



Let's Solve



Point of view

Transitioning to Green Energy for a **Sustainable Future**



A Larsen & Toubro
Group Company

Renewable & Non-renewable energy and its impacts

Global warming, climate change, and a spate of natural disasters in the last couple of decades have sharply focused world attention on the urgent need to move away from fossil fuels and explore alternative and sustainable energy sources. In the past two years of the current decade, renewable energy utilization has increased sharply, and we are seeing a decided shift toward reducing greenhouse emissions.

Energy sources are broadly categorized as renewable and non-renewable based on the source of generation. These two categories are further sub-divided based on their usable form and source of generation:

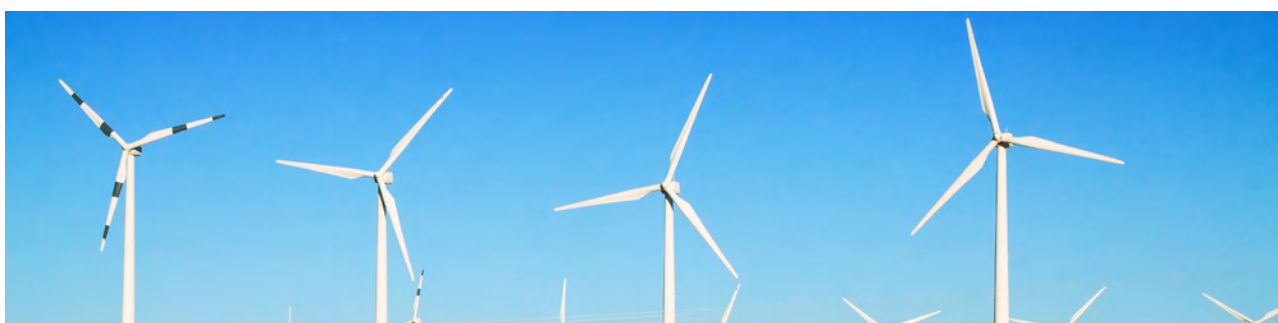
Renewable Energy

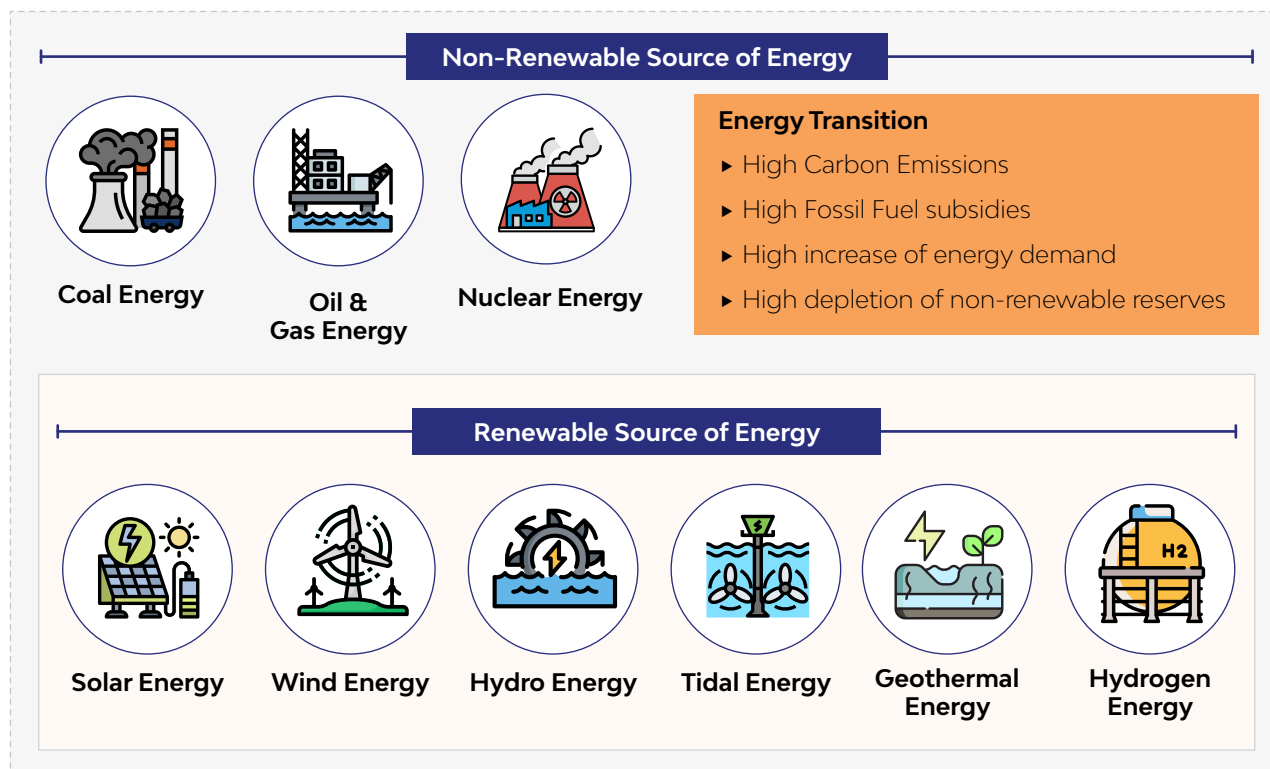


Non-Renewable Energy



Further classifications are defined for green and clean energy based on emissions and generation. Clean energy stands for clean air with zero emissions. Green energy is sourced from nature, mostly from the sun and wind. Greenhouse gas emissions have been slowly increasing over the last 150 years. They increased significantly with the discovery and utilization of fossil fuels. Greenhouse gases trap the heat in the atmosphere raising the temperature of the earth, resulting in global warming.





Global initiatives toward renewables

In 2015, amid rising global concerns of climate change, 92 countries got together in Paris to be signatories to a landmark agreement aimed at reducing the greenhouse gas emissions, and building a sustainable low-carbon future. The Paris Agreement is an international treaty to take measures to substantially reduce global greenhouse gas emissions, to ensure the global temperatures do not rise beyond 1.5 degrees Celsius. Furthermore, the emissions are to be reduced to net zero for the second half of century. As of today, 196 countries are signatories to this agreement, under which each country needs to have a concrete plan and regular reporting on their contributions ^[1].

Initiatives by oil and gas companies

Today, there is a paradigm shift among oil and gas companies toward reducing their greenhouse gas emissions to net zero. They started transitioning by setting their organization goals to minimize greenhouse gases and migrating toward green energy. Norway-based oil company Statoil has changed its name to Equinor in 2018, showcasing their strategic shift from oil and gas energy to all forms of energy equally ^[2]. Oil and gas companies started initiatives such as capturing emissions during the midstream and downstream life cycle. These emissions are converted into useful industrial products

in manufacturing feedstock that boosts economic growth and job creation. They also started the Carbon Capture Storage (CCS) initiative, a process of capturing carbon dioxide (CO₂) from industrial emissions and pumping it back into nearby geological reservoirs to minimize emissions. For example, energy capital Houston, having large number of upstream, midstream, and downstream companies, has great potential of capturing carbon dioxide emissions and storing them by pumping them into the Gulf Coast reservoir. Oil and gas companies are aiming to capture 50 million metric tons of carbon dioxide emissions by 2030, and 100 million metric tons by 2040, targeting net emission target to zero ^[3]. Most of these companies are working to advance the energy transition to meet the growing demand for affordable, reliable, sustainable, green energy. They have started identifying their strengths and are filling the gaps by partnering with technologically advanced firms and research institutions that share aspirations/goals of green energy transition.

A closer look at some of the oil and gas initiatives for green energy transition reveals interesting alternatives.

- ▶ **Drilling geothermal relief wells:** Geothermal energy is generated by drilling more relief wells for utilizing the heat below Earth's surface more effectively. This energy is utilized in generating electricity and heating homes. Geothermal energy sources are easily reachable and available at optimal cost.
- ▶ **Carbon capture storage in geo-reservoirs to keep emissions down to zero and improve injection pressure:** Carbon capture storage is a complicated process of injecting carbon dioxide into geological reservoirs permanently before it combines with the atmosphere. The main challenge is identifying potential reservoirs which can hold carbon dioxide permanently. Such carbon dioxide storage enhances the fluid pressure of the reservoir making the existing reservoir more productive through Enhanced Oil Recovery techniques.



- ▶ **Capturing emissions and converting them to feedstock for boosting economic growth:** Carbon effluents captured from atmosphere around the industry clusters can be used and reused as a feedstock. Carbon emission volumes are significantly challenging the environment, they offer a trillion-dollar market opportunity for utilizing the carbon as feedstock for making building materials, chemicals, and fuels. Hence, the reduction of carbon in atmosphere will eventually reduce the global temperature on Earth.
- ▶ **Establishing wind and solar plants at oil and gas fields for utilizing decarbonized electricity at manufacturing units:** In the oil and gas value chain, energy is consumed at various processes and points such as drilling, completions, production, refineries, and transporting crude through pipelines. Most of these intermediate processes utilize non-renewable sources of energy. There is huge potential for establishing solar and wind plants, which are economical and ecofriendly, for generating energy for different processes.
- ▶ **Changing strategy from oil and gas generation to renewable energy generation:** In future most energy sources will be renewable, hence many companies are shifting their strategy from fossil fuels to renewable sources of energy to establish their footprint in the energy industry and survive the energy transition. Companies are investing in R&D to identify renewable energy sources in an economically viable manner.
- ▶ **Shifting from oil and gas to energy from biofuels and converting traditional refinery to biorefinery:** Oil and gas refineries need to customize and enhance their refineries to process crude oil and biodiesel simultaneously considering the energy transition and demand. This could well position them as pioneers in energy transition for sustainable growth.
- ▶ **Investing in energy storage technology for sustainable energy:** The major challenge to be addressed in energy transition is producing low-cost energy and storage. Energy generated through renewable sources underlines the need to enhance energy storage especially in transportation. Many universities and industries are investing heavily in research and development for enhancing the energy storage capacity for transportation.
- ▶ **Shifting energy source to hydrogen:** Hydrogen energy is generated from sources such as fossil fuels, biomass, methanol, and electrolysis. Based on the process of generation, hydrogen energy is classified as grey, blue, and green hydrogen. Companies are increasingly investing in startups to continue research and development in exploring hydrogen as low-cost fuel keeping carbon emissions at zero.

- ▶ **Global carbon reduction by offsets:** This is a remarkable solution to reduce global carbon emissions cost-effectively. Offset solutions for reduction of carbon from the environment include soil carbon storage, reforestation, mangrove cultivation, land cultivation, and agriculture farming for generating high quality carbon credits. Companies are partnering with NGOs to build their credits and reduce the global carbon.

IT role

Green energy is influencing the world market, forcing every industry to examine its readiness for transition. Industries are taking foundational steps to expand their green energy solutions with technology. Information technology plays a vital role in bridging business gaps with technology. AI, ML, analytics, data science and edge/cloud technologies help green energy transition toward a sustainable future. Areas in which technology plays a key role in transition include:

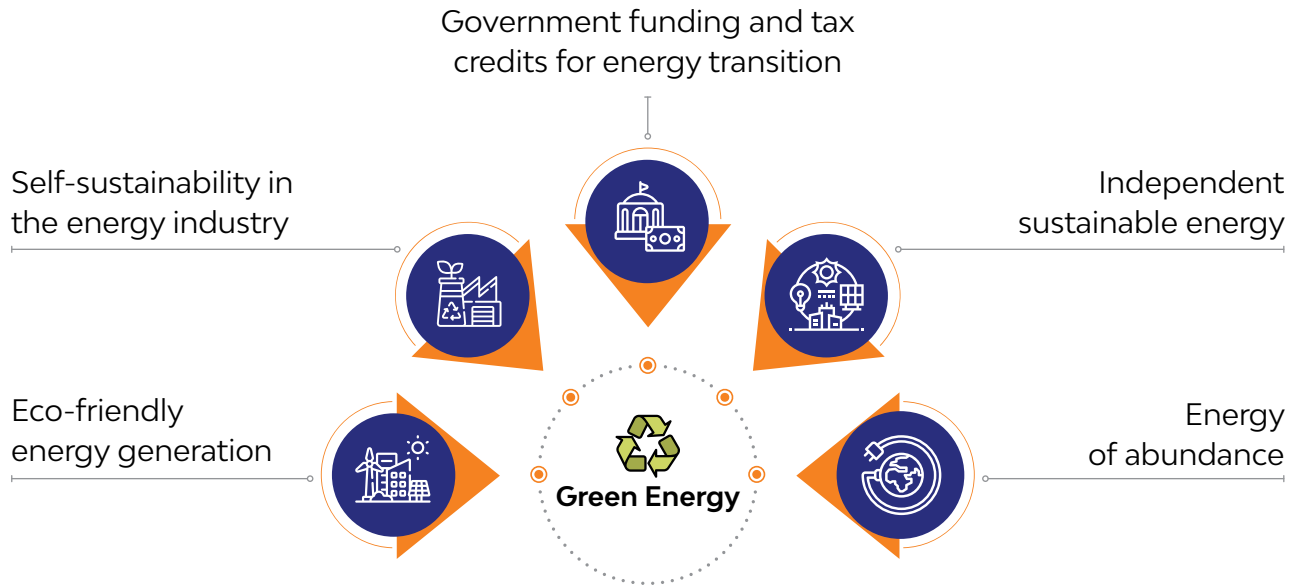
- ▶ **Green energy consulting:** This helps in identifying the unsolved problems by integrating the business gaps with technology.
- ▶ **AI/ML solutions:** AI/ML solutions are used in implementing automation by training the robots on various simulation models and eliminating the manual process . Renewable energy infrastructure is mostly operated from remote areas, which need regular surveillance to ensure smooth operations. Machine learning techniques help in running the smooth operations by training the bots. For example, bots are deployed at hydrogen and storage plants to monitor operations and infrastructure from the field site.
- ▶ **Enabling edge/cloud solutions:** Data plays a vital role in operations, so data availability from remote fields to the operations center helps in effective decision-making. Data generated in the field can be transferred using cloud technology or edge solutions in real time with minimal time lag from the field. This technology fills the gap in making data available to the end-users for efficient and timely decision-making.
- ▶ **Data analytics and intelligence:** Data analytics enables the visual perspective of operations, which enhances intelligence about the operations and planning strategy. It drives better decision-making by lowering operation costs and enhancing energy generation, keeping carbon emissions at net zero.

- ▶ **Data trends and dashboarding:** Data dashboarding helps users and business leaders to understand operational efficacy by comparing it with past and future forecasts. For example, looking at the data trends of carbon emissions, offsets, carbon capture, and hydrogen generation enables leaders to take decisions that align with their energy goals.
- ▶ **Adaptable to the technology transformation:** This helps develop applications/products/adapters as per business need by narrowing the business gaps. For example, building an inventory system for the hydrogen value chain for tracking, inventory, supply chain, and logistics; or developing a mobile application with good dashboarding to showcase the operations to the business stakeholders.

Outlook

Crude oil and natural gas demand is going to continue well into 2030 and 2040, with a slight reduction of demand by 2050 due to increase in green energy utilization ^[4]. Energy related emissions are expected to drop by 75% by 2050 due to a shift to renewable energy technologies and low-carbon electricity. Green energy is going to play a major role in contributing nearly 70% of energy, mostly solar generated. The bells are tolling for the oil and gas industry—it is imperative for these companies take up the challenge of reducing greenhouse gas emissions and strategizing for business expansion into clean and green energy sources. Upstream, midstream, and downstream companies are going to have to shift their focus to solar and wind energies and utilizing the green energy for performing drilling and production activities, pumping the viscous fluid through pipelines, and transportation through electrified vehicles. These companies will have to set up green energy plants at their production units for producing and utilizing low-carbon electricity at their manufacturing units.

Above all, the following factors will drive the shift by oil and gas companies toward green energy:



About the Author



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Jagadish has 15+ years of experience in Geo-science Data Management Consulting in the Energy sector. In his current role, he is responsible for consulting and solutioning for Global Upstream and Energy transition projects. Jagadish's areas of expertise includes Delfi and OSDU adoption, CRM, Data Digitization, Data Migration, Data Quality Management and application support services for O&G industry. He also holds a doctorate in Geology.

References

1. How oil and gas is navigating the energy transition | McKinsey
2. The renewable energy strategies of oil majors - From oil to energy? - ScienceDirect
3. Joe Blommaert On Houston CCS Innovation Zone | Energy Factor (exxonmobil.com)
4. Global Oil outlook to 2040 - McKinsey Summary Report-February-2021

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