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Point of view

Solving the Net Zero Equation with Circularity

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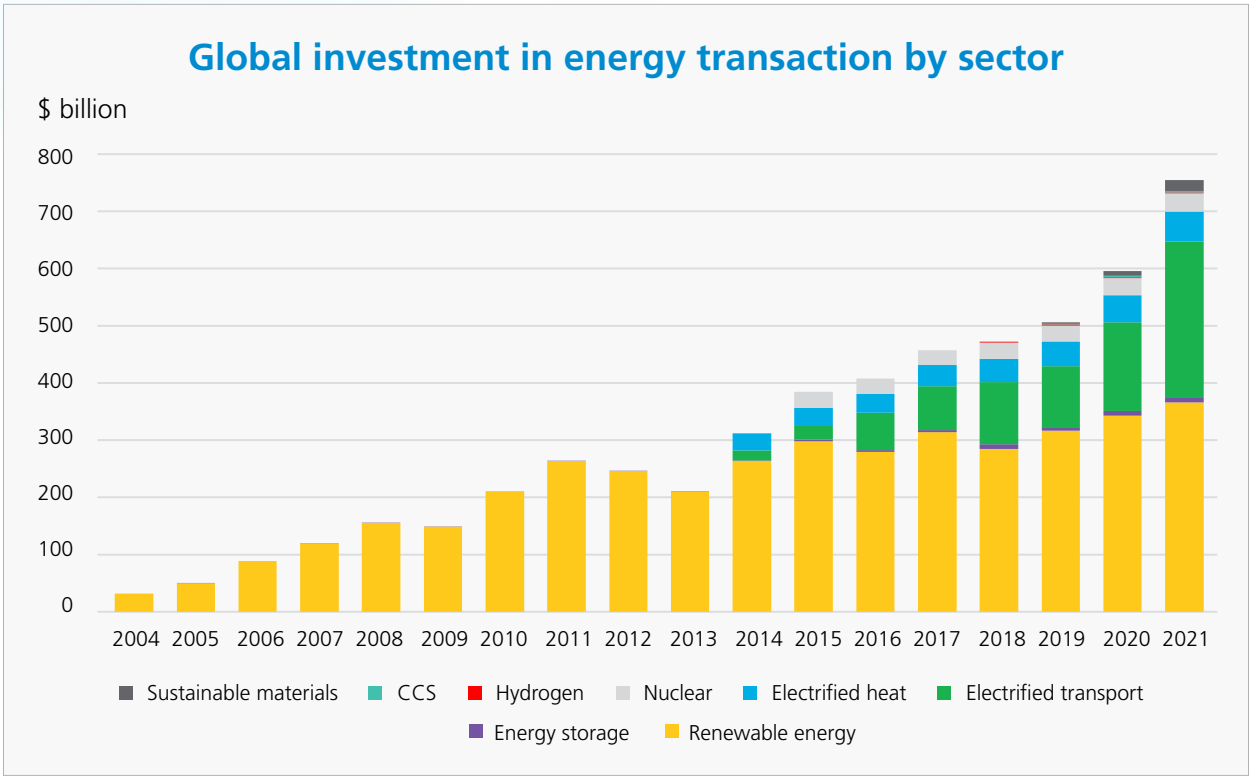
Discussions around achieving net-zero emission of greenhouse gases by 2050 have gained traction against the backdrop of the UN COP26 conference on climate change in Glasgow. Net-zero commitments are no longer nice-to-have but a strategic priority for businesses. With capital markets increasingly incorporating emission risk in asset pricing and investment in energy transition technologies at an all-time high1, more and more companies are making net-zero commitments as part of the United Nation's 'Race to Zero' campaign.



Source: BloombergNEF

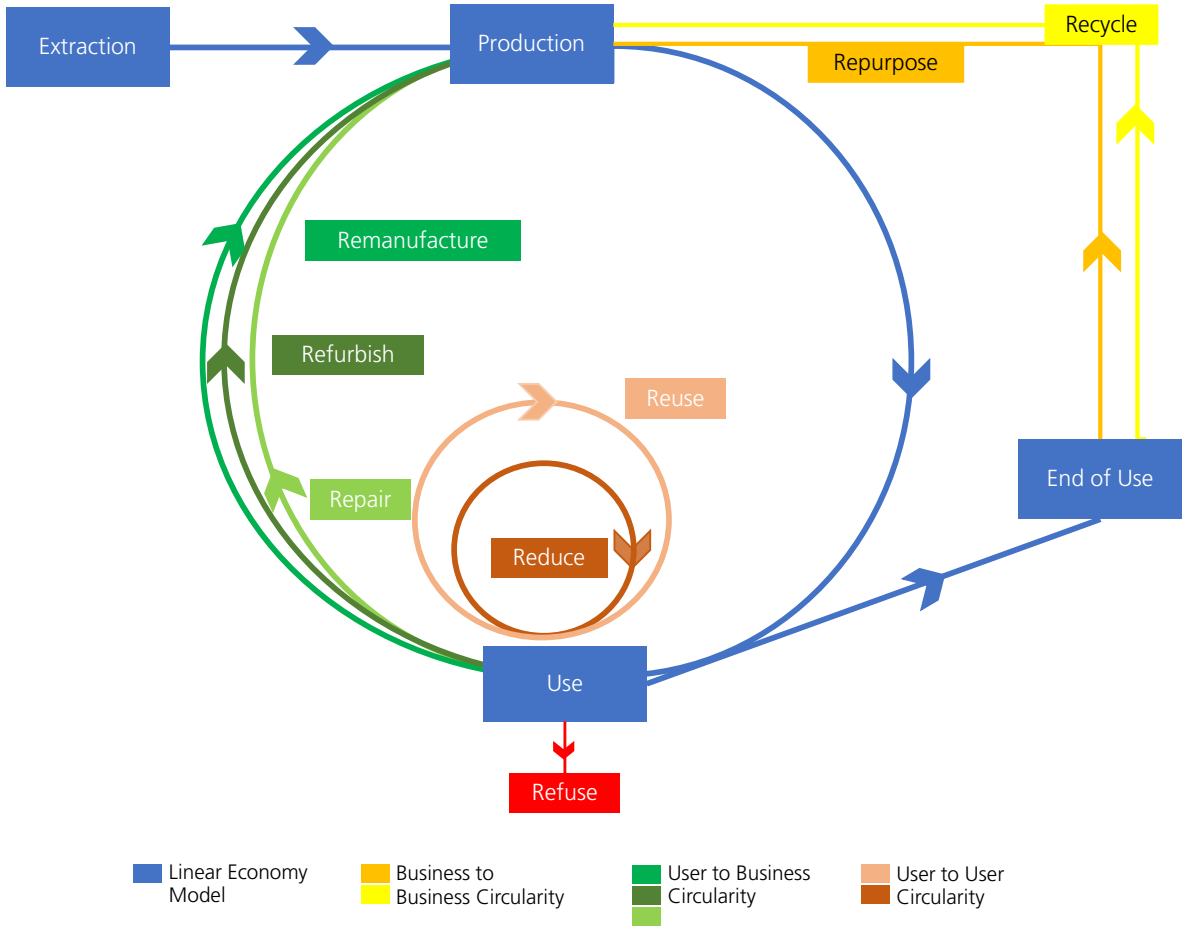
Solving the net-zero equation essentially means balancing the sources and sinks of emissions of greenhouse gases— in short, to achieve net-zero, the amount of greenhouse gas emissions due to human activities should be equal to the amount of greenhouse gas removed from the atmosphere. In the journey of solving the net-zero equation, while the focus is on reducing the energy-related carbon footprint through renewable energy and energy efficiency2, another key variable that needs attention is the circular economy.

Mining and processing of natural resources cause almost half of the global emissions. Circularity offers an excellent solution to minimize natural resource depletion and bring down carbon emissions. One of the core goals of the circular economy is to keep assets, products, components, and materials at their highest value as long as possible[3]. This automatically leads to a reduction in the carbon footprint as using less material or recycling materials results in a lower carbon impact compared to using virgin materials. Since the circular economy focuses on maintenance and refurbishing rather than on new builds, it effectively reduces carbon emissions.

Circular Economy: A Value-Retention Approach

The essence of circularity lies in the principle of value retention across the entire product or service life cycle as depicted in the UNEP circularity approach[4] below.

Circularity: Reduce by Design Approach



- "Reduce by design" acts as a guiding principle for the circular economy, leading to the design of products and services that use fewer materials per unit of production and generate less waste at the end of life.

- "Recycle and Repurpose" refer to the reuse of discarded goods or components after reprocessing, thus allowing the materials to enter a new life cycle and reducing or eliminating the cost of waste disposal. These functions involve some form of businessto-business transactions.

- "Repair, Refurbish, and Remanufacture" helps in extending the product lifetime by fixing specific faults or replacing defective components in a product. Users send a nonfunctional product to business intermediaries (retailers or repair shops) and get back the product with restored or improved performance.

- "Reuse" implies the handing over of a product or service from one user to another user (e.g., sale of second-hand products) without any repair or modification. Reduce is a user's choice to use products and services for longer and buy new items less frequently.

- "Refuse" is a user's choice to reject a product or service that doesn't adhere to a sustainable lifestyle or is considered hazardous to the environment (e.g., rejecting the use of plastic bags).

Circular Economy in Process Industry

A process industry can be defined as one where the primary production processes are either continuous or occur on a batch of materials that is indistinguishable. Some of the major process industries are petroleum, chemical, petrochemicals, and plastic.

In the petroleum industry, oil and gas companies have vast scope for pivoting their business around the circular economy. In the upstream, many tools and equipment used for drilling and other activities can be recycled. During decommissioning of offshore platforms, part of the substructure can be converted into an artificial reef, thus promoting marine life and contributing to the environment and sustainability[5]. In the downstream, refineries can recover and recycle 'spent catalysts' and chemicals used in the refining process. Oil and gas production generates a significant amount of brine that contains valuable and high-demand minerals. These minerals can be extracted for use by other industries. Waste-to-energy can also be a great business opportunity. Waste products can be treated and processed to produce power which can be used to meet refinery needs or exported to nearby grids. The chemical industry also needs to play an important role in the transition to a circular economy. Chemical recycling of non-biodegradable waste such as plastic through depolymerization and conversion should be a strategic priority for the chemical industry. Chemical manufacturing companies can use metals of recycled batteries to produce battery materials, leading to significant CO2 reduction during the production of electric vehicles. Recycling wind turbines that are reaching the end of life is another good example of incorporating circularity[6]. The industry's procurement strategy should also consider if the suppliers of raw materials are following a sustainable and circular approach in their operation. Thus, circularity should not be seen as an organization-specific siloed approach, but as a harmonized policy that needs to be implemented across the entire product or service lifecycle. Technology plays a key role in integrating organizations across the value chain and connecting them with the circularity approach.

Changing Consumer Perceptions

The circular economy should not just be analyzed from the company side; a clear understanding of the market side is also needed. Consumers play an important role in the circular economy strategy implementation since many key elements of the circularity approach e.g., acceptance of recycled goods, use of second-hand products,rejecting non-sustainable products, etc. depends largely on user choice.

Earlier research indicated that consumers may perceive recycled products as low quality due to their lack of understanding of the recycling process, reducing their purchase intention for recycled goods. However, with growing sensitivity towards the environment, there has been a major shift in consumer behavior in recent times. Recycled products can now be positioned in the consumer's mind as environment-friendly "green products," creating a positive image about recycled products in the mind of consumers[7]. This will not only boost demand for recycled products but also increase consumer willingness to pay.

Companies need to capitalize on this macro market trend of recycled products and can leverage it as a competitive advantage. Technology can help companies to create awareness around sustainability and the environmental benefits of using recycled products.

Technology: The Missing Link in Circularity

Technology is one of the key enablers in implementing a circular economy. Technology can play a major role in the following areas[8]

Information exchange and facilitating partnerships.

Incorporating circularity in the product, process, and service design.

Creating consumer awareness of sustainable choices

Let us, deep-dive, into each of these key areas.

Information exchange and facilitating partnership:

Technology firms can be facilitators in the organization's journey toward a circular economy by –

- Creating online knowledge databases that act as a common repository of information on the circular economy.
- Tracking product conditions throughout the life cycle by using RFID, QR code, blockchain, and other technologies to gather information on the scope of recycling and reuse.
- Facilitating partnerships and collaborations (B2B and B2C) using online platforms that can aggregate buyers and sellers of second-hand goods or facilitate repair and refurbishing of used products.

Incorporating circularity in the product, process, and service design:

Emerging technologies such as artificial intelligence, 3D printing, IoT, etc. can play a key role here.

- Artificial intelligence can help designers create more sustainable and durable products by enabling testing with various materials and structures and refining design suggestions.
- Technologies such as 3D printing can optimize production processes and reduce waste by using exact amounts of material required.
- Digital solutions can enable new business models such as Product as a Service and Servitization that promote sharing and reuse of products, reducing demand for new products and materials.
- Waste management can be improved by real-time waste monitoring sensors and IoT systems, helping in sorting and recycling waste and resource recovery.

Creating consumer awareness of sustainable choices:

Technology can be leveraged to boost consumer demand for recycled and refurbished products.

Digital solutions can be used to influence and educate people and enable sustainable choices by sharing product information such as its environmental footprint.

Technology can be used to incentivize users for bringing used products for recycling and reprocessing.

Inevitable Choice

According to a 2020 Gartner survey, focus on circularity is going to increase in the coming years due to the following drivers:

- COVID-19 has shown how globalized supply chains can be disrupted and access to raw materials can be a challenge during a crisis. On the other hand, a circular economy has the potential to ensure raw material security from end-of-life products.
- The Product as a Service (PaaS) model has become more attractive as consumers are not willing to buy new products.

However, many challenges remain that need to be addressed for transitioning to a circular economy:

- Ownership of end-of-life materials remains the biggest challenge. Companies lose control of products and raw materials at their respective points of sale. They need to work along with consumers to regain access to the product at the end of the product's life.
- Collecting and centralizing end-of-life products for processing is another challenge. Companies can collaborate with waste vendors and reverse logistics service providers to overcome this block.
- It may not be economically viable to reprocess products with low residual value.
- Product complexity can be a challenge for reprocessing products at the end of life. Poorly designed products with environmentally hazardous materials can be very difficult to reprocess and put back into the market.

Society, government, and companies need to come together to overcome these challenges. Achieving net-zero is much more than just transitioning to clean energy. Making the products and materials used in daily life more energy-efficient, sustainable, and ensuring the least amount of waste generation at every stage of the product life cycle is of utmost importance. A circular economy is an inevitable option for transitioning to such a sustainable future.

About the Author

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Ayan has 9+ years of experience in consulting, business analysis, and delivery in the energy sector. At present he is engaged in delivering data and machine learning solutions for global energy clients, driving their digital transformation initiatives. He holds an MBA from IIM Bangalore.

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