Aligning Hitachi ABB Power Grids transformers with United Nations Sustainability Development Goals

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The United Nations Sustainability development goals (UN SDGs) were established in 2015 with the objective of solving the world's most pressing challenges, having clearly defined targets set for 2030. Unlike some of the previous international charters, the founding principles of UN SDGs recognised that achieving the goals requires active contribution from, not only Governments and civil society, but also Corporates, in turn providing them a way to add purpose to their business.

Today, it is recognised that, while most economic activities positively contribute to some UN SDGs, they can also have

UN Sustainability development goals

negative impact on some other SDGs. For example, activities that contribute to providing essential goods and services for an enhanced quality of life may also be causing environmental damage and unsustainable resource usage. Our endeavour is to understand the impacts across our business value chain, enabling us to align our actions to enhance our positive contributions, while mitigating the negative impacts.

The energy sector is contributing significantly to the future success of achieving the UN SDGs, but also grappling with the challenges of scaling access to clean energy for a growing population and decarbonizing the global energy supply [1]. An energy transition is ongoing to support this. Renewables and energy efficiency are two pillars of this shift with important enablers such as digitalization.

Transformers – key components of electrical grids

Increasing electrification of the world's energy supply implies that electrical equipment such as transformers will remain integral to the future of sustainable energy. We, at Hitachi ABB Power Grids, are conscious of the important role of transformers and are integrating the SDGs into our business for the benefit of our customers, partners, and society. This requires a deep oversight of our value chain, starting from our suppliers, operations, and the entire lifecycle of our products.

We have been pioneering transformers, enabling the development of the grid as we know it today, e.g., allowing efficient ultra-high-voltage transmission and also distribution of electricity to the remotest parts of the world. Our transformers operate reliably in the harshest of conditions, from the Arctic region to deserts, in remote offshore windfarms, under the sea, and inside buildings, with electricity reaching millions of people.

Integrating UN SDGs in our transformers

As part of our heritage of supplying the world with transformers for over 100 years, we have strived to maintain the highest environmental benchmarks in the industry. Today the planet faces mega-challenges for preserving the balance of the ecosystem that sustains us all. Accordingly, the three focus areas around which we are developing our offering for enhanced environmental sustainability are:

- Carbon neutrality – associated with the reduction of carbon emissions in the energy system by integrating renewables and improving energy efficiency
- Circular economy – application of circularity to processes and products
- Hazardous substances and preserving biodiversity – preventing the reach of hazardous substances to the natural environment and finding their alternatives.

Digitalization is an overarching enabler to the above three areas, contributing to more efficient operations, assisting in the overall lifecycle management and reducing environmental impact.

Carbon neutrality: SDG 7 and 13

1. Carbon neutrality – contributing to SDG 7 and SDG 13

As per the Intergovernmental Panel on Climate Change, given the current concentrations and ongoing emissions of greenhouse gases (GHG), it is likely that by the end of this century, the increase in global temperature will exceed the safe limit of 1.5°C [2].

In 2019, the electricity sector contributed to about 13 $GtCO_2e$ (IEA Global Energy & CO_2 Status Report 2019) of GHG emissions out of a total of about 55.3 $GtCO_2e$ globally (UN Emissions Gap Report 2019).

The path to decarbonization of the sector includes shifting power generation from fossil fuels to renewables. But smoothly integrating renewable electricity into the grid comes with its own challenges. Our scientists and engineers, with their deep knowledge of power systems and transformers, are developing and designing special transformers that operate smoothly with these variable energy sources and also provide stable grid interconnections from remote renewable energy projects.

Nevertheless, producing electricity from renewables for over 7 billion people is expected to take decades to realise, and enhancing energy efficiency must be complementary to those efforts. For us, this translates to a passion to reduce energy losses in transformers and to increase the overall efficiency of the power system with higher AC and DC voltages and more efficient interconnections, as well as reactors, phase shifting transformers, and transformers for flexible AC transmission systems (FACTS).

This aligns with SDG 7 goals to substantially increase the share of renewable energy in the global energy mix and double the rate of improvement in energy efficiency by 2030; and also SDG 13, which aims to take urgent action to combat climate change and its impacts.

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Circular economy: SDG 12

2. Circular economy – contributing to SDG 12

The 20th century saw amongst the highest number of people ever to be lifted out of poverty based on rapid industrialization, enhanced agricultural productivity, and rapid gains in health care, but this came with a caveat for the Earth - a jump in the global population close to four times.

The end result is that today we consume far more than the Earth can produce or absorb the waste. As per the global footprint network, "at the moment we are overusing Earth at about 175 % meaning that we need 1.75 planets to support our consumption of resources. By 2032, we will need 2. We are consuming the future". [3]

As scientists and thinkers realised the above, the concept of circular economy was born and has been around in various forms since the 1960s, gaining popularity in the last decade. Most recently, it has been popularised by the Ellen MacArthur Foundation that explains it like this: Looking beyond the current take-make-waste extractive industrial model, a circular economy aims to redefine growth, focusing on positive society-wide benefits. It entails gradually decoupling economic activity from the consumption of finite resources and designing waste out of the system. It is based on the following three principles along with our initiatives in the same:

- Design out waste and pollution – recycling
- Keep products and materials in use – services to extend the life of our equipment
- Regenerate natural systems.


Transformer for renewables in a wind farm

From the perspective of transformers, circularity is part of several of our activities, for example, end-of-life materials disposal and recycling. We are further progressing by developing a framework for integrating initiatives for circularity systematically in the whole transformers value chain, starting from our suppliers, to our own operations (design, production, transport) and the operation, maintenance, and end-of-life treatment of our equipment.

This aligns with SDG 12 goals to ensure sustainable consumption and production patterns in line with the circular economy concept.

3. Reduction of hazardous and polluting materials, enhancing human safety and biodiversity– contributing to SDG 12 and SDG 8

Contamination of the natural environment affects all life forms. As per the World Health Organization, about 9 out of 10 people breath polluted air today which causes about 7 million deaths annually [4], and the rate at which species are going extinct is accelerating, according to a UN report [5]. These threats to our

ecosystem can be turned around only by a huge concerted effort by all stakeholders.

Potential impacts from transformers in this area can be from leakage of mineral oil in case of an accident, use of materials such as paint with high VOC (volatile organic compounds), and the associated fire risk.

The transition to dry solutions in transformers (e.g., dry transformers and bushings) and biodegradable fluids to substitute mineral oils address those concerns. We offer transformers with bio-degradable oils like esters up to 550 kV, as well as dry type transformers up to 145 kV to mitigate the risk of oil leakages and enhance fire safety.

In addition, with innovations like the TXpand for preventing transformer tank ruptures in case of a serious fault and TXplore for robotic inspection of transformers without taking out the oil, we offer risk mitigation of oil spills. And, crucially, these technologies also ensure safety for transformer operators and maintenance personnel from rare incidents of transformers fires or asphyxiation in transformer tanks during servicing and maintenance operations.

Noise is also a type of contamination that we can mitigate with low sound transformers especially relevant in installations in or close to buildings and other dense urban areas. With regard to paints, we have switched to using paints with low VOC content.

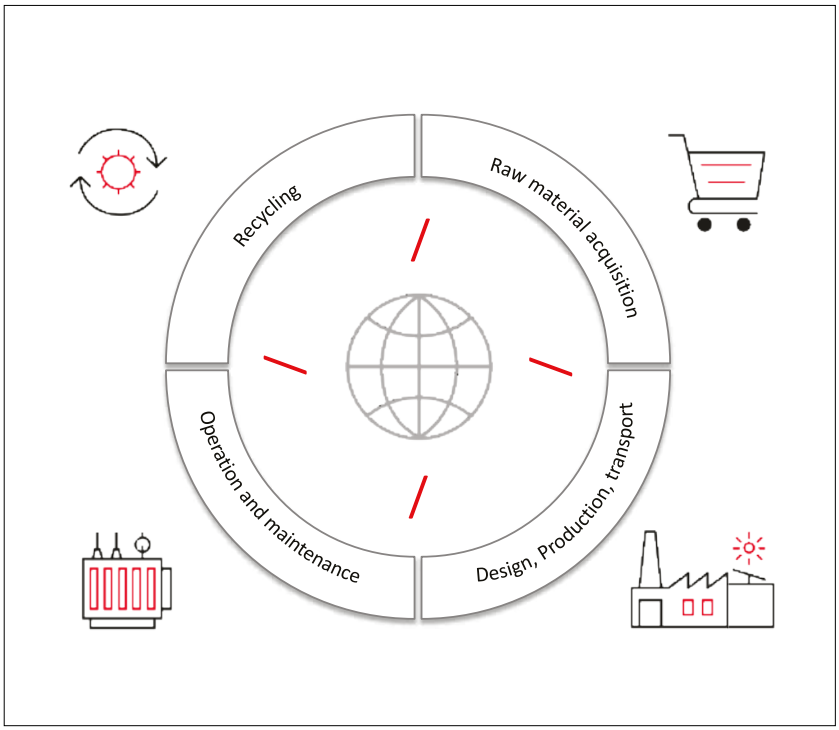
This is in line with the SDG 12 goal to achieve by 2020 environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water, and soil to minimise their adverse impacts on human health and the environment.

While enhancing safety is our top priority it is also aligned with SDG 8 of decent work and economic growth.

Unlocking the potential of the digital grid

Digitalization is helping improve the safety, productivity, accessibility, and sustainability of energy systems around the world [6].

The decarbonization in the electrical energy sector can be accomplished through the use of the renewables which comes with new challenges for the transformers' operation



Circular economy and transformers

A simple and affordable access to big amount of data is changing how we do and operate things. This is also applicable to the electricity systems where digitalization is supporting their optimization and an overall cost reduction that ultimately contributes to energy affordability and lower environment impact in different ways:

- Improving network efficiency, reducing energy losses
- Reducing operations and maintenance costs
- Reducing unplanned outages and downtime
- Extending the operational lifetime of assets.

Digitalization extends beyond monitoring and obtaining data from sensors, it enables intelligent electrical systems by analysing data and providing actionable information to help making the right decisions. These provide benefits across the whole energy value chain from generation, transmission, distribution, industries and infrastructure, helping them to reduce costs and enhance operations, life-expectancy and environmental performance.

Reduction of hazardous and polluting materials: SDG 12 and 8

Digitalization is one of the key initiatives at Hitachi ABB Power grids. Our TXpert™ Ecosystem makes digitalization of transformers simple, enabling a sustainable energy future that demands greater resilience, flexibility and efficiency in electricity networks.

Four articles are included in this issue, covering many of the transformer sus-

HiDry transformer

The key elements in the sustainability chain include the adoption of the principles of the circular economy and the reduction of the hazardous and polluting materials

tainability aspects outlined in this article to provide more detailed information of the transformer's contribution to the UN SDGs:

(1) Towards net zero emissions – The role of circularity in transformers

Addressing the role and contribution of transformers to the circular economy and different options to further move towards circularity, discerning what and where the largest environmental impact is, pointing out what changes can be made to reduce that impact, and answering how circularity can be systematically considered in transformers value and how to make that change happen.

(2) United for transformer losses

Dealing about energy efficiency and transformers and the UN's 'United for efficiency' programme to accelerate the global adoption of energy-efficient transformers trough an integrated policy approach that includes model regulation and procurement guidelines.

(3) Transformers for underground substations

This application has been selected to exemplify different transformer solutions addressing a reduction of the environmental impact and an enhanced safety for underground installations: dry and ester filled transformers in the combination of dry bushings and our TXpand system to prevent tank rupture.

(4) Transformer solutions to increase reliability and ease maintenance

Addressing sustainability and resource efficiency through transformer digitalization, implementing technology to reduce downtime, increase maintenance intervals and extend their lifespan, supporting a switch to condition-based lifecycle management.

A lot has been done already but more remains from the transformer industry to contribute to a better future.

Undoubtedly, we are at the start of this journey that we feel has the potential to not only "power good for the world" but also exhilarate our teams through a higher purpose this gives them the opportunity to identify with.

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