Tecpetrol

The net-zero transition by McKinsey

This document seeks to demonstrate the economic shifts that would need to take place if the goal of limiting warming to 1.5 degrees[1] is to be attainable and a relatively orderly transition achieved. It estimates the transition's economic effects on demand, capital allocation, costs, and jobs to 2050 globally across energy and land-use systems that produce about 85% of overall emissions and assess economic shifts for 69 countries. However, it is not clear whether the world will be able to keep the temperature increase to that level, or which of numerous pathways it may take in an effort to do so.

COST: capital spending on physical assets for energy and land-use systems in the net-zero transition between 2021 and 2050 would amount to about $275 trillion, or $9.2 trillion per year on average, an annual increase of as much as $3.5 trillion from today. The spending would be front-loaded, rising from 6.8% of GDP today to as much as 8.8% of GDP between 2026 and 2030 before falling. Technological innovation could reduce capital costs for net-zero technologies faster than expected.
In this scenario, the global average delivered cost of electricity would increase in the near term but then fall back from that peak, although this would vary across regions. As the power sector builds renewables and transmission and distribution capacity, the fully loaded unit cost of electricity production, could rise about 25% from 2020 until 2040 and still be about 20% higher in 2050 on average globally (higher if grid intermittency issues are not well managed and lower because of the lower operating cost of renewables).

JOBS: the transition could result in a gain of about 200 million (jobs in operations and in construction of physical assets) and a loss of about 185 million direct and indirect jobs (in the fossil fuel) globally by 2050. While the transition would create opportunities, sectors with high-emissions products or operations—which generate about 20% of global GDP—would face substantial effects on demand, production costs, and employment. Coal production for energy use would nearly end by 2050, and oil and gas production volumes would be about 55% and 70% lower than today. Process changes would increase production costs in other sectors, with steel and cement facing increases by 2050 of about 30 and 45%, respectively. Conversely, some markets for low-carbon products and support services would expand. For example, demand for electricity in 2050 could more than double from today.

EXPOSURE: Poorer countries and those reliant on fossil fuels are most exposed to the shifts in a net-zero transition, although they have growth prospects as well (they need to invest 1.5 times or more than advanced economies as a share of GDP today to support economic development and build low-carbon infrastructure). Consumers may face additional up-front capital costs and have to spend more in the near term on electricity if cost increases are passed through, and lower-income households everywhere are naturally more at risk. Economic shifts could be substantially higher under a disorderly transition, in particular because of higher-order effects not considered here (shortages and price increases or volatility, much depends on how the transition is managed).

CHANGES: government and business would need to act together to manage risks and capture opportunities. Many of today's institutions would need to be revamped and new ones created to disseminate best practices. Financial institutions in particular have a pivotal role to play in supporting large-scale capital reallocation, even as they manage their own risks and opportunities. Governments and multilateral institutions could use existing and new policy, regulatory, and fiscal tools to establish incentives, support vulnerable stakeholders, and foster collective action.

NZT CHARACTERISTICS:

[1] Net Zero 2050 scenario from the Network for Greening the Financial System (NGFS)

Universal: All carbon dioxide and methane emissions today come from seven energy and land-use systems. Net-zero emissions can be achieved if and only if all energy and land-use systems that contribute to emissions are decarbonized. All economic sectors and all countries would need to participate.

Significant: Capital spending on physical assets for energy and land-use systems will need to rise by $3.5 trillion per year for the next 30 years.
Front-loaded: Global capital spending in the transition could rise in the short term before falling back (about 7.6% of global GDP across 2021-50).
Uneven: the transition would be felt unevenly among sectors, geographies, and communities. Developing countries and fossil fuel-rich regions are more exposed. Developing countries and those with large fossil fuel sectors would likely spend more on physical assets, relative to GDP, on decarbonization and low-carbon growth (9% of GDP).
Exposed to risks: risks include rising energy prices, energy supply volatility, and asset impairment. If not well managed, there is a risk that the transition itself would be derailed.
Rich in opportunity: decarbonizing processes and products; replacing high-emissions products and processes with low-emissions ones and new offerings to aid decarbonization including supply chain inputs, infrastructure, and support services.

POWER: it would require substantial annual capital spending from 2021 to 2050, which we estimate at about $1 trillion in power generation, $820 billion in the power grid, and $120 billion in energy storage in the NGFS Net Zero 2050 scenario.

MOBILITY: decarbonization would involve replacing ICE vehicles with battery-electric vehicles or vehicles powered by hydrogen fuel cells. In the Net Zero 2050 scenario, annual spending would be $3.5 trillion on both vehicles and to build charging and fueling infrastructure between 2021 and 2050.

INDUSTRY: steel and cement production could be decarbonized by installing CCS equipment or switching to processes or fuels—such as hydrogen— that can have zero or low emissions. Production costs in both sectors could increase by more than 30% by 2050 compared with today.

Net zero transition: McKinsey (MK) vs IEA

IEA states that “there’s no one-size-fits-all approach to clean energy transitions” and does little to show how the solutions proposed affect different economies, how assumptions on technologies vary between regions or who would pay for the changes implied. Conversely, MK mentions this topics but with little depth. The report seeks to demonstrate the economic shifts that would need to take place if the goal of limiting warming to 1.5 degrees is to be attainable but it´s just theory without a solid path or statistics.
IEA emphasizes on the need for governments to lead this transition and most of the document seems to be targeted for policy makers. On the other hand, for MK all economic sectors and all countries would need to participate. Net-zero emissions can be achieved if and only if all energy and land-use systems that contribute to emissions are decarbonized. But in both documents results are presented but usually without any economics or assumptions that justify why a solution/path is chosen versus another.
There is a single mention of global electricity costs in IEA’s document, which shows they would rise from 71 usd/MWh to almost 90 usd/MWh in 2030 and finally fall to 80 usd/MWh in 2050. Electricity supply becomes much more capital intensive due to the massive increase in renewables and the corresponding need for more network capacity and sources of flexibility. Battery and transmissions costs are a constant omission throughout the document. According to MK, the delivered cost of electricity would increase by 20% from 2020 levels by 2050, including operating costs, capital costs, and depreciation of existing and new assets. Cost increases in the near

term could be significantly higher than those estimated here, for example, if grid intermittency issues are not well managed. The delivered cost could also fall below 2020 levels over time because of the lower operating cost of renewables—provided that power producers build flexible, reliable, and low-cost grids.

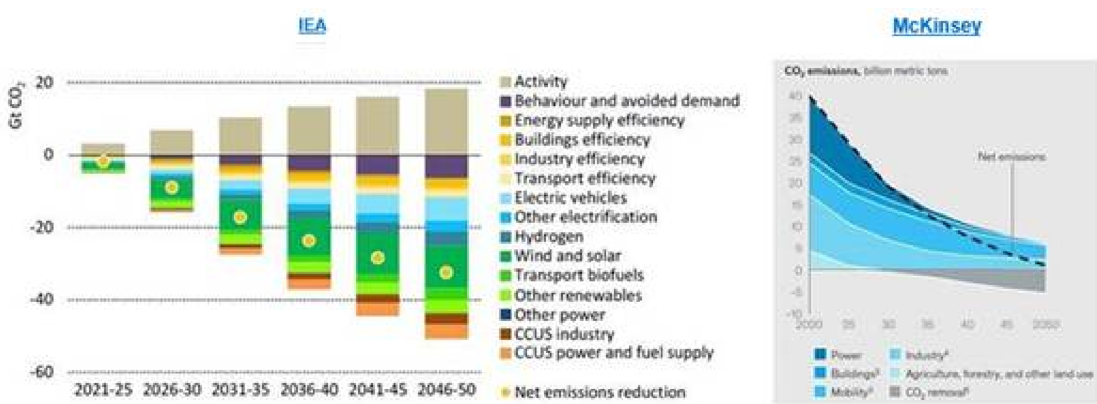
In IEA scenario, capital investment in energy should rise from 2.5% of GDP in recent years (2.3 trillion usd) to 4.5% by 2030 (5 trillion usd). The majority is spent on electricity generation, networks and electric end-user equipment. MK suggests it would require substantial annual capital spending from 2021 to 2050, which estimates at about $1 trillion in power generation, $820 billion in the power grid, and $120 billion in energy storage in the NGFS Net Zero 2050 scenario.

IEA's NZE presents one of the grimmest scenarios for the oil and gas industry to date. By 2050, fuels account for just 20% of energy consumed, from almost 80% today. MK says that coal production for energy use would nearly end by 2050, and oil and gas production volumes would be about 55% and 70% lower than today. IEA states that oil, gas and coal production is expected to drop significantly due to CO2 prices. MK makes no mention of prices.

According to MK, EVs would be cheaper than an ICE car in most regions by 2025. EV sales increase from 5 % of new-vehicle sales in 2020 to virtually 100 % by 2050 (120 million cars). In the same way, IEA suggests that EV sales increase eighteenfold between 2020 and 2030, hitting more than 55 million annually by then, accounting for over 60% of sales versus 4.6% last year.

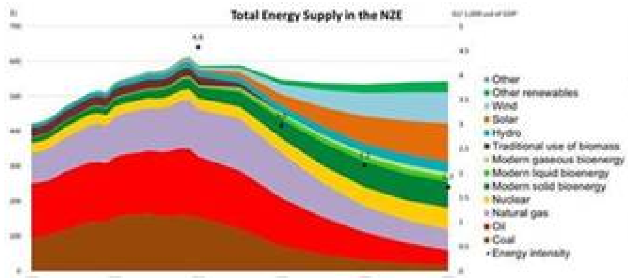
IEA: Steel, along with cement, chemical production and other heavy industries are the last sectors to get decarbonized. MK: steel and cement together account for approximately 14% of global CO_2 emissions. While technology pathways are still emerging, steel and cement production could be decarbonized by installing CCS equipment or switching to processes or fuels—such as hydrogen— that can have zero or low emissions. Production costs in both sectors could increase by more than 30% by 2050 compared with today, though this could be lower with continued innovation.

IEA: largest reductions in global emissions in the NZE are initially seen in the electricity sector. Electricity generation was the largest source of emissions in 2020 (40%), but emissions drop by nearly 60% in the period to 2030, mainly due to major reductions from coal-fired power plants, which are replaced with solar and wind capacity. By 2040, the electricity sector achieves net zero emissions. Unlike IEA, for WK Electricity generation represents 30% of emissions and mentions CO2 removals.

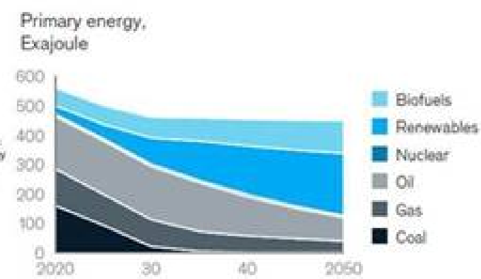


Total energy supply falls in both analysis. This occurs despite significant increases in the global population and economy because of a fall in energy intensity.

IEA



McKinsey



The document published by MK shows general ideas with very little data analysis and validation. On the other hand, it presents a wider scenario with more players (energy transition is universal) than IEA´s point of view.

POSSIBLE IMPLICATIONS FOR THE OT

Power and industry are major energy consumers and together generate about 60% of CO2 emissions (30% electricity, 8% steel, 6% cement, 5% O&G extraction, 4% chemicals, 8% other). Decarbonizing industry emissions would require a shift to processes and plants that are more energy efficient, using alternate fuels and inputs such as green hydrogen, and scaling carbon capture, utilization and storage for hard to abate emissions. This would increase production costs. To adjust to the transition, steel producers would need to assess their emissions, identify a net-zero strategy, engage with the broader ecosystem, and decide on a technologically and economically viable way to decrease their carbon footprint.
Improving the energy efficiency of heating systems in steel plants lowers both emissions and operating costs. Steelmakers can implement low-carbon production processes such as direct reduced iron–electric arc furnaces (DRI-EAF) powered by green hydrogen (expensive today). EAF would be the main mode of steel production by 2050, accounting for nearly 65% of overall output. BF-BOF plants would still account for the remaining 35% of steel production. Most of this production would be decarbonized by installing CCS equipment. DRI-EAF could be an opportunity for Tenova.
Even though MK doesn´t mention natural gas as a bridge fuel for the energy transition, we consider that Tecpetrol has an edge over other O&G companies by having a gas heavy portfolio, with relatively low emissions.