

It is explicit, that the economic activities of all households have come to an full stop around the world in COVID-19 period. Most of the people are confined to houses and locked down without work leading to loss of income. Additionally, staying in homes in pandemic time has increased the electricity bill. The situation of loss in income and rising electricity bills makes a huge economic and financial burden on households. The wavering or suspension of utility bills by the governments in pandemic times alleviates the financial burden on household. Therefore it is much needed policy plan by the current governments to tackle economically the COVID-19 pandemic situation. The flowchart in Fig. 3 explains the pandemic situation in detail.

Significance of the research: G20 member countries covers 19 member countries and European Union. These G20 Member countries contribute to 85% of global economic output, 80% of primary electricity consumption and they have 66% of the world's popula-

Domestic electricity Forecast G-20

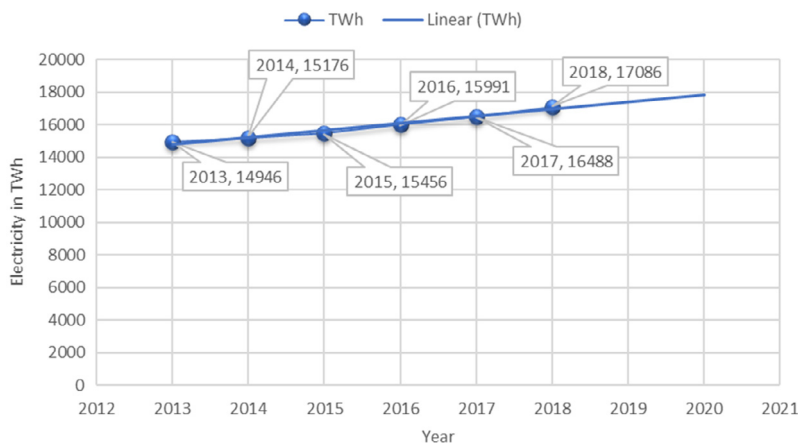


Fig. 2. Domestic energy consumption Estimate G20 Countries.

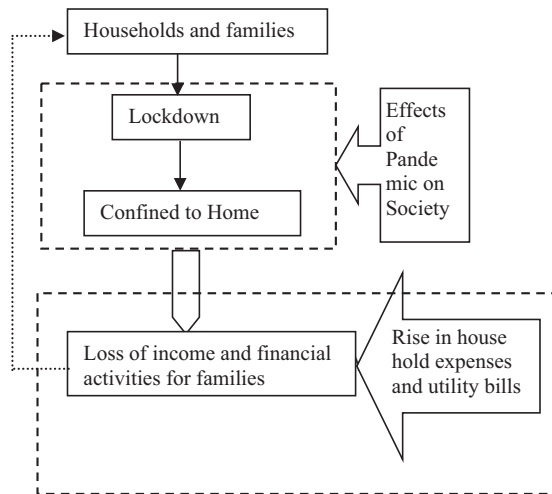


Fig. 3. Effects of pandemic on households.

tion [1]. Any minor economic or financial imbalance of these G20 countries have a huge impact on the world's economy. This imbalance has the potential to create an economic catastrophe globally. Therefore amid the COVID-19 emergency it is necessary to revisit the government policies and actions towards Energy consumption in buildings. The energy literature for G20 countries is rare [1]. This paper investigates the action taken by G20 countries towards domestic energy consumption while corona virus pandemic outbreak. The enerdata global energy statistics handbook of 2019 reports; for the year 2018 the total domestic electricity consumption was globally was 22968Twh and for G20 countries it was 21056Twh as depicted in Fig. 4.

One of the motivations for writing this paper is; COVID-19 pandemic being considered as a healthcare emergency is also a Public, Financial and economic emergency globally. Electricity plays a major role in shaping the economy of a country [2]. Although many factors have been found responsible for energy consumption in

DOMESTIC ELECTRICITY CONSUMPTION SHARE G20 COUNTRIES -2018

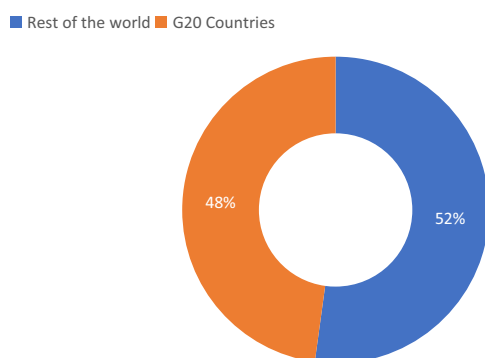


Fig. 4. Domestic electricity consumption share G20 countries-2018.

buildings for residential sector [3]. But, to assess the economic impact, the electricity sector government policies should also be analyzed. This paper analyses the policies taken by administrative governments to address electricity sector in G20 countries.

2. Objectives of the research work

This research work is an investigation on the administrative plans of the G20 Governments towards energy consumption in the time of pandemic outbreak, the objectives of this research are:

a) To investigate the action plans taken by the G20 member countries towards domestic electricity consumers at the time of pandemic crisis.

b) Whether the action plan was fruitful in elevating the energy shortage scenario for the end users or not.

Among the essential services the electricity distribution companies continue to provide electricity 24/7/365 to all doctors, nurses, hospitals, firefighters, Police officers and military to fight the COVID-19 outbreak. Reliable and uninterrupted energy supply is also one of the essential services during national emergencies and must be acknowledged on par with healthcare professionals [4]. There might be very small and incremental rise in usage of electricity in COVID-19 fallout [5]. Despite the increase in load on the utility companies, in northern America the energy investors and the utility companies are prepared for the COVID-19 emergency plan and to provide electricity to the users [6].

This work tries to answer the following research questions:

1) Which of the G20 countries provided a response to act on domestic energy consumption in lockdown period?

2) What are the orders passed by the respective administration towards energy distribution sector at the time of pandemic outbreak?

The research design followed is depicted in Fig. 5. Only those G20 countries that have acted on COVID-19 situation for electricity sector are investigated, The policies of these G20 countries are compiled for analysis. The Final The policy recommendations are proposed.

While the government of Malaysia was struggling to control COVID-19, it declared a 30% discount in electricity bills and free water; starting from 1April 2020 for a period of three months. This discount was an initiative under COVID-19 package programme to ease the burden of excess electricity usage to the building residents while in lockdown. There will be 512,000 beneficiaries in Malaysia for these initiatives [7].

The UK government put in place a series of measures to support its residents while in pandemic period. These measures will benefit 4 million energy users in UK [8]. Some of the measures are:

a) No line disconnection for prepaid and pay as you go customers, Energy supply is ensured at this emergency time of coronavirus outbreak.

b) All industry agreement signed by UK Energy suppliers will come into effect immediately.

The Australian government ensured that in the time of COVID-19 outbreak no Australian citizen should be deprived of energy and it made options such as deferred payment and arrangement of options to arrange finance in discussion with the local energy company [9].



Fig. 5. Stages of Analysis.

The Canadian government classified electricity sector into National strategy for critical infrastructure and it suspended electricity line disconnection for non-payment of electricity bills, it also levied administrative charges on all bills [10]. It stated that all domestic customers will pay off time price for next 45 days starting from 25 March 2020 [11].

United states in series of measures and emergency plans announced that there will be no electricity service disconnection for non-payments of bills [12].

Although the electricity demand in India will increase in years to come [13-15] and the power industry is facing huge challenges in terms of electricity pricing [16], The Indian government announced a three months moratorium for state owned electricity distribution companies to make payments for their power purchased by them it also reduced the payment security to 50% for future power purchases, The government also waived penalties for late payment and it ensured that electricity is not disconnected round the clock in COVID-19 prevalent times [17]. The 5th April 2020 at 9.00 Pm the entire nation domestic sector switched off for 9 min in to show the solidarity and patriotism to fight corona virus and it showed that there was a reduction of 32,000 Megawatts of load on grid, Hence proving that the Indian domestic lighting consumption is around 32 GW [18] with an error of $\pm 10\%$.

The Government of Argentina passed decree 311/2020, classifying domestic electricity sector under the framework of Health and emergency plan, it suspended the disconnections due to non-payment of electricity bills for three consecutive bills. This will be in effect for 180 days from 24 March 2020 [19] The French government suspended all electricity bills from 16 March 2020 for a period of 30 days This measure targeted basically small business establishments that are affected by Pandemic. It also stated that there would be no penalties and no disconnections for default payment [26].

Germany provided an aid package that no one in the country would be cut off from basic services such as electricity supply, it stated that for those who have an income loss can defer payments till 30 June 2020 [20].

The government of Italy passed Decree No.6 of which according to article 4 the payments of all electricity bills is exempted till 30 April 2020. Also, Article 6 extended 12 months suspension of instalment and extension of amortization plan timeline, all of these on conditional basis [21].

Indonesian president announced a free electricity for 3 months starting from 24 March 2020 in category of 450 Volt amperes, and a 50% discount for 900 Volt ampere categories. By this decision 24 million will get free electricity and 7 million will get a discount of 50% [22].

Japanese Government requested all the electricity and energy producing companies in Japan to submit a bill on providing a moratorium of up to 3 months on electricity bill payment in order to lessen the financial burden on Japanese people economically and financially hit by COVID-19 pandemic [23].

China one of the worst hit countries and the epicentre of COVID-19 outbreak announced a series of measures where it reduced, he prices of electricity to support the citizens and economy to boost up after epidemic outbreak [24].

The governments of Brazil, Mexico, South Africa and South Korea have responded by providing financial, social and economic aid to the residents that may support electricity sector indirectly but direct law or any legislation on electricity sector is not substantiated.

While more than 213 countries and billions of citizens impacted by the COVID-19 outbreak the measures provided by G20 Governments summarized in Table 2, acted as a temporary relief measures at the time of financial loss. Common citizens, businesses, domestic sector and commercial sector were at the receiving end. The fol-

lowing policy recommendations are provided to strategically handle the COVID-19 like similar situation.

3. Conclusions and policy recommendations

The policy recommendations for electricity sector in pandemic times are as follows:

No.1 Domestic electricity distribution sector must be acknowledged by the government as an emergency sector on par with Healthcare sector and should be provided with all facilities as provided to healthcare sector employees. It is because without electricity distribution sector none of the healthcare and Military would operate to their full extent in Fighting COVID-19 outbreak.

No.2 There should be uninterrupted and reliable supply of electricity to everybody without discriminating residential, commercial, essential and emergency services.

No.3 There should be at least a minimum of 15% discount to all domestic and residential energy users in electricity bills in this time of COVID-19 emergency. This is to negate the extra surge in electricity consumption caused due to lockdowns. This will alleviate the phycological burden of high utility bills in residential sectors and provide financial relief to the locked down residents in buildings.

No.4 The commercial sector that has incurred a loss of business and revenue due to COVID-19 lockdown should be provided a 100% discount in electricity bills for at least a period of lockdown in that specific area.

No.5 To review the economy of the country through industrialization, All new industries and establishments coming up after COVID-19 pandemic period should be provided a free electricity at least for a period of one year so that the business could establish and could help in the review of economy of the country.

No.6 All residential and domestic Building energy consumers should be provided with an energy conservation guide by the respective local administration or local utility company or electricity distributor; Guiding how to conserve energy in buildings in the time of lockdown and pandemic outbreak.

No.7 Any utility bill payments should not be penalized at least for a period; until the pandemic is existent in the community.

No.8 Because of its vital role in everyday life of a building resident, Energy should be declared as necessity of life and should be fundamental right of every citizen in a democratic set up.

No.9 To boost the morale and acknowledge the service of utility companies, Incentives should be provided by the government to electricity distribution companies and their employees recognizing their work of providing uninterrupted energy during COVID-19 emergency.

No.10 The Local administration and government authorities should have a "Energy Emergency pandemic plan" in force and should activate at the time of healthcare emergencies like COVID-19 in future possibilities of occurrence. The lessons learned and endured from COVID-19 outbreak can act as an input to the future Energy Emergency Pandemic Plan if case arises.

No.11 An online and social media energy awareness camping should be conducted frequently to involve, motivate and encourage the lockdown community to participate in conservation of energy in buildings. This is to impart a responsible energy behavioural change among the end users of energy and to make them "intelligent users of energy" in their dwelling habitats

CRedit authorship contribution statement

Syed Shuibul Qarnain: Conceptualization, Writing - original draft. **S. Muthuvel:** Supervision. **S. Bathrinath:** Investigation, Writing - review & editing, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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