

## The Uncertain World Observable from Future Predictions

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Our organization published its predictions for global energy supply and demand, the IEEJ Outlook 2023, in October 2022. The IEEJ Outlook 2023 draws on quantitative models to forecast energy demand, CO<sub>2</sub> emissions and other factors up to 2050. However, quantitative models do not predict the future perfectly. Future predictions are made under a range of conditions, and the prediction outcomes change significantly depending on the setting of those conditions. The IEEJ Outlook 2023 itself presents two scenarios (the Reference Scenario and Advanced Technologies Scenario), according to different condition settings.

Future predictions are greatly influenced by the values of the analyst. The setting of the conditions is in itself something that also looks ahead to the future, and even if attempts are made to envisage conditions objectively, at least a small amount of subjectivity creeps in. Consequently, if there are 10 individuals, 10 predictions will appear. The following diagram compares the most recent CO<sub>2</sub> emissions predictions for the world as a whole, as made by 10 organizations, including major think-tanks and energy companies. As you can see, there is considerable breadth to the predictions. They vary widely, from forecasts that CO<sub>2</sub> emissions will follow past trends and increase into the future, to forecasts that they will fall away from here forward and head toward zero. This is the result of each organization presenting a probable world based on the various conditions that it has set, but even so, there is considerable variation. This large range is indicative of just how uncertain the future is.

Additionally, we should keep in mind that there are differences in approach, not just differences in condition-setting. In particular, there is a need to take note of the differences between the forecasting approach and the backcasting approach<sup>1</sup>. As you can see, forecasting approach predictions (solid lines) are concentrated in the upper part of the graph (quite large volumes of emissions), while backcasting approach predictions (dotted lines) are gathered in the lower part (somewhat lesser volumes of emissions). Predictions that emissions will decline will probably only be formed using the backcasting approach. On the other hand, even looking solely at the forecasting approach, the range of predictions is large, so it can be said that ample uncertainty lies ahead. Incidentally, in the predictions based on

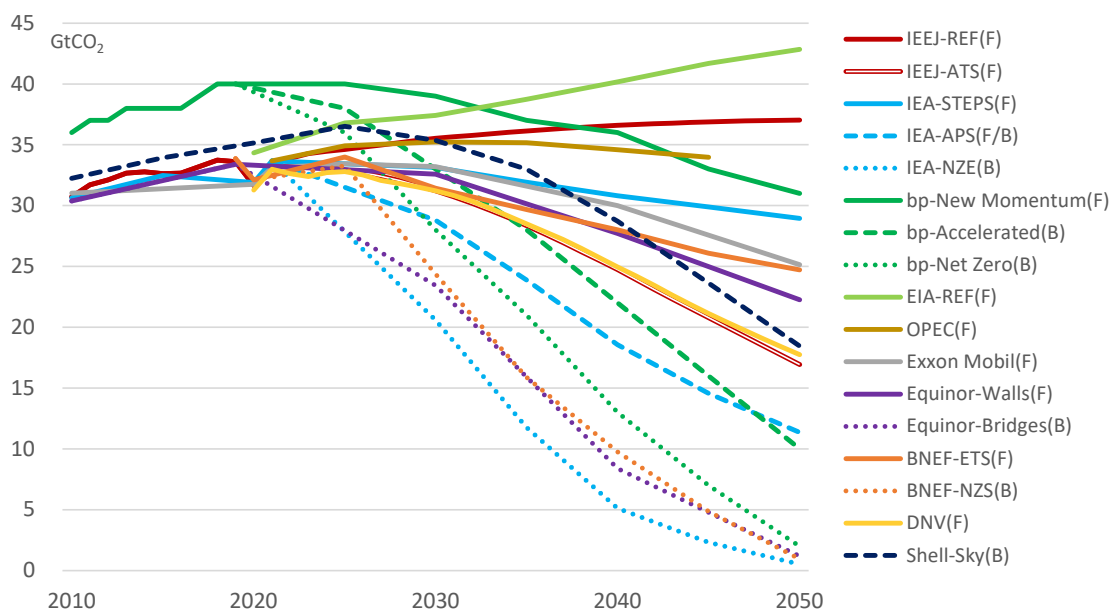
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<sup>1</sup> Refer to ‘Future Energy Landscape - Global Energy Agenda - “The Forecasting Approach and the Backcasting Approach”’ (published October 3, 2022).

the forecasting approach, the IEEJ’s Advanced Technologies Scenario (IEEJ-ATS) is the one with the lowest emissions. In aiming for a low-carbon society with the forecasting approach, it may well be that something resembling the ATS is the limit.

The future is thus uncertain, in this way. Furthermore, when there is a significant divergence between the ideal and reality, the degree by which future predictions vary also tends to increase. As a result, it can also be said that relying too heavily on the results of one model is risky. Those reading and interpreting the results must have a proper grasp of the characteristics of model analysis. Future predictions are important reference benchmarks that provide guideposts for our activities. Nevertheless, in a highly uncertain world, flexible strategies and policies that take advantage of various options will undoubtedly be important.

Diagram: Major organizations’ predictions for energy-related CO<sub>2</sub> emissions (global)



Note) (F) is forecasting approach, (B) is backcasting approach. The IEA-APS prediction is based on a mixture of both approaches. The bp predictions include emissions from industrial processes, methane emissions generated when mining for oil and gas, and so on.

Source) IEEJ: The Institute of Energy Economics, Japan’s IEEJ Outlook 2023 (2022)

- REF: Reference Scenario; ATS: Advanced Technologies Scenario
- IEA: International Energy Agency “World Energy Outlook 2022” (2022)
- STEPS: Stated Policies Scenario, APS: Announced Pledges Scenario, NZE: Net Zero Emissions by 2050 Scenario
- bp: bp “Energy Outlook 2022 edition” (2022)
- New Momentum, Accelerated, Net Zero
- EIA: U.S. Energy Information Administration “International Energy Outlook 2021” (2021)
- REF: Reference case
- OPEC: Organization of the Petroleum Exporting Countries “World Oil Outlook 2022” (2022)
- Exxon Mobil: Exxon Mobil “2022 Outlook for Energy” (2022)
- Equinor: Equinor “Energy Perspectives 2022” (2022)
- Walls, Bridges
- BNEF: Bloomberg NEF “New Energy Outlook 2022” (2022)
- ETS: Economic Transition Scenario, NZS: Net Zero Scenario
- DNV: DNV “Energy Transition Outlook 2022” (2022)
- Shell: Shell “Sky scenario” (2018)

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