



Impact of Fossil Fuel Subsidies on Renewable Energy Sector

Sikandar Abdul Qadir, Furqan Tahir and Luluwah Al-Fagih

EasyChair preprints are intended for rapid dissemination of research results and are integrated with the rest of EasyChair.

May 27, 2021

Impact of Fossil Fuel Subsidies on Renewable Energy Sector

¹Sikandar Abdul Qadir, ²Furqan Tahir, ¹Luluwah Al-Fagih,

¹ Division of Engineering and Management Sciences, College of Science and Engineering, Hamad Bin Khalifa University, Doha - 34110, Qatar

²Division of Sustainable Development, College of Science and Engineering, Hamad Bin Khalifa University, Doha - 34110, Qatar

* E-mail: sqadir@hbku.edu.qa

Abstract

The incessant growth of carbon emissions from fossil fuel based power plants need to be controlled in order to limit the global temperature rise. Energy subsidies are one of the reasons for the over consumption of fossil fuel all over the world. Instead of providing benefits, they are damaging the environment. In comparison, subsidies for renewable energy (RE) are very low which is one of the factors for the laggard growth. Additionally, subsidies data for the renewables is not available, unlike fossil fuel. In this work, we discussed that by providing subsidy the cost of environmentally damaging fuel is decreased hence excess usage. Subsidies for renewable may provide long term benefits, are also discussed and some policy recommendations are put forward to accelerate the growth of RE across the world.

Keywords: Fossil Fuels, Subsidies, Barriers, Renewable Energy, Incentives

I. Introduction

It has been a known fact that for many years that the consumption of fossil fuel (FF) is damaging the environment (Ali et al., 2018; Imteyaz and Tahir, 2019; Tahir, 2014). However, after many years of research and studies that discourage fossil fuel use, the World is still consuming the FF for the energy needs (Imteyaz et al., 2020; Tahir et al., 2019). The term "Fossil-Fuel" is composed of two-word, Fossil, which means the preserved remains of animals and plants on the Earth for millions of years. Fuel, any substance used to produce energy for useful work, i.e., heat engines, electricity generators, etc. There are different kinds of fossil fuel in different states which exist in Earth's crust, such as (i) Petroleum, (ii) Coal, and (iii) Gas. These three are the major categories of fossil fuel and have varying emissions levels depending on the composition of the material. Their presence in the Earth's crust also varies based on the type of fuel that is extracted. Extraction is also an energy-intensive process as drilling is required to find the deposits of the FF. World's largest FF deposits were found in the Middle East (Charles et al., 2014). The abundance of FF in the region has led to the overuse of the resource. Furthermore, all states in the region have support mechanisms such as subsidy to support consumers and producers. Additionally, subsidies for FF are the driving factor for economic activity, particularly in the GCC region (Charles et al., 2014). One of the main reasons to discourage FF use is due to CO₂ and other gases emitted when any FF is burned. When more FFs is burned, ultimately CO₂ emission will increase which is main cause for environmental damage.

It has been projected that energy demand will rise by 12% between 2019 and 2030. Although the rise will not be the same for energy after the pandemic, and it is anticipated that the global demand will increase by 9% till 2030 (IEA, 2020a). To achieve this 9% target of energy demand with minimal FFs is challenging for the global community. Since complete removal for FF usage will not reduce due to the economic growth, specifically in Brazil, China, Russia and India (Apergis, 2019). Therefore, policies must be formulated in such a way that discourages the use of FFs. One of the key policy measures to reduce the use of FF is to promote the use of renewable energy (RE) with support mechanism to encourage investment but so far we have not reached the levels where we can assure that we can manage the climate crisis. United Nations sustainable development goal (SDG-7) is related to the use of clean energy resources (United Nations, n.d.); it has been reported in the annual review that the target set for 2030 for clean energy resources will not be achieved due to less deployment of RE resource worldwide (Nemitallah et al., 2020). The lower installation of renewables is due to subsidy present still for the FFs; therefore, power generation is still based on FFs. In this study, we have first discussed the FFs subsidies in detail. FFs subsidies are one of the significant barriers in shifting the World towards renewable energy. We have then enlightened the potential of renewable energy to overcome the growing energy needs of the World. Policies related suggestions are highlighted in the discussion section with concluding remarks.

II. Fossil Fuel Subsidies

A subsidy is defined as the government's additional amount to lower the actual of the FF (Hayer, 2017). From IEA data for total energy supply we can observe that in 2018, oil and coal were the major source of fuel supply to the world as shown in Fig. 1 (IEA, 2018). Use of fossil fuel for the energy needs all overall the world signifies that priority is still the FF for energy needs. Subsidy for the FF has decreased in the recent years and it is expected it will be around \$181.9 Billion this year as shown in Fig. 2 (IEA, 2020b). Fig. 3 represents the total amount in USD for the subsidy provided in 42 countries extracted from IEA Data from 2010 to 2019 (IEA, 2020b). In 2019, \$317.5 Billion has been spent on fossil fuel subsidies, as reported in the IEA Database (IEA, 2020b).

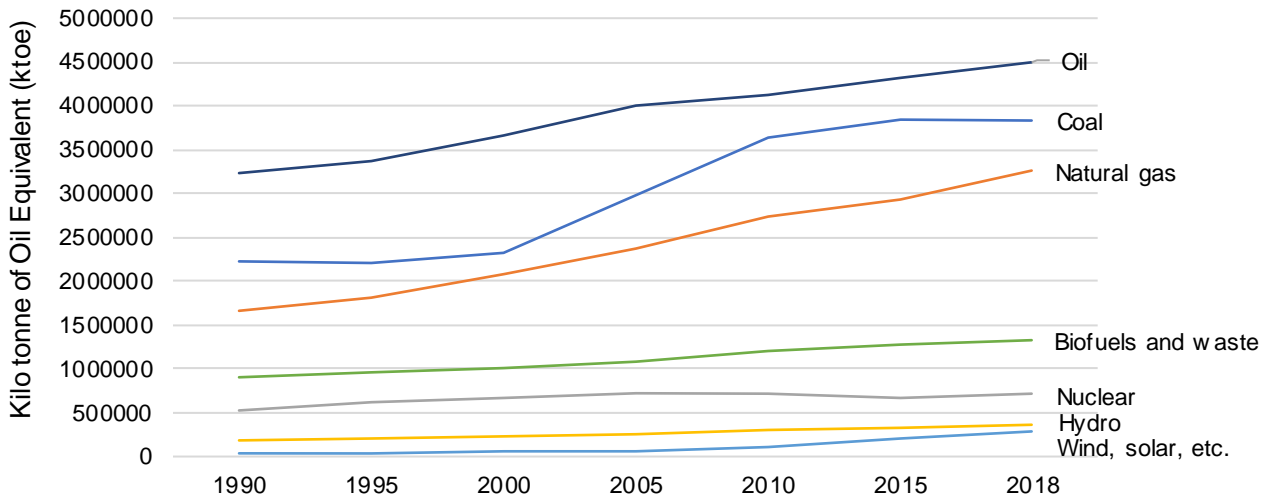


Fig. 1: Total Energy Supply by Fuel Source (IEA Data 1990 - 2018)

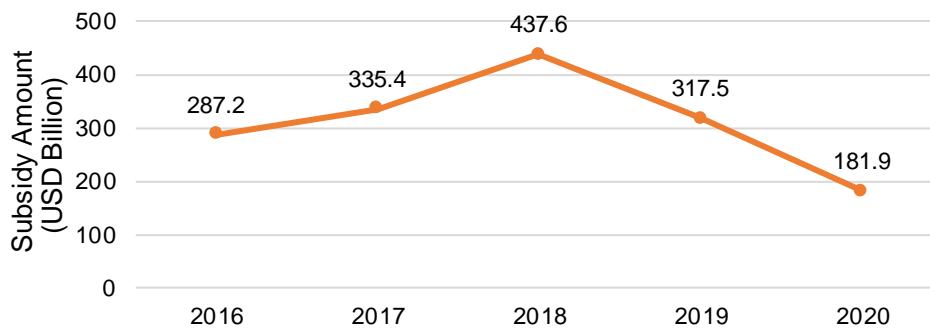


Fig. 2: Downward trend in the Subsidy for Fossil Fuel since 2018 (IEA)

III. Replacing Fossil Fuel Subsidies with Renewable

Renewable energy subsidies are not well documented, unlike FFs subsidies. FFs subsidies data is widely available on different sources such as IEA due to their preeminence in the energy sector (IEA, 2020b). Therefore, it is difficult to calculate how much support is provided to renewable energy projects in the recent years. A 2017 report from IRENA “Energy subsidies: Evolution in the global energy transformation to 2050” reported about the renewable energy subsidy for the world’s major energy consumers nation represented in Fig. 4 (Taylor, 2020). If we compare the RE subsidy data to the FFs subsidy it is almost half of FFs subsidy. Additionally, it should be noted that subsidy provided for the renewable is not directly for the consumers but rather for encouraging the investment in renewable energy sector such as tax benefits, energy related services at cost lower than actual etc.

With the post-pandemic growth rate mentioned in the “IEA World Energy Outlook 2020”, there is still a need to discover clean energy resources to meet the world demand in the future. More investment is needed to ensure that the 2030 SDG target is achieved (Nemitallah et al., 2020). Renewable energy potential worldwide can be estimated from the fact that currently 26.2% of electricity is produced from RE and it had the potential to reach 45% of global electricity generation by 2040. This potential for RE is estimated using Solar, wind and hydropower (C2ES, 2019). At present, solar and wind project cost have become low-priced due to mature technology. There is a debate that subsidies for renewables, which are already low, should be wholly removed (“It’s Time to End Subsidies for Renewable Energy - America’s Power,” 2020; Perry et al., 2020). Investors finance renewable energy projects because, with support mechanisms from the states, selling cheap electricity to the grid is still financially feasible for them. As solar and wind both are a variable source of energy, the selling price is already low to grid compared to a conventional energy source, i.e., fossil fuel (Perry et al., 2020).

To keep renewable energy price low and minimize the damage to environment, FFs subsidies should be directed for the renewables. It will significantly impact on the overall transition to RE. Few of the advantages are listed below (Bridle et al., 2019):

- Revenue stream for government will increase once the FFs subsidies are removed, and actual energy price will be charged for FFs.
- With emission reduction targets, there is a need to shutdown gradually non clean energy resource, reduction in subsidies for FFs should decrease any new investment in the FFs based plants and business will ultimately shift towards clean energy plants.
- This replacement of energy subsidy will not only help now to reach climate change targets but will help

countries in future to have cheap energy resource which is directly linked to the economic development. Industries will have abundant energy resources to manufacture more with clean and cheap energy which makes them more competitive in the international market.

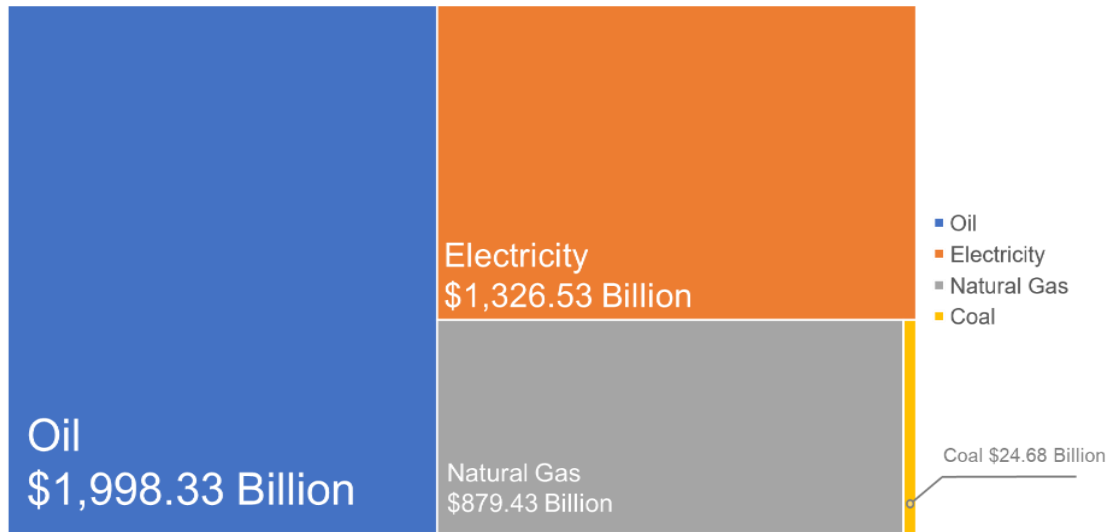


Fig. 3: Total Fossil Fuel Subsidies 2010 - 2019

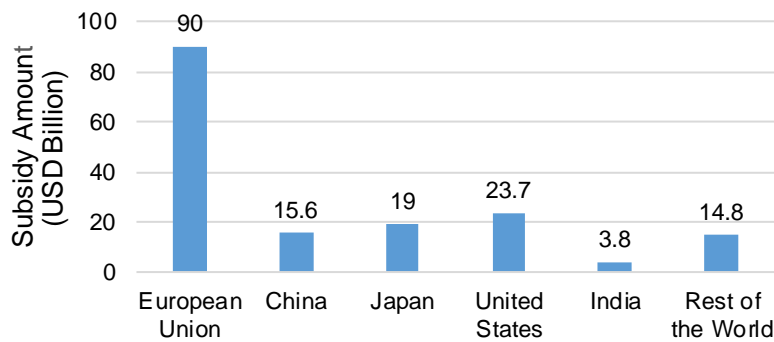


Fig. 4: Renewable Energy Subsidy 2017 (IRENA)

IV. Discussion

With the current fossil fuel subsidy, it is expected that the oil industry will remain profitable and it may extract the half of domestic oil reserves in the US which leads to the higher production rate and more CO₂ will be emitted to the atmosphere (Coleman and Dietz, 2019; Erickson et al., 2017). Therefore, it should be stressed that policies to diverge the FFs subsidies towards Renewables are formulated. Two methodologies can be applied for such transformation either by selling cheap renewable electricity to the final consumer or by providing support for investment in building the RE plants infrastructure. By providing the support for the renewable, two objectives can be achieved. First, Electricity will reach in rural underdeveloped areas where transmission lines are not available. They can generate their own electricity from various means such as solar, wind and hydro. This will ultimately improve the quality of life in the rural areas. Second, job opportunities will be created for the locals due the renewable energy plants. Few of the policy directions for renewable energy promotion are mentioned below:

- Comprehensive database for RE subsidy should be available like FF subsidy for the comparison.
- International monitoring body such as IRENA should work with UN to monitor progress of SDG – 7 i.e. usage of clean energy resources.
- Role of IRENA in promoting and prioritizing renewable usage should be made more inclusive.
- Innovative fiscal incentives should be provided to increase the share of RE in energy usage and reduce the FFs consumption and subsidies in general.
- Gradual plan for the removal of FF subsidies and closure of non-clean energy plants should be prepared with discussion from all stakeholder.

V. Conclusion

As we are experiencing difficult times now due to the COVID-19 pandemic, it is essential to save the taxpayers money by diverting the capital allocated for the subsidies to other stimuli such as healthcare or the promotion of renewable energy. The World economies were shut down or are partially open at present; energies usage has been significantly reduced, which also paves the way to reduce subsidies gradually. Governments across the World can

use this time to align their resources to mitigate the climate change issue. Since the start of the pandemic, it has been noticed GHG has been reduced during this time, but if strict measures are not taken to curb the GHG emissions, the rate of emissions will be higher as people are more likely to go out after the lockdown restrictions are eased.

References

- Ali, H., Tahir, F., Atif, M., AB Baloch, A., 2018. Analysis of steam reforming of methane integrated with solar central receiver system, in: Qatar Foundation Annual Research Conference Proceedings. p. EEPD969.
- Apergis, N., 2019. Chapter 6 - Renewable Energy and its Finance as a Solution to the Environmental Degradation, in: Özcan, B., Öztürk, I. (Eds.), Environmental Kuznets Curve (EKC). Academic Press, pp. 55–63. <https://doi.org/https://doi.org/10.1016/B978-0-12-816797-7.00006-0>
- Bridle, R., Sharma, S., Mostafa, M., Geddes, A., 2019. Fossil Fuel to Clean Energy Subsidy Swaps: How to pay for an energy revolution GSI REPORT.
- C2ES, 2019. Renewable Energy — Center for Climate and Energy Solutions [WWW Document]. Cent. Clim. Energy Solut.
- Charles, C., Moerenhout, T., Bridle, R., 2014. The Context of Fossil-Fuel Subsidies in the GCC Region and Their Impact on Renewable Energy Development.
- Coleman, C., Dietz, E., 2019. Fossil Fuel Subsidies: A Closer Look at Tax Breaks and Societal Costs [WWW Document]. EESI.
- Erickson, P., Down, A., Lazarus, M., Koplów, D., 2017. Effect of subsidies to fossil fuel companies on United States crude oil production. *Nat. Energy* 2, 891–898. <https://doi.org/10.1038/s41560-017-0009-8>
- Hayer, S., 2017. Fossil Fuel Subsidies.
- IEA, 2020a. World Energy Outlook 2020 [WWW Document]. IEA, Paris.
- IEA, 2020b. Energy subsidies Tracking the impact of fossil-fuel subsidies [WWW Document]. IEA, Paris.
- IEA, 2018. Data & Statistics - IEA [WWW Document]. IEA, Paris.
- Imteyaz, B., Tahir, F., 2019. Thermodynamic analysis of premixed and non-premixed oxy-methane combustion cycle with membrane assisted oxygen separation, in: 8th Global Conference on Global Warming (GCGW), Doha, Qatar. p. 33.
- Imteyaz, B., Tahir, F., Habib, M.A., 2020. Thermodynamic Assessment of Membrane Assisted Premixed and Non-Premixed Oxy-Fuel Combustion Power Cycles. *J. Energy Resour. Technol.* 1–11. <https://doi.org/10.1115/1.4049463>
- It's Time to End Subsidies for Renewable Energy - America's Power [WWW Document], 2020. . Am. Power.
- Nemitallah, M.A., Abdelhafez, A.A., Habib, M.A., 2020. Approaches for Clean Combustion in Gas Turbines, Fluid Mechanics and Its Applications.
- Perry, A., Cleary, M., Wyman, O., 2020. Why It's Too Soon To Sunset Renewable Energy Subsidies [WWW Document]. Forbes.
- Tahir, F., 2014. Experimental & Numerical Investigations of Oxy-fuel Combustion Using Porous Plate Reactor. King Fahd University of Petroleum and Minerals.
- Tahir, F., Ali, H., Baloch, A.A.B., Jamil, Y., 2019. Performance Analysis of Air and Oxy-Fuel Laminar Combustion in a Porous Plate Reactor. *Energies* 12, 1706. <https://doi.org/10.3390/en12091706>
- Taylor, B.Y.M., 2020. Energy subsidies: Evolution in the global energy transformation to 2050, International Renewable Energy Agency.
- United Nations, n.d. Sustainable Development Goals [WWW Document]. Sustain. Dev. Knowl. Platf.