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OUR PLANET IN 2040: COMPARING WORLD ENERGY OUTLOOKS

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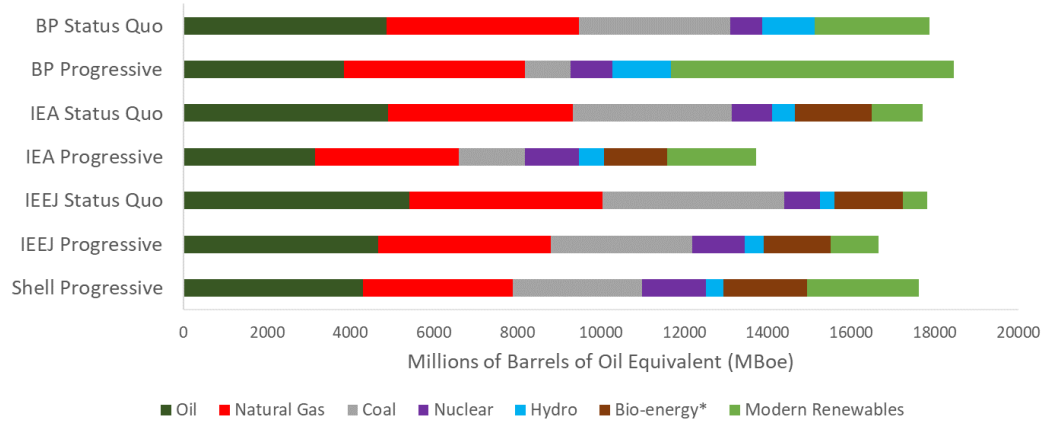
Comparing the predictions of the latest world energy reports gives insights into the world's progress towards limiting greenhouse gas emissions and meeting the goals of the Paris Agreement. It gives an indication of just how close — or far — we might be from keeping global temperature increases below 2°C by 2100.

According to the Climate Action Tracker, to meet the Paris Agreement targets, global emissions need to be reduced to 28 giga (billion) tonnes of CO_2-equivalent by 2030. A variety of international oil companies and energy agencies publish annual world energy reports, which forecast global energy consumption, as well as global CO_2 emissions. These reports attempt to make real world predictions, and the researchers tune their models to reflect geopolitical, economic, and technological trends as closely as possible. We studied reports from four of the most-cited outlook-producing agencies — BP, the International Energy Agency (IEA), the Institute of Energy Economics Japan (IEEJ) and Shell — to understand how their visions compare. We looked at two scenarios from each agency: the status quo technology and policy scenario (BP Evolving Transition, IEA New Policies and IEEJ Reference), and forecasts with more progressive technology and policy (BP Rapid Transition, IEA Sustainable Development, IEEJ Advanced Technologies, and Shell Sky).

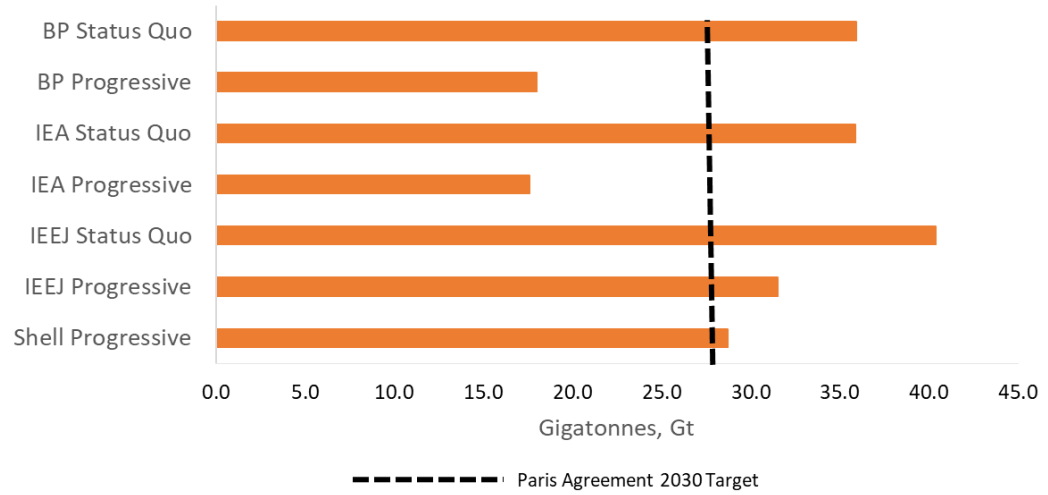
For primary energy consumption, all status quo scenarios forecast a significant increase of about 30 percent of total world energy consumption by 2040 relative to current consumption. This is driven by a predicted increase in world population to over 9 billion by 2040, increased global output, and the energy demand associated with the growing middle class in Asian countries such as India and China.

Figure 1: World Primary Energy Use by Type in 2040



**The BP scenarios include Bio-energy in Modern Renewables*

Figure 2: Global Annual CO_2 Emissions in 2040



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These status quo scenarios show an increase in fossil fuel-based energy sources, including oil and natural gas. There is also a projected increase in non-fossil-fuel energy sources such as nuclear, bio-energy, hydro and modern renewables. The largest increase is in the modern renewables sector, which consists of wind, solar and geothermal energy. However, even with this increase in non-fossil-fuel sources, all the status quo scenarios predict that CO_2 emissions will stay too high and the Paris Agreement target will not be met.

All status quo scenarios forecast that CO_2 emissions will stay high and the Paris Agreement target will **not** be met.

To ensure that emissions are mitigated in accordance with the Paris Agreement, there needs to be a drastic change in the world's energy make-up. Options include use of low-carbon energy sources growing more rapidly than projected to under status quo scenarios; technological improvements that increase efficiency through a decrease in the amount of CO_2 produced for each unit of energy; or technological improvements to capture and store emissions that are difficult to abate. As discussed in all of the reports studied, implementation of these measures will require both societal and political will.

Uptake of the above actions are reflected in the more progressive scenarios, which show much lower global annual CO_2 emissions in 2040 (Figure 2). While the IEA and Shell's progressive scenarios slightly overshoot the 28 Gt CO_2 target identified by the Climate Action Tracker, they still predict a shift in energy use and related emissions that move us much closer to reaching emissions reductions required to achieve the Paris Agreement targets.

In comparison to the status quo scenarios, all progressive scenarios show a decrease in fossil fuel energy sources, specifically coal, and an increase of 40-50 percent in modern renewables. The forecast increase in modern renewables, in conjunction with increased electricity storage, accounts for much of the CO_2 emissions reductions. The progressive scenarios assume lower atmospheric CO_2 through the use of carbon capture and use or carbon capture and storage technologies, or the use of forests as natural carbon sinks. The reports generally agree that beyond 2040, trends in primary energy consumption and CO_2 emissions reduction will need to be sustained through significant technological progress to ensure the Paris Agreement goals are met by 2100.

It is clear that, regardless of the scenario, the status quo for policy and technology means energy use and emissions will continue to grow. Mitigating climate change requires more progressive thinking and policy action.

References:

BP p.l.c. Energy Outlook 2019 Edition. 2019. Available from https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/energy-outlook/bp-energy-outlook-2019.pdf

CAT Emissions Gaps, Climate Action Tracker https://climateactiontracker.org/global/cat-emissions-gaps/

International Energy Agency. IEA: World Energy Outlook 2018. Nov. 2018. Available from https://webstore.iea.org/world-energy-outlook-2018

IEEJ, Institute of Energy Economics Japan. Outlook 2019-Energy transition and a thorny path for 3E challenges. 2018. Available from https://eneken.ieej.or.jp/data/8122.pdf

Shell. Shell: Sky Scenario. 2018. Available from https://www.shell.com/promos/business-customers-promos/download-latest-scenario-sky/_jcr_content.stream/1530643931055/eca19f7fc0d20adbe830d3b0b27bcc9ef72198f5/shell-scenario-sky.pdf

Data:

BP Energy Outlook 2019 Edition, Available from https://www.bp.com/en/global/corporate/energy-economics/energy-outlook.html

IEA: World Energy Outlook 2018, Available from https://www.iea.org/weo/weo2018/secure/

IEEJ Outlook 2019-Energy transition and a thorny path for 3E challenges. Available from https://eneken.ieej.or.jp/en/whatsnew/430.html

Shell: Sky Scenario. Available from https://www.shell.com/promos/business-customers-promos/numbers-behind-sky/_jcr_content.stream/1530643757647/c6daf2e0c93fd3d724f2804837d053fdd24e0553/shell-sky-scenario-data-2018.xlsx