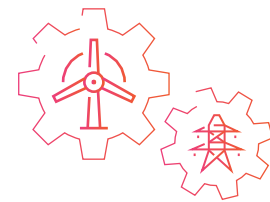




Alternative Energy Sources: Making the Case for Widespread Adoption, Now

WHITE PAPER

Abstract



Fossil fuels, particularly coal, have been around as the principal source of energy for hundreds of years. As of June 2020, fossil fuels catered to 84% of the world's energy needs with oil making up 33% of the contribution, followed by coal at 27%, natural gas at 24%, hydro power at 6%, renewables at 5%, and nuclear power at 4%. However, this use of coal and oil has resulted in increased air pollution with heightened CO₂ levels, global warming and water pollution.

This impact on climate change is spurring efforts to find scalable and distributable alternative energy sources. These alternate energy sources can bring in revolutionary changes such as electrification, de-carbonization and climate change control. This paper throws light on major forces impacting the demand and supply of fossil fuels and the challenges in increasing adoption of renewable sources of energy.

Does that mean fossil fuels will go away for good? While we wait for the answers, experts have and society in general are moving towards electricity as the secondary energy source, with innovation scaling at great speed, resulting in emerging technology solutions in the energy sector focused on use of electricity.

Leveraging electrification to reduce dependence on fossil fuel

Electrification of the society has impacted the ways power is generated, distributed and consumed. This has both positive and negative implications. The negative was amply highlighted in the February 2021 winter storm that affected all of the southern US. The positives are well illustrated by the electrification of vehicles in the transportation sector. While electric cars make up for 2% and 5% market share of new car sales in the US and Europe respectively, their share is expected to increase by 28% by 2030¹. This will boost recharging infrastructure and battery technology while reducing electric car prices. According to the International Council on Clean Transportation Report, electric cars could cost less than equivalent petrol vehicles by 2030². In addition, the increasing use of driverless cars is also expected to reduce the number of cars on the road. In fact, the global autonomous or driverless car market valued at USD 24.1 billion in 2019, is expected to grow at a CAGR of 18.06%, during the forecast period, 2020-2025.³ Combining this with increased digitization all around us and subsequent increase in demand for electricity, there is likely to be greater reliance on fossil fuels, particularly, natural gas in the near term. In order to reduce this dependence, organizations need to leverage active management systems that help automate interaction between the electric smart grids and charging stations and home and factory appliances. This will help manage supply, channelize and monitor local power generation, distribution and consumption, creating an internet-like electricity consumption and distribution model, thereby reducing the demand for generating electricity from fossil fuels.

Paving the way for climate change and decarbonization

Increasingly, global warming and reducing ice mass have become a real threat to contend with. In 2019, Greenland's ice mass loss was more than twice the ice loss in 2003. Melting of all ice in Greenland can increase the sea level by 7 feet. This is why 195 countries have signed the Paris Accord to control the global temperature rise to +1.5 degree centigrade by 2050, which looks like an increasingly difficult target currently. In order to mitigate climate impact, organizations need to reduce their carbon footprint. They also need to invest in strategies and technologies that reduce coal and crude oil usage responsible for toxic emissions and multiple environmental hazards such as sludge pond failures and acid rain. France and Japan have already reduced their reliance on coal by 40% by leveraging nuclear and wind energy. At this point it is also crucial to increase carbon taxation to limit fossil fuel usage.

[1] *Renewable Energy World, Electrification of transportation sector nears tipping point, July 2020, <https://www.renewableenergyworld.com/opinion-and-commentary/electrification-of-transportation-sector-nears-tipping-point/#gref>, accessed on February, 2020*

[2] *The Driven, Electric cars could cost less than equivalent petrol vehicles by 2030, April, 2019, <https://thedriven.io/2019/04/04/electric-cars-could-cost-half-of-equivalent-petrol-vehicles-by-2030/> accessed on February 2020*

[3] *Research and Markets, Global Autonomous/Driverless Car Market Projections, 2020-2025: World Market Anticipating a CAGR of ~18%, March 18, 2020, <https://www.globenewswire.com/news-release/2020/03/18/2002529/0/en/Global-Autonomous-Driverless-Car-Market-Projections-2020-2025-World-Market-Anticipating-a-CAGR-of-18.html>, accessed on February, 2020*

Considering RoI for oil shares

Oil majors are already hedging themselves and supplying electricity from various sources including wind, sun and geothermal. At the same time, the declining public image of Big Oil has hampered investor interest in oil share trading. For example, the Norwegian National Investment Fund and some of the large US Pension Funds have declared they will divest all their holdings in the Oil & Gas sector. Leading US banks such as CitiGroup, Goldman Sachs, JP Morgan Chase, Morgan Stanley and Wells Fargo have pledged over the past year to end funding for new drilling and exploration programs such as Artic Drilling programs due to increased climate risk and reduced RoI from investment.

Tacking the Climate Change Imperative with Renewable Energy

With increasing digitization and electrification, utility industries can utilize fossil fuel alternatives such as nuclear, wind, sun, geothermal and hydrogen energy to reduce dependence on fossil fuels.

For instance, nuclear energy can meet much of the current and future electricity needs. However, the barriers and associated risks are high including worker and site safety concerns, operational risks, regulatory restrictions, risk of uranium mining and unresolved waste management concerns. Nuclear power stations are also very expensive to build and maintain.

Wind power electricity generation is growing steadily with a large number of countries, including many states in the US, stipulating that a percentage of the energy supplied by utility companies come from renewable resources. However, high initial investments and lack of effective storage solutions (battery technology) have hampered wide-adoption of wind power.

Solar energy, on the other hand, is one the most viable options at present. An hour's sunlight around the world can help generate enough energy to meet global energy requirements for an entire year while ensuring cost optimization. However, the material used in solar cells are relatively primitive and limits the level of energy captured. In addition, organizations are currently harnessing only a very small part of the spectrum to generate solar power with no real solution to store solar energy. Organizations can also consider leveraging geothermal energy with new drilling technology and potential new electricity distribution networks that make it easier to distribute the energy from remote sources.

At the same time, hydrogen is being promoted as an alternative transport fuel especially for heavy transport as it a clean burning fuel. However, hydrogen is energy intensive to produce, store and transport. BNEF (BloombergNEF) estimates ubiquitous usage of hydrogen will cost USD 637 billion by 2050.

Capitalizing on Renewable Energy

Currently, there is no single alternate energy source that matches fossil fuels in terms of energy content per unit of measure as well as being easily transportable. It is expected that over the next 30 years, coal and crude oil will have diminishing roles while the use of natural gas will increase. In order to increase use of renewable energy, organizations need to upgrade their power distribution grids and invest in smarter homes and electric transportation. This will not only generate cleaner fuel but will also generate a huge amount of information to manage and analyze. This can offer significant automation opportunities for system and information integrators with strong global IT capabilities and resources to scale quickly, offering a competitive edge to utility industries.

Sources

- Forbes – Source www.Forbes.com 2020/06/20
- Burn Out – The Endgame for Fossil Fuels; Dieder Helm 2017 Yale University Press ISBN 978-0-300-22562-4
- The New York Times – Tipping Point: Electric Cars Get closer on Price – September 21, 2020
- The New York Times – Greenland’s Record Ice Loss – August 25, 2020
- Wall Street Journal - Bank’s Arctic Financing Retreat - October 9, 2020
- Journal of Petroleum Journal (JPT) – H2 Economy – Hype, Horizon or Here? – August 2020
- The New Map – Energy Climate, and the Clash of Nations; Daniel Yergin – 2020 Penguin Pres ISBN – 976-1-59420-643-6
- National Geographic Special Issue – Let’s not waste this moment – Robert Kunzig - November 2020

About The Author

Jan Erik Johansson

Jan Erik Johansson is currently the Advisor, Upstream COE, with TCS' Global Oil & Gas Practice. Formerly, he worked as Operations Manager, Senior Consultant and Practice Manager for the world largest Oilfield Service Company. He is an active member of the Society of Petroleum Engineers (SPE), American Association of Petroleum Geologists (AAPG) and American Association of Mechanical Engineering (AIMEE). Jan has over 40 years of experience in Upstream operations management including budgeting, day to day operation of business operation and has also started both technical and business consulting practices. In his current consulting and advisory role for global customers, he conducts workshops and mentors teams on projects and front ended proposals for Data Management, Analytics and Business Process Transformation.

Contact

Visit the [Energy, Resources & Utilities](#) page on www.tcs.com

Email: er.marketing@tcs.com

About Tata Consultancy Services Ltd (TCS)

Tata Consultancy Services is an IT services, consulting and business solutions organization that has been partnering with many of the world's largest businesses in their transformation journeys for over 50 years. TCS offers a consulting-led, cognitive powered, integrated portfolio of business, technology and engineering services and solutions. This is delivered through its unique Location Independent Agile™ delivery model, recognized as a benchmark of excellence in software development.

A part of the Tata group, India's largest multinational business group, TCS has over 453,000 of the world's best-trained consultants in 46 countries. The company generated consolidated revenues of US \$22 billion in the fiscal year ended March 31, 2020, and is listed on the BSE (formerly Bombay Stock Exchange) and the NSE (National Stock Exchange) in India. TCS' proactive stance on climate change and award-winning work with communities across the world have earned it a place in leading sustainability indices such as the Dow Jones Sustainability Index (DJSI), MSCI Global Sustainability Index and the FTSE4Good Emerging Index.

For more information, visit us at www.tcs.com

All content / information present here is the exclusive property of Tata Consultancy Services Limited (TCS). The content / information contained here is correct at the time of publishing. No material from here may be copied, modified, reproduced, republished, uploaded, transmitted, posted or distributed in any form without prior written permission from TCS. Unauthorized use of the content / information appearing here may violate copyright, trademark and other applicable laws, and could result in criminal or civil penalties.

Copyright © 2021 Tata Consultancy Services Limited