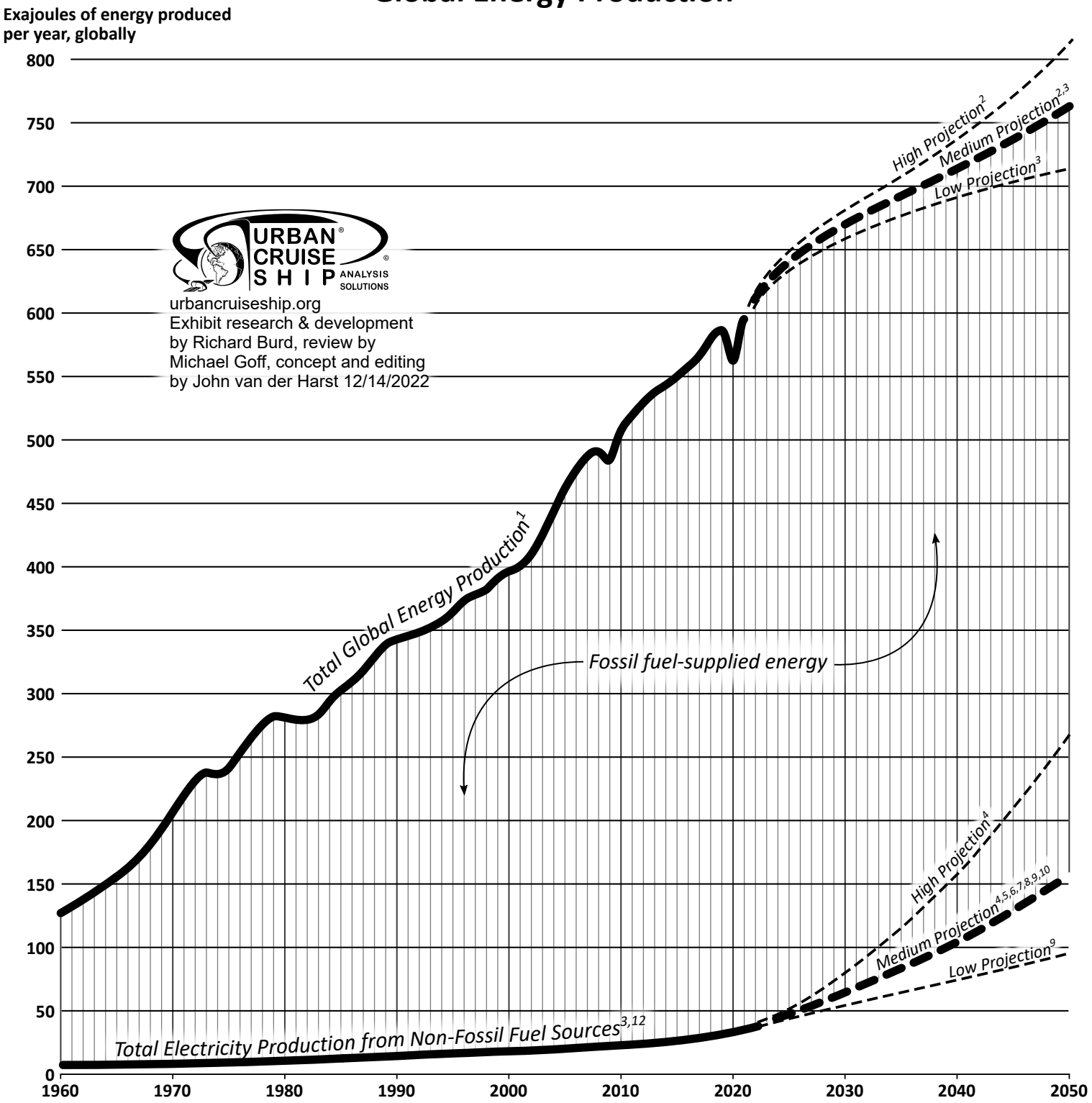
ENERGY PRODUCTION FORECAST

Global Energy Production



1.) Our World in Data *Primary Energy Consumption*. Accessed on September 7, 2022. *This is the primary source for historical data on Total Global Energy Consumption*

2.) EIA, Nalley, Stephen (Acting Administrator) & LaRose, Angelina (Assistant Administrator) International Energy Outlook 2021 (IEO2021). p.8: World energy consumption. Accessed on September 7, 2022. *This source gave the high projection for total global energy use from 2020 to 2050*

3.) McKinsey Energy Insights Global Energy Perspective 2022; McKinsey Power Model. p.10 of 28. Accessed on September 7, 2022. *This source gave the low projection of total global energy use from 2020 to 2050 after adjusting final energy to primary energy. To do this we assume 80% efficiency on hydrogen electrolysis by multiplying hydrogen figures by 2.4 and electricity figures by 1.93 based on figures given in the IEA Sankey diagram located here.*

4.) BP Statistical Review of World Energy - all data, BP Overview Documents/bp-stats-review-2022-all-data.xlsx. Accessed on August 17, 2022. *This is the primary source for all historical data outside geothermal and wave (ocean) energy.*

5.) McKinsey Energy Insights Global Energy Perspective 2022; McKinsey Power Model. p.12 of 28. Accessed on August 17, 2022. *This source gave the highest projected estimates for energy sources except nuclear and geothermal.*

6.) IEA (2021), World Energy Outlook 2021, IEA, Paris. Figure 3.12. Accessed on August 17, 2022. *The data shown in the Announced Pledges Scenario (APS) were consulted for 2030 and an extrapolation was done between it and the next source; the middle trajectory shown here* ***is an average of all trajectories*** *derrived from the consulted sources*

7.) BP Energy Outlook 2022 Edition. Accessed on August 17, 2022. *The data shown in the New Momentum scenario were consulted for 2050 and an extrapolation was done between it and the previous source to form an estimated tragectory.*

8.) IEA (2021), World Energy Outlook 2021, IEA, Paris. Table A.17: Solar PV Generation. Accessed on August 18, 2022 *This data provided the middle-most tragectory for forecasted solar eneregy generation*

9.) IEA (2021), World Energy Outlook 2021, IEA, Paris. Table A.18: Wind Generation. Accessed on August 18, 2022 *This data provided the middle-most tragectory for forecasted wind energy generation*

10.) EIA, Nalley, Stephen (Acting Administrator) & LaRose, Angelina (Assistant Administrator) International Energy Outlook 2021 (IEO2021). p.14: World net electricity generation by source. Accessed on August 17, 2022. *This source provided the lowest forecasted trajectory for future electricity sources except solar where it was the middle estimate. Values are for 2020, 2030, 2040, and 2050, with intermittent years being interpolated by our UCS model. This source provides no input on geothermal or wave (ocean) energy*

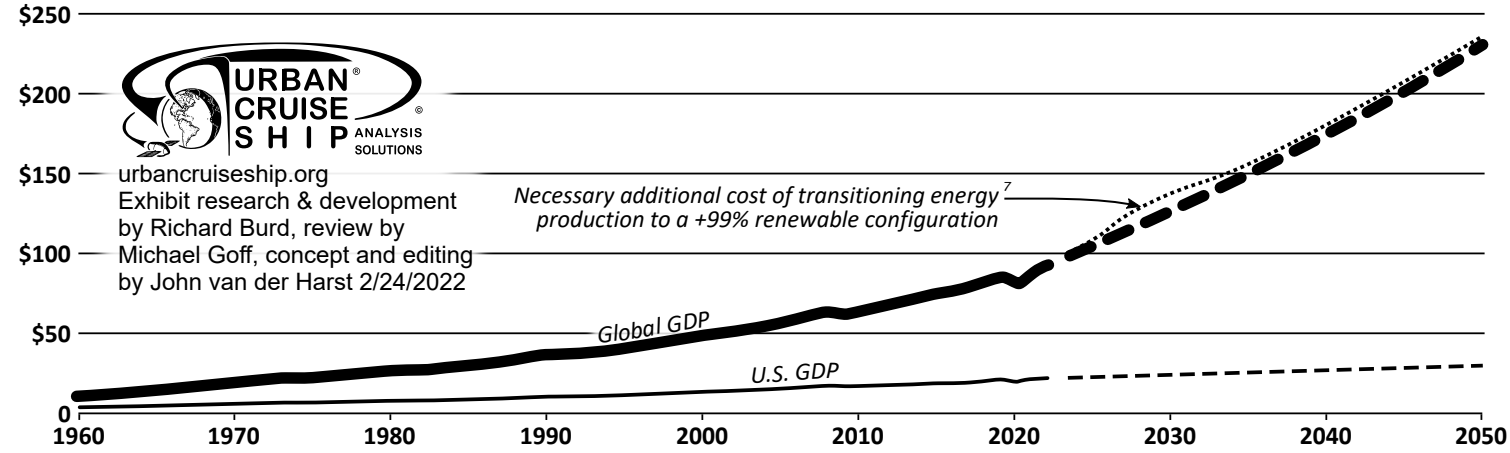
11.) IEA (2021), World Energy Outlook 2021, IEA, Paris. Table A.19: Nuclear Generation. Accessed on August 18, 2022 *This data provided the middle-most tragectory for forecasted nuclear energy generation*

12.) *This includes the following energy sources: geothermal, wave, solar, wind, hydro, and nuclear.*

ENERGY PRODUCTION FORECAST

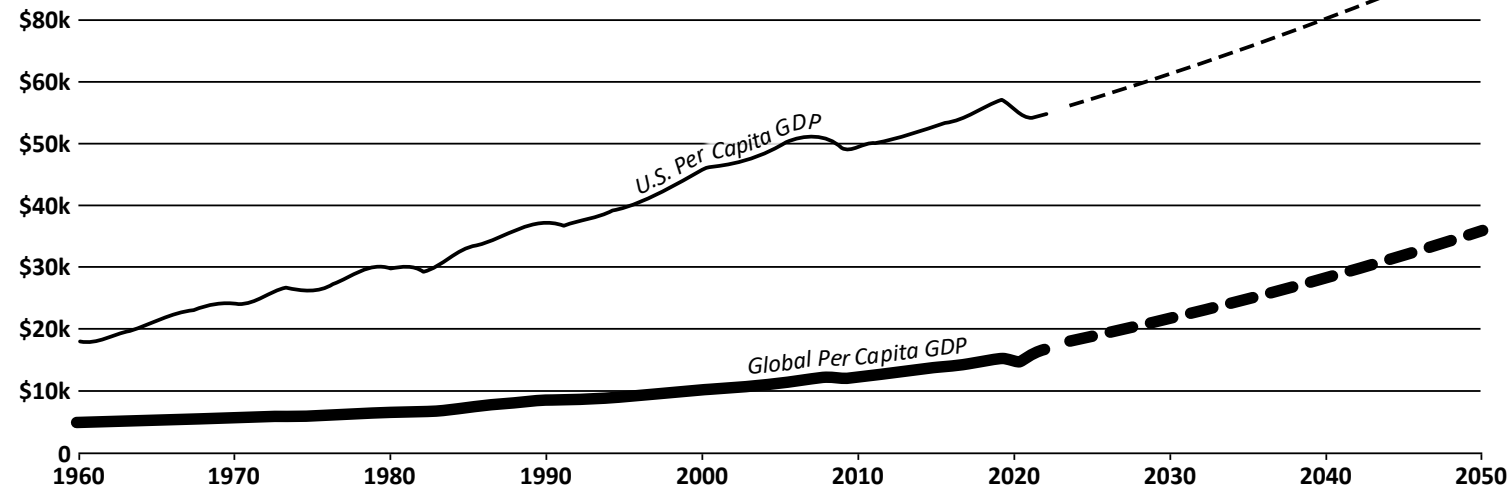
Total Global & U.S. Gross Domestic Product (GDP)[1,2]

Trillions of 2015 U.S. Dollars
Adjusted for inflation



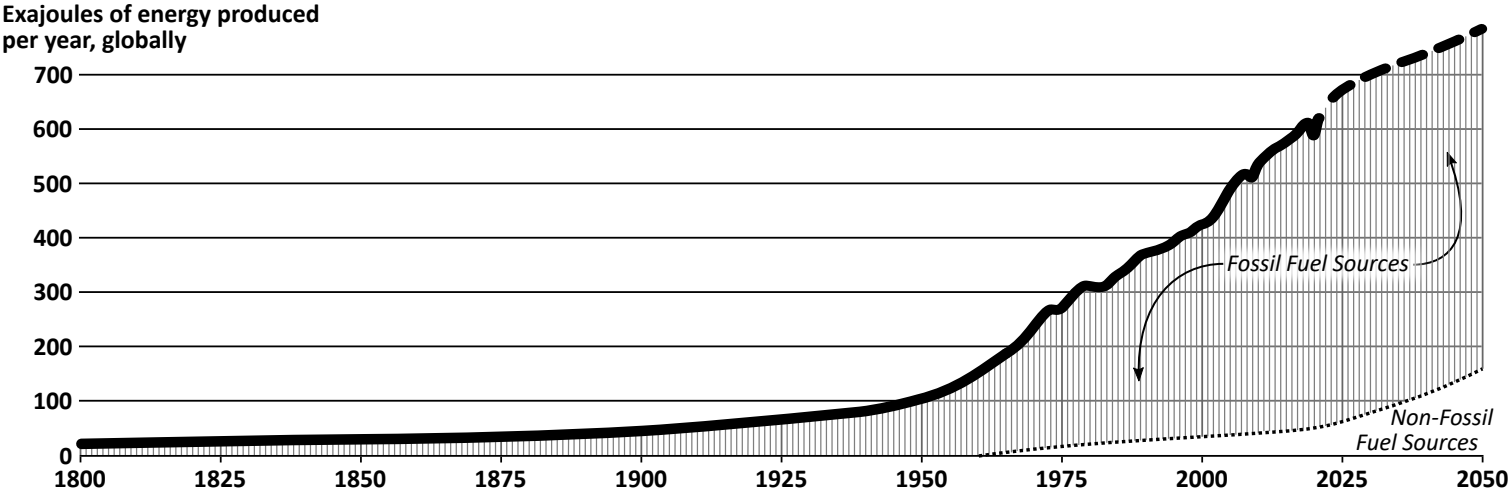
Total Per Capita GDP Worldwide[3,4]

Purchasing Power Parity (PPP)
GDP 2017 International Dollars



Global Primary Energy Consumption by Category [5,6]

Exajoules of energy produced per year, globally



1.) Our World in Data *Gross Domestic Product (GDP), 1960 to 2020*. Accessed on September 7, 2022. *This is the primary source for historical data on world GDP.*

2.) International Monetary Fund *GDP, Current Prices*. Accessed on September 7, 2022. *This is the source for GDP projection to 2027; here we extend that projection out to 2050.*

3.) Our World in Data *GDP Per Capita* and well as *GDP Per Capita, 1960 to 2018*. Accessed on September 7, 2022. *These are the primary sources for historical data on world GDP; for earlier years.*

4.) International Monetary Fund *GDP, Per Capita, Current Prices*. Accessed on September 7, 2022. *This is the source for GDP per capita projection to 2027; here we extend that projection out to 2050.*

5.) Our World in Data *Global Direct Primary Energy Consumption*. Accessed on September 7, 2022. *This is the primary source for historical data on different energy sources*

6.) McKinsey Energy Insights Global Energy Perspective 2022; McKinsey Power Model. p.10 of 28. Accessed on September 7, 2022. *Other sources for Primary Energy Consumption on p.1 of this handout were also used.*

7.) McKinsey Sustainability The Net-Zero Transition: *What It Would Cost, What It Could Bring*. Accessed on September 12, 2022. *Capital spending would be highest in tyhe next ten to 15 years to build a net-zero economy.*