7th Annual Global Conference on Energy Efficiency

The value of urgent action on energy efficiency

International Energy Agency

INTERNATIONAL ENERGY AGENCY

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Highlights

- Doubling the current rate of energy intensity improvement – a key measure of the economy's energy efficiency - from 2% to 4% per year over this decade is required to meet the IEA Net Zero Emissions by 2050 Scenario. Compared to the case with current policy settings, this has the potential to avoid 95 EJ a year of final energy consumption; equivalent to the current final energy consumption of China.
- In this high efficiency scenario, with each unit of energy delivering more than it does today, final energy demand can be around 5% lower by 2030, but serving an economy 40% larger.
- Achieving this hinges on a global push on energy efficiency and related avoided energy demand measures including electrification, behaviour change, digitalisation and material efficiency in industry. Slower action would lock-in higher energy consumption for years to come.
- Such a step-up of action could reduce CO2 emissions by an additional 5 Gt per year by 2030, compared with current policy settings. This is about a third of the total emission abatement needed this decade in the IEA's Net Zero Emissions by 2050 Scenario.
- In terms of strengthening energy security, achieving 95 EJ of energy savings per year by 2030 helps avoid:
  - almost 30 million barrels of oil per day, about triple Russia's average production in 2021; and
  - 650 bcm of natural gas per year, around four times what the European Union imported from Russia in 2021.
- This shift in global effort includes providing clean and efficient cooking and heating to all those who lack it today. This would avoid over 20 EJ demand for the traditional use of biomass – such as wood and charcoal - in 2030 compared with current policies, dramatically improving the lives of billions of people. For example, household air pollution is linked to around 2.5 million premature deaths a year, with women and children most affected.
- Overall, these total energy savings can contribute to lowering household energy bills by at least USD 650 billion a year by 2030 compared with current policies.
- Scaling up investment to achieve these energy savings can support an extra 10 million jobs by 2030 in efficiency-related fields such as in new construction and building retrofits, manufacturing and transport infrastructure.
- Energy efficiency gains have already made a large contribution to constraining the growth in greenhouse gas emissions. Without the global energy intensity gains of the last two decades, emissions growth would have been almost double, or about 8 Gt per year higher in 2019.

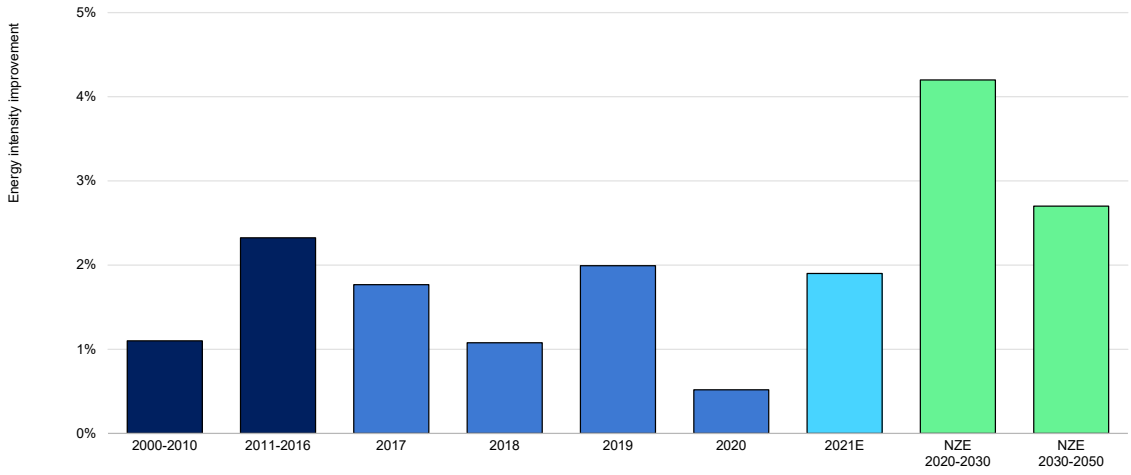
Why faster action on energy efficiency is needed

The current challenges regarding energy security, energy prices and the cost of living have intersected with the climate crisis to remind us that energy efficiency is more indispensable than ever.

The cleanest, cheapest, most reliable source of energy is what countries can avoid using, while still providing full energy services for citizens. That is why the IEA refers to energy efficiency as the “first fuel”. Without early action on efficiency the energy transition to net zero emissions will be more expensive and much more difficult to achieve.

The IEA Net Zero Emissions by 2050 Scenario (NZE) sees the average annual rate of global energy intensity (i.e., energy use per unit of GDP) improvement – a key measure of the economy’s energy efficiency - doubling from around 2% achieved between 2010-2020 to just over 4% from 2020-2030. With accelerated action, the global economy by 2030 could be around one third more energy efficient than in 2020.

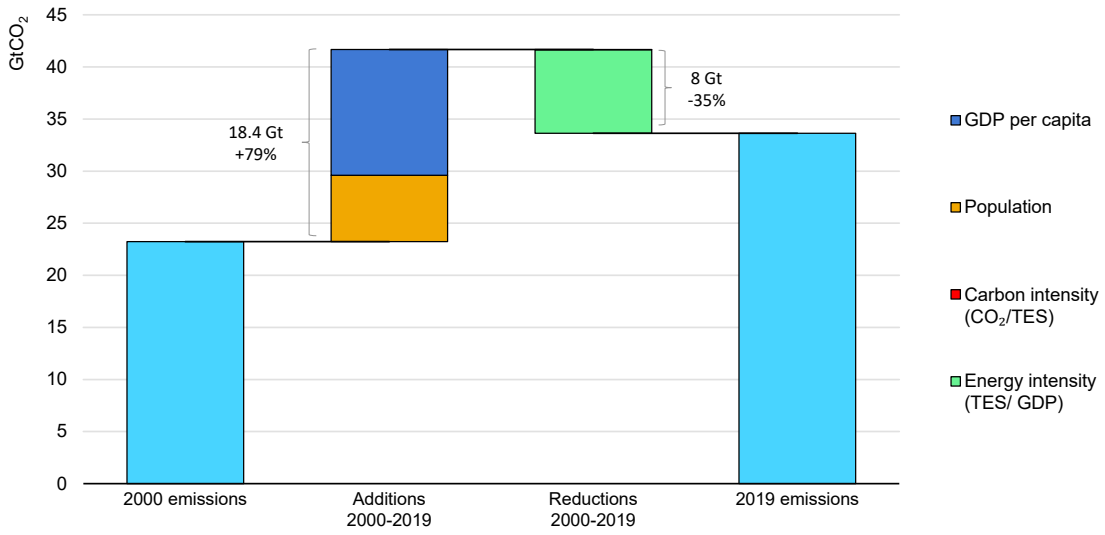
Primary energy intensity improvements, 2000-2021 and rates assumed in the Net Zero Scenario



Most of the efficiency measures in the Net Zero Scenario, beyond those in the current policy case, are already cost effective and pay for themselves through energy savings, even more so at today’s energy prices. Put simply, a more efficient building, car or industrial facility, requires less energy to perform the same function, with cost savings that are larger than the investment required to achieve them.

The year 2021 saw the largest ever annual increase in global energy related CO2 emissions, around 2 Gt to about 36 Gt of CO2, more than offsetting the decline in 2020. This followed an increase of about 10 Gt, or 45% between 2000 and 2019. During this period, the energy intensity of the global economy improved by around a quarter resulting in avoided emissions of about 8 Gt CO2 in 2019. This means that energy intensity improvements in the economy are offsetting almost half of the emissions growth that could have happened.

CO2 emissions from fuel combustion and drivers, 2000-2019

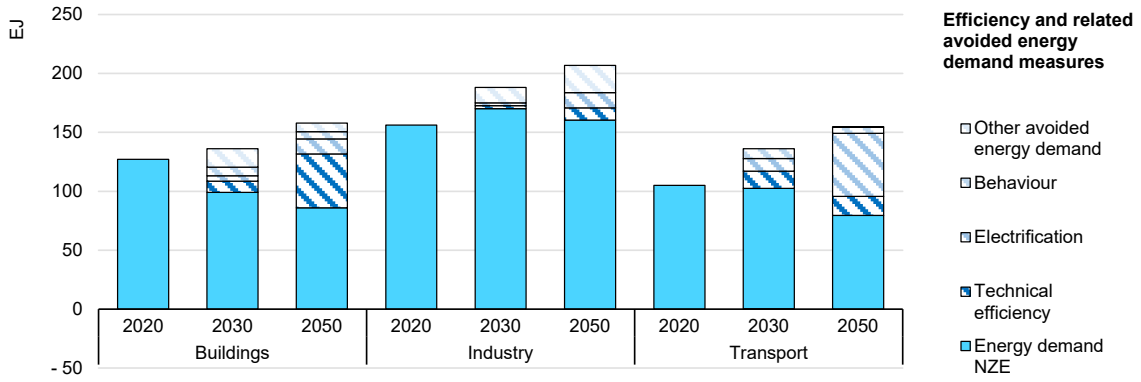


Faster action on efficiency-related measures can avoid an extra 95 EJ of energy demand by 2030 even as the economy grows

Accelerated action on energy efficiency and related avoided energy demand measures can help avoid around 95 EJ of final energy demand in 2030 compared to the Stated Policies Scenario (STEPS) which takes into account existing policies and measures and also those under development. Without this additional action, final energy demand could be 18% higher in 2030 instead of around 5% lower as in the Net Zero Scenario.

This avoided energy demand results from a wide range of measures, reflecting the diverse nature of efficiency-related technologies and actions across all sectors. Elements of avoided energy demand include technical efficiency, electrification, behaviour change and other avoided energy demand such as from digitalisation, material efficiency and other fuel switching. It is also achieved even as the economy grows by 40% and supports around 800 million more people with improved access to energy services.

Total final energy consumption and avoided energy demand, in the Stated Policies Scenario versus the Net Zero Scenario, 2020 to 2050



By 2030, around a third of avoided energy demand comes from the deployment of purely more technically efficient equipment, ranging from air conditioners to cars and trucks. Electrification provides around 20%, for example through replacing fossil fuel boilers with more efficient heat pumps, switching to electricity for low temperature heat in industry, and faster adoption of electric vehicles. Behaviour change provides a further 18% through measures such as turning down thermostats and changing travel patterns.

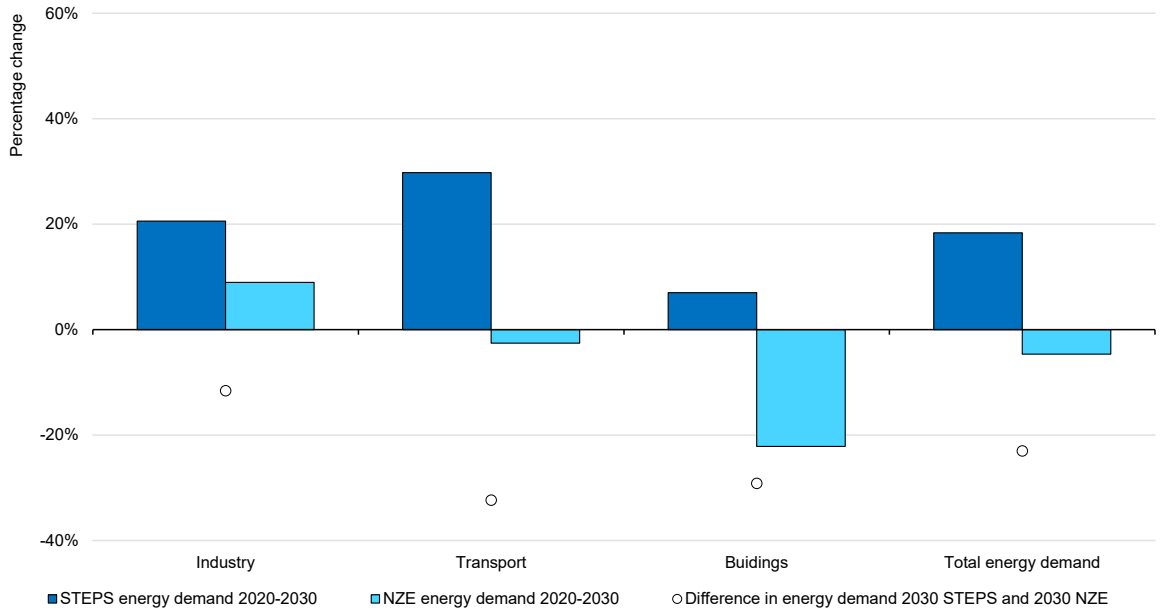
Other measures such as digitalisation and material efficiency provide the remaining third. This includes avoided energy from digitalisation such as through the adoption of smart controls as well as material efficiency measures including the increased recycling of plastics and scrap steel.

This level of accelerated investment and deployment of energy efficiency-related technologies supports an extra 10 million jobs by 2030 relative to current policies. This includes in areas such as new construction and building retrofits, manufacturing and transport infrastructure.

Short-term potential is greatest in the transport and buildings sectors

In the Net Zero Scenario, by 2030 energy demand falls the most in the buildings sector, however the greatest potential for avoiding energy demand is found in the transport sector. Efficiency-related measures are also crucial for industry with material efficiency in heavy industry and electrification in manufacturing helping moderate otherwise strong energy demand growth by 2030.

Change in energy demand 2020-2030, in the Stated Policies Scenario and the Net Zero Scenario

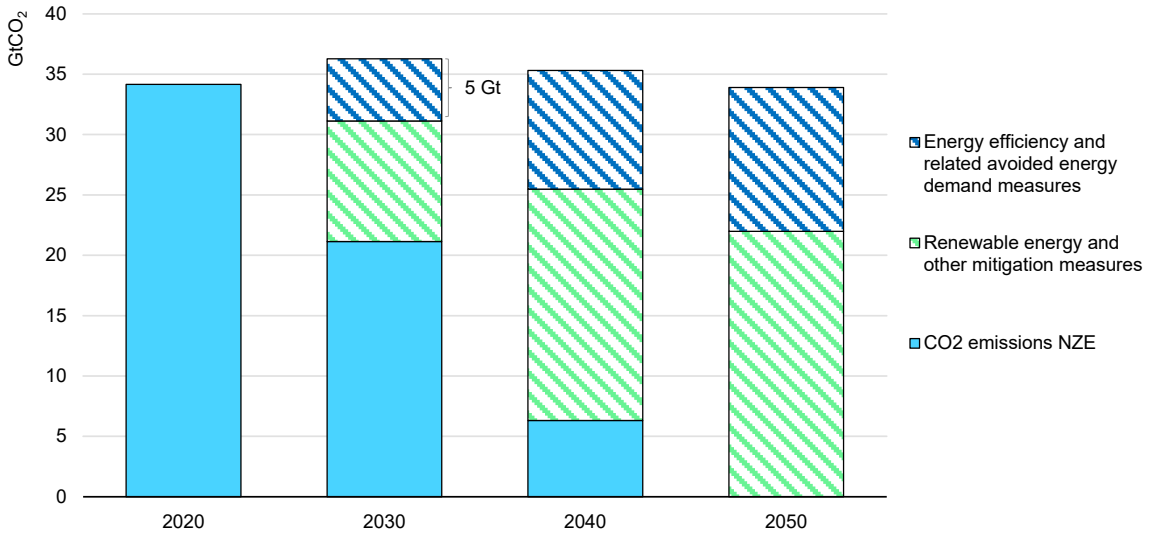


In the Net Zero Scenario, energy consumption in buildings falls by over 20% between 2020 and 2030. This is due to a combination of measures including replacing fossil fuel boilers with electric heat pumps and a major effort to replace the traditional use of solid biomass - such as wood and charcoal for cooking - with more efficient and cleaner alternatives. This helps achieve universal access to clean cooking by 2030, a key Sustainable Development Goal with profound social and economic benefits. Traditional use of biomass contributes to household air pollution which is currently linked to around 2.5 million premature deaths a year, mostly affecting women and children.

Enhanced efficiency-related measures provide one third of the emissions reductions needed for net zero

Doubling the current rate of energy intensity improvement from 2% to just over to 4% per year over the next decade could help avoid an extra 5 Gt of emissions per year by 2030 compared with a scenario with no extra major push by policy makers. This provides around one third of all emission reductions seen in the NZE Scenario.

CO2 emissions and main mitigation measures in the Stated Policies Scenario and the Net Zero Scenario, 2020-2050



In 2020 transportation's energy consumption totalled around 105 EJ and accounted for around 27% of total global energy related emissions. Early action on electrification, improved efficiency of internal combustion engine vehicles, behaviour change and other avoided energy demand measures provide about 2.5 Gt of emissions reductions, or almost 80% of what's needed in the transport sector by 2030 in the NZE Scenario.

In 2020, energy consumption in buildings totalled around 129 EJ, and contributed around 28% of all global energy related emissions. Early action on energy efficiency including electrification and other fuel switching helps avoid around 37 EJ by 2030. This results in around 1.2 Gt of emissions reductions from the direct combustion of fossil fuels in buildings and also helps lower overall electricity sector emissions.

In 2020, industrial energy consumption was around 156 EJ, contributing around 39% of all global energy related emissions. Faster action on energy efficiency-related measures, especially material efficiency, helps avoid 18 EJ and 1.3 Gt of industrial emissions by 2030. This is about 43% of the total industrial sector emissions abatement effort seen by 2030 in the NZE Scenario

Strengthening energy security and lowering household energy bills by at least USD 650 billion per year in 2030

Enhanced action on a wide spectrum of energy efficiency-related measures covering behaviour change, electrification and other fuel switching, digitalisation

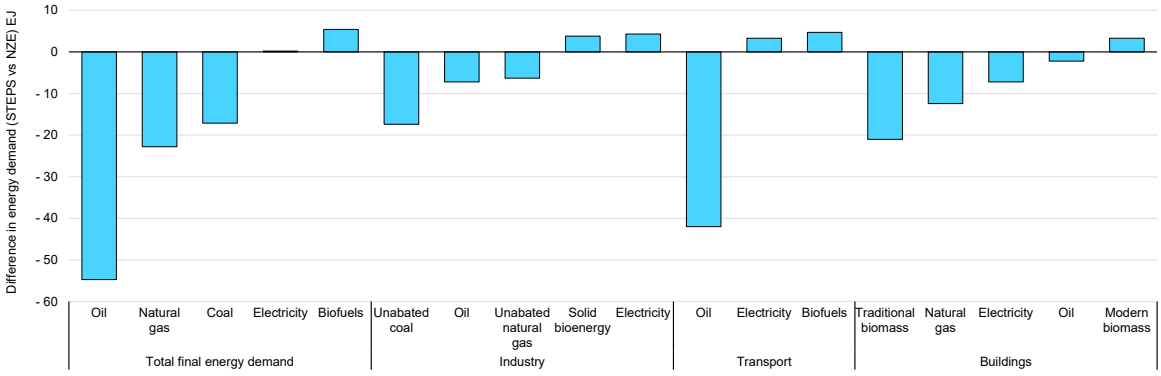
and material efficiency can help avoid about 95 EJ per year by 2030. This compares to a scenario based on current efficiency-related policies where energy demand rises around 18% instead of being 5% lower.

Comparing these two scenarios in terms of the fuels used shows the significant contribution that lower demand for fossil fuels makes to improving energy security and reducing exposure to volatile prices.

By 2030, around 55 EJ per year of oil consumption could be avoided. This equates to approximately 30 million barrels of oil per day, around triple Russia's average production in 2021. These reductions would reduce energy costs by between around USD 400 billion to just over USD 1 trillion, depending on oil prices – with the higher value assuming recent market conditions. The majority of this avoided oil consumption comes from the transport sector with smaller but significant reductions from industry and buildings.

For example, in the NZE Scenario, 20% of all cars are electric in 2030. For traditional cars, strict fuel-economy standards continue to play a crucial role through to 2030 along with behavioural shifts, such as increased use of public transport, walking and cycling, as well as train travel replacing short haul flights.

Difference in final energy demand in 2030, selected fuels, Stated Policies Scenario versus the Net Zero Scenario



The next largest reduction in fossil fuel use comes from natural gas with around 23 EJ per year avoided by 2030. This equates to approximately 650 bcm, about four times the European Union's 2021 imports of gas from Russia.

Around 17 EJ of energy demand is avoided from coal use, equating to almost 500 megatonnes, equivalent to around 1.5 times China's total coal imports in 2021. This reduction is mainly in the industrial sector as a result of a substitution towards electricity and modern bioenergy.

For households alone, enhanced efficiency and related avoided energy demand could help contribute to reducing global household energy bills by at least USD 650 billion a year by 2030 in the NZE.

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Typeset in France by IEA – June 2022

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