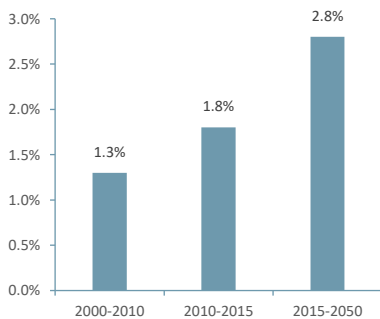


SPOTLIGHT

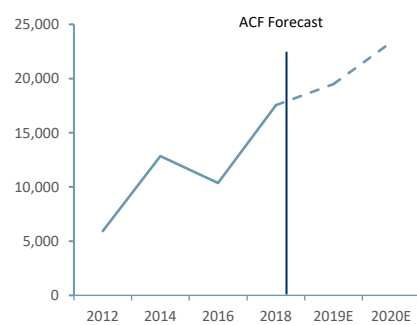
Energy Intensity Improvements

2050E 2.8%



Energy Intensity Improvements (%/yr)

Thursday, 21 May 2020



ESG Sustainable Investing Assets in USD trillions

How the Renewable Energy Market Has Transformed Energy Efficiency

Investing in renewables promotes energy efficiency

Renewable energy is super-abundant and should not contribute to the carbon footprint. Synergies between renewables and energy efficiency can potentially reduce greenhouse gas emissions by 70% by 2050, which is why this combination of renewable plus efficiency is so critical. Total global energy consumption increased by 2.9% in 2018 vs. 2017 and will only increase further as the rate of population rises, which in turn amplifies concerns around sustainability and the politics of climate change. Companies will need to diversify their business activities in response to changing social priorities in the general population if they want to attract investors. Explicitly, institutional investors increasingly require any investment candidate to have a metrics driven Environmental, Social, and Governance (ESG) policy as part of their core business. Our forecasts suggest that the total amount of ESG filtered investments available in 2020 will be \$25.2 trillion.

- Renewable energy is super-abundant;
- Renewables and energy efficiency together reduce CO₂ by 70%;
- Total global energy consumption was up 2.9% in 18A vs 17A;
- \$25.2 trillion of ESG filtered funds 20E up 30% vs. 18A.

Energy Efficiency

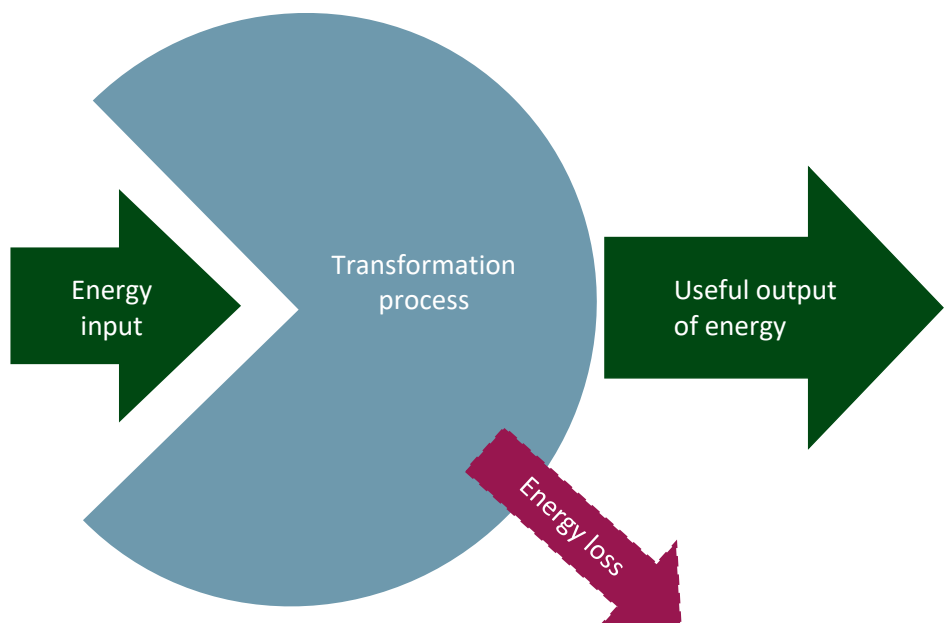
Renewables along with energy efficiency could reduce carbon emissions by 70% by 2050.

Renewable energy combined with energy efficiency could potentially reduce CO₂ by 70% over 30 years. Below we attempt to explain why this combination effort is so critical to climate change goals and success.

Energy efficiency means using the least amount of energy input to produce the same level of energy output. For example, every time you turn on the light switch you are using energy. By using an energy efficient LED light bulb, less energy is required to produce the same amount of light.

Energy efficiency depends on:

- The *reliability* of the input. - Is it environmentally sustainable? Is it cost efficient?
- The *usefulness* of the output. - Is there enough value or benefit produced from the output energy for its original purpose?



What is Energy Conversion Efficiency?

Energy conversion efficiency measures the ratio between the useful output of an energy conversion device (e.g. lightbulbs, water kettle, car, etc.) and the energy input. This is a device that can transform energy sources such as fossil fuels and renewables into forms that can be used by human beings such as heat and electricity.

Energy conversion efficiency is defined as:

$$\text{Efficiency (\%)} \eta = P_{\text{out}}/P_{\text{in}} \times 100$$

η is the ratio calculated as a percentage

P_{out} is the useful output of energy

P_{in} is the input of energy

The types of output and input of energy depend on the energy conversion device. For example, an internal combustion device such, as a car, converts heat (input) into mechanical energy (output) or the sun generates nuclear energy (input) into heat and light energy (output) via the use of solar cells.

Ongoing concerns around inefficient devices that cause a loss of energy.

The ongoing concern around efficiency is that devices that use non-renewable energy sources are inefficient because some of the energy is lost during transformation and transmission. This loss contributes to climate change via carbon emissions. Renewable energy is considered efficient as there are 'no' or better said fewer pollutants (note SF₆) emitted into the atmosphere during energy generation when compared to other sources such as fossil fuels.

Energy Loss and Lack of Efficiency

The transformation process can cause some energy to be 'transformed' into unwanted forms of energy.

During the process of energy transformation, energy cannot be created or destroyed but some can be 'transformed' into unwanted forms; e.g. heat, sound, or carbon pollution. This means that energy is wasted via heat loss or due to inefficient technology. Energy is also lost in the same way during transmission when energy is moved from the generating station via distribution lines into homes or commercial buildings (by way of wires inside walls) to fuel energy conversion devices.

Most commercial energy conversion devices commonly used such as washing machines, hair dryers, light bulbs, kettles, etc. are culprits in causing energy loss when in use as they generate unwanted heat. Other devices such as large generators or steam locomotives, on the other hand, are very loud and produce unwanted sound energy not intended for its original purpose.

Transforming energy from renewable sources (solar, wind, hydro, biomass, geothermal, and hydrokinetic) is characterised in some quarters as 100% efficient because in principle renewables do not emit air pollutants, though the unintentional emission of SF₆, a fierce greenhouse gas, is a potentially legitimate concern and there are other environmental energetic compromises to be made.

Geothermal, for example, does have some negative environmental effects in that during production, carbon dioxide (CO₂) can be released. However, geothermal power plants produce only one-sixth of the CO₂ that is produced in fossil fuel plants therefore, still rendering it more efficient.

Renewable Energy and Efficiency

Renewable energy is abundant and does not deplete natural resources.

Renewable energy sources are also efficient due to their abundant availability and because they do not deplete or pollute global natural resources, though they do make their own demands on natural ecosystems e.g. Hydro dams. However, renewables' share in the global energy mix will only increase as the global demand for energy surges. Total energy consumption rose by 2.9% in 2018 vs. 2017.

The use of renewable sources needs to increase at least six-fold to meet global concerns.

According to the IRENA Global Energy Transformation: A Roadmap to 2050 report (2018), the use of renewable energy sources needs to increase by at least six times in order to meet the Paris Agreement goal of limiting average global temperature rises to below 2°C.

The efficiency of renewables is measured by the share of renewable energy in the total final energy consumption (TFEC) - composed of both fossil fuels and renewables. In order to meet the Paris Agreement goal the share of renewables must increase to 65% by 2050, up from 18% in 2018. Energy intensity needs to reduce by 2.8% per year by 2050 compared to 1.2% in 2018.

Energy intensity measures how much energy is required to produce each unit of GDP – Gross Domestic Product, which is an indication of how well an economy converts energy into monetary output. A lower rate indicates a higher intensity which means a higher cost of converting energy into GDP.

The overall goal is to reduce the level of greenhouse gasses (GHG) in the atmosphere and accelerate this transition which can be done in two ways:

- Combining energy efficiency and renewable energy measures by amending public sector policies to integrate renewable technology in building renovations and incorporate them in the construction of new buildings.
- Using renewable energy technology to increase energy efficiency. For example, using combined heat and power (CHP) systems that use renewables as fuel to capture waste heat to generate thermal energy that can be used for industrial plants, commercial, or residential property for heating or cooling.

Renewables and energy efficiency can work in synergy to reduce CO₂ by 70% by 2050.

Working in synergy, renewable energy and energy efficiency could potentially reduce CO₂ by 70% in 2050 and be eliminated by 2060. This can be done by using technologies that are reliable, sustainable, globally available, and affordable. Costs to produce renewables fell by 26% in 2018 vs. 2017 (IRENA, 2019) and are expected to fall further.

Investing in Renewables and Energy Efficiency

Covid-19, essentially a respiratory disease, has proven to be a health and environmental concern. Cities such as Barcelona, Madrid, Milan, Paris, and Rome experienced a decrease in the levels of nitrogen dioxide (NO₂) as a result of lockdown. Sustainability and climate change will be in the forefront now more than ever.

Companies will need to start diversifying to ensure that they carry out business activities in a sustainable way. This can only lead to greater interest from investors who are becoming more and more inclined to put their money into companies that have an ESG (Environmental, Social, and Governance) policy as part of their core businesses.

\$25trn in ESG filtered investing assets is available to companies with an ESG policy.

Without an ESG policy many companies will lose the opportunity to gain access to USD 25 trillion 2020 (ACF estimate) in ESG filtered investing assets, up from \$17.5trn in 2018.

Glossary

CHP	Combined Heat and Power Systems – Energy efficient technology that generates electricity and captures waste heat.
CO₂	Carbon Dioxide – A greenhouse gas whose concentrations in the atmosphere contribute significantly to climate change.
ESG	Environmental, Social, and Governance – Metrics and policy that measure the sustainability of a company or business.
GDP	Gross Domestic Product – Monetary measure of the market value of goods and services produced in a country during a specific period.
GHG	Greenhouse Gas - A gas that absorbs and emits radiant energy and therefore contributes to warming of the Earth's atmosphere and so to climate change via global warming.
IRENA	International Renewable Energy Agency – Intergovernmental organisation that promotes the adoption and sustainable use of renewable energy.
NO₂	Nitrogen Dioxide – A highly reactive gas where increased levels cause respiratory diseases.
SF₆	Sulfur Hexafluoride – A potent GHG that when exposed to electrical discharges toxic by-products can be produced that pose a threat to health. As a GHG SF ₆ is 23,500x more effective as a greenhouse gas than CO ₂ .
TFEC	Total Final Energy Consumption - Total consumption of fossil fuels and renewables globally.

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