

The Challenges of Energy, Climate & Sustainability

A Look at Macro Trends and Data

LOS ALAMOS ENVIRONMENTAL
SUSTAINABILITY BOARD

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Session outline

INTRODUCTION	AFFORDABLE, CLEAN ENERGY	CLIMATE ACTION	TAKEAWAYS
What is sustainability?			
Why is it important?			
Who do you trust?			

What is sustainability?

It is up to us to decide...

Thought exercise to be conducted with people in attendance via active participation.

- Write your definition of sustainability on the provided piece of paper

Why is a definition important?

The definition of sustainable says* -

- 1) An act that is able to be maintained, at a certain rate or level, ***over a period of time.***
- 2) The ability of an action to be upheld and defended.

The United Nations sustainability goals¹:

- | | |
|------------------------------------|--|
| 1. No poverty | 9. Industry innovation and infrastructure |
| 2. Zero hunger | 10. Reduced inequalities |
| 3. Good health and well being | 11. Sustainable cities and communities |
| 4. Quality education | 12. Responsible consumption and production |
| 5. Gender equality | 13. Climate action |
| 6. Clean water and sanitation | 14. Life below water |
| 7. Affordable, clean energy | 15. Life on Land |
| 8. Decent work and economic growth | 16. Peace, Justice and strong institutions |
| | 17. Partnerships for the goals |

Are these obtainable?

Are these sustainable?



*= compiled from looking across Merriam-Webster Dictionary, Google search results, Cambridge Dictionary and Investopedia definitions

1= <https://sdgs.un.org/goals>

Who do you trust?



There is a lot of information from a lot of different sources -

Is anyone right? Is anyone helpful?

Are we listening to the full story or just what we want to hear?



Which ones make the most difference?

10 ways to fight the climate crisis by the United Nations¹:

1. Spread the word
2. Keep up political pressure
3. Transform your transport
4. Rein in your power use
5. Tweak your diet
6. Shop local and buy sustainable
7. Don't waste food
8. Dress smart
9. Plant Trees
10. Focus on planet friendly investments

They sound fairly common sense, why is it so hard?



United Nations



WSJ



Bloomberg

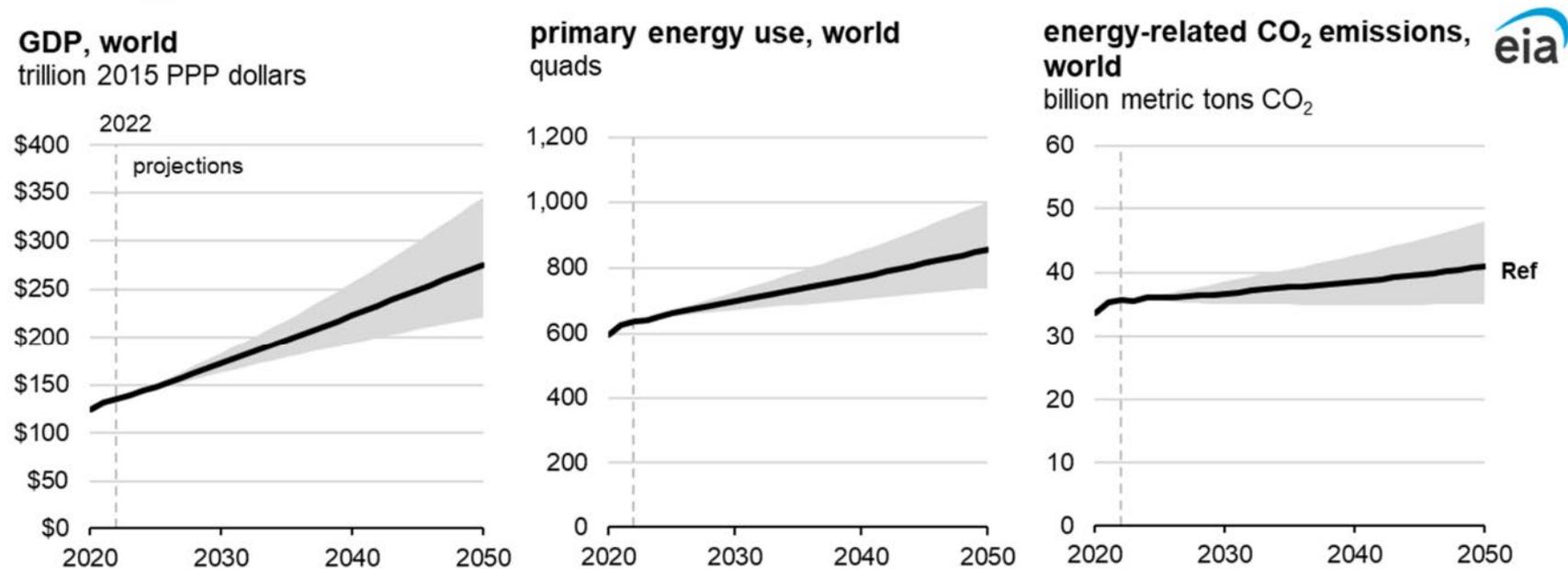


Session outline

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	World projections		
	Scale of supplies		
	Price		

Demand side projections (World)

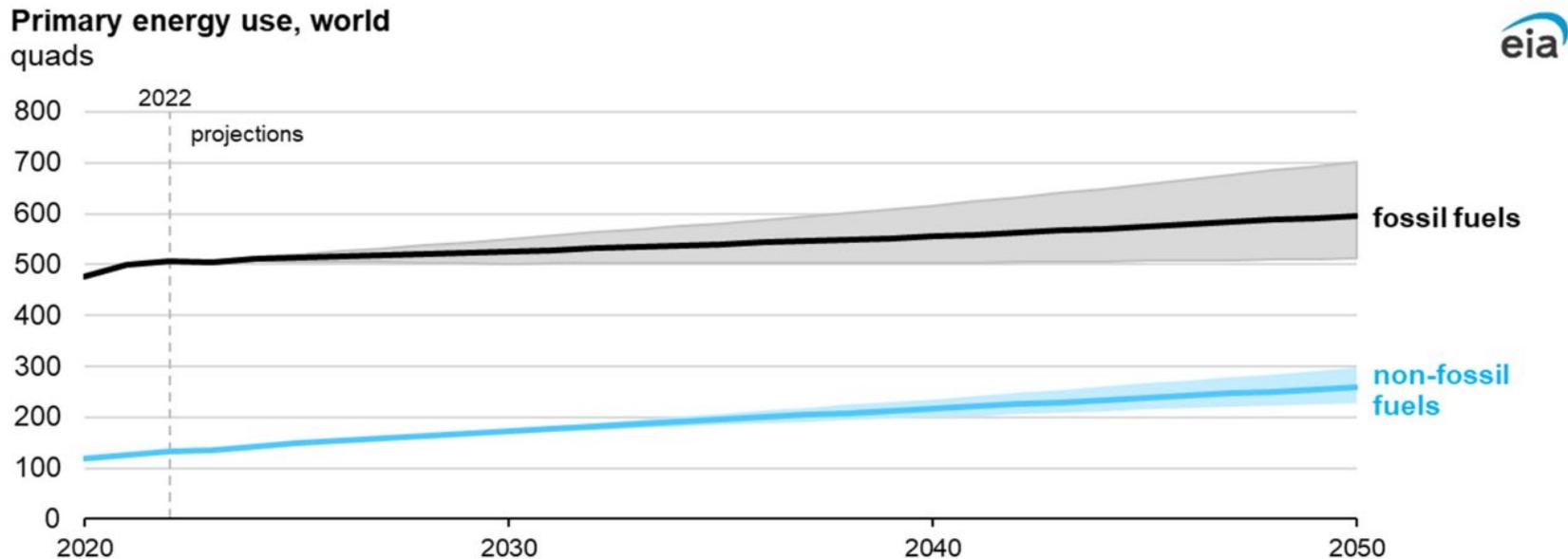
Across most cases, energy-related CO₂ emissions continue to rise through 2050 under current laws



Data source: U.S. Energy Information Administration, *International Energy Outlook 2023* (IEO2023)
Note: Shaded regions represent maximum and minimum values for each projection year across the IEO2023 Reference case and side cases. Ref=Reference case; GDP=gross domestic product; quads=quadrillion British thermal units; PPP=purchasing power parity.

Scale of supplies- an honest look? (World)

Increasing demand and current policies drive steady growth in fossil fuel energy—and faster growth in non-fossil fuel sources



Data source: U.S. Energy Information Administration, *International Energy Outlook 2023* (IEO2023)
Note: Each line represents IEO2023 Reference case projections. Shaded regions represent maximum and minimum values for each projection year across the IEO2023 Reference case and side cases. Quads=quadrillion British thermal units.

Average Trend Line

Total Energy use 2022= ~625 quads
Total Energy use 2050= ~825 quads

Average Fossil Fuels %

Energy use 2022= ~80%
Energy use 2050= ~70%

High Fossil Fuels %

Energy use 2050= $700/1000= 70\%$
Energy use 2050= $700/925= 75\%$

Low Fossil Fuels %

Energy use 2050= $500/800= 62.5\%$
Energy use 2050= $500/725= 68\%$

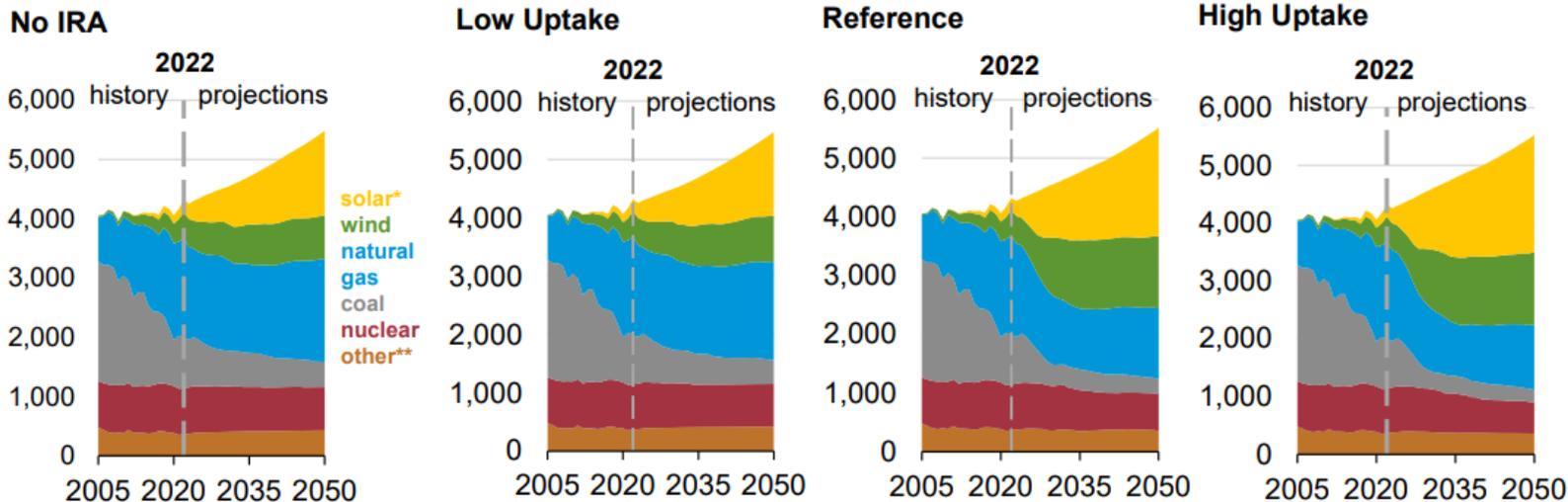
Note:

Variability of fossil fuels is ~200 quads and average use of non fossil fuels is only at ~250 quads

Scale of supplies- an honest look? (US)

Solar and wind generate a majority of U.S. electricity by 2050 in the Reference and High Uptake cases

U.S. net electricity generation by fuel
billion kilowatthours



Data source: U.S. Energy Information Administration, *Annual Energy Outlook 2023* (AEO2023)

Note: IRA=Inflation Reduction Act

*Includes utility-scale and end-use photovoltaic generation and excludes off-grid photovoltaics.

**Includes petroleum, conventional hydroelectric power, geothermal, wood and other biomass, pumped storage, non-biogenic municipal waste in the electric power sector, refinery gas, still gas, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, and miscellaneous technologies.



Does it make sense?

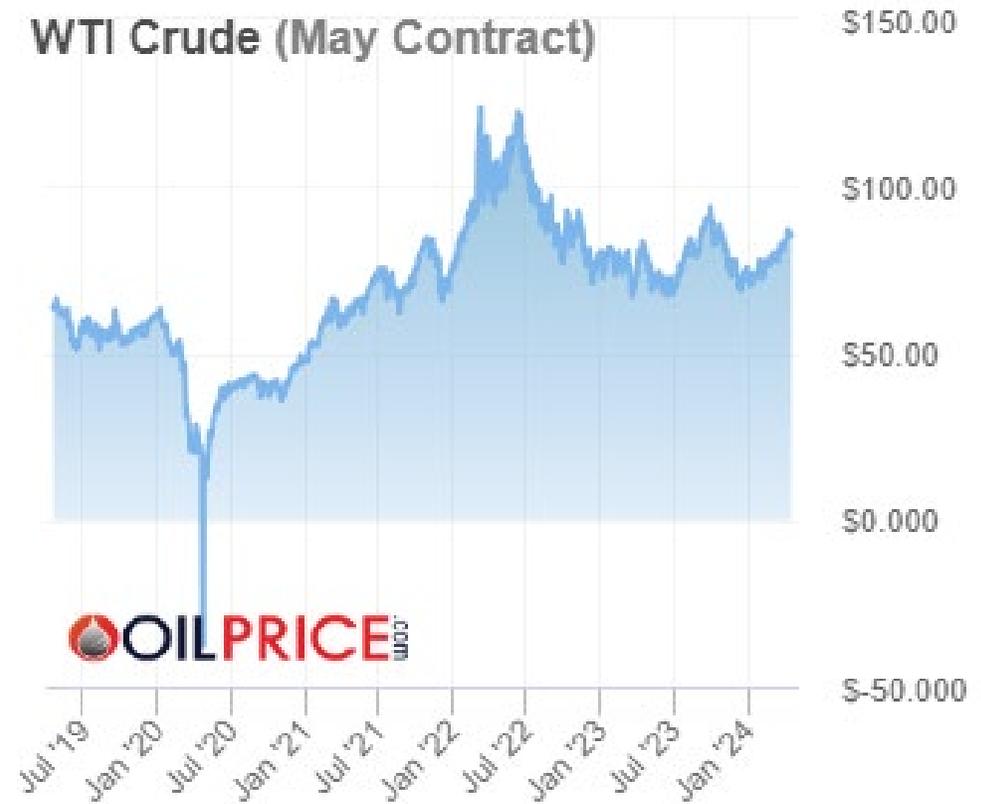
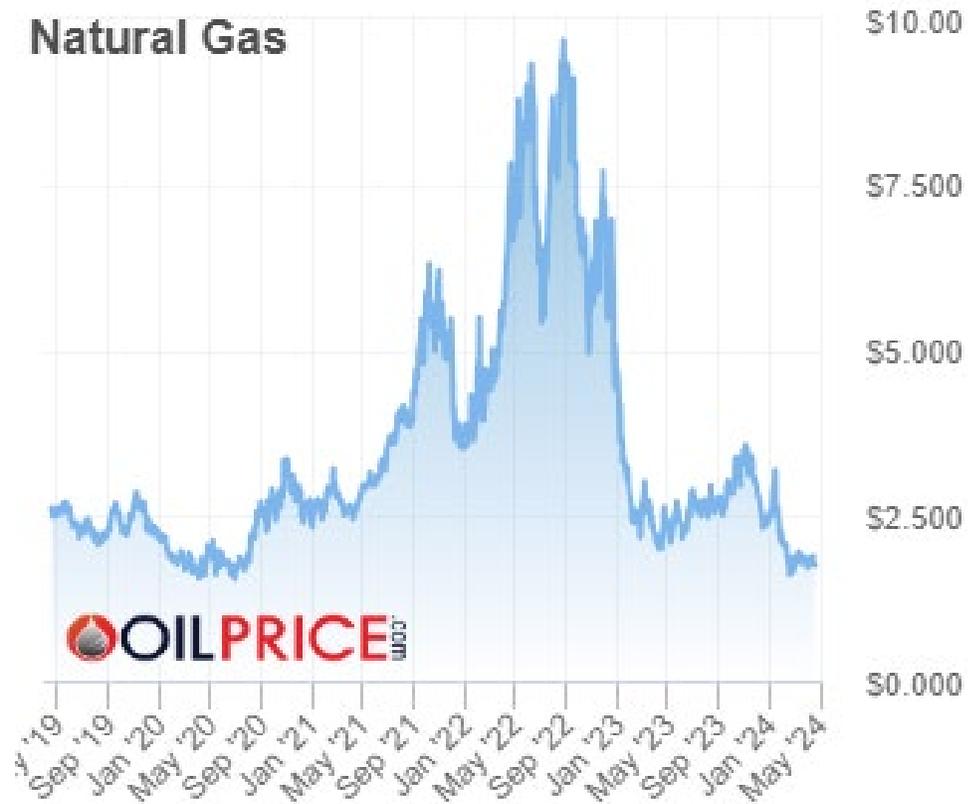
High uptake case is almost identical to reference case because we have made such ambitious targets with policy and goals

Massive growth in wind needed, is it reasonable?

Currently tracking to a low uptake scenario- note portion of energy supplied by natural gas

Do we think solar projections are reasonable?

Price is important!



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		What is climate?	
		EV uptake	
		Planet friendly investments	

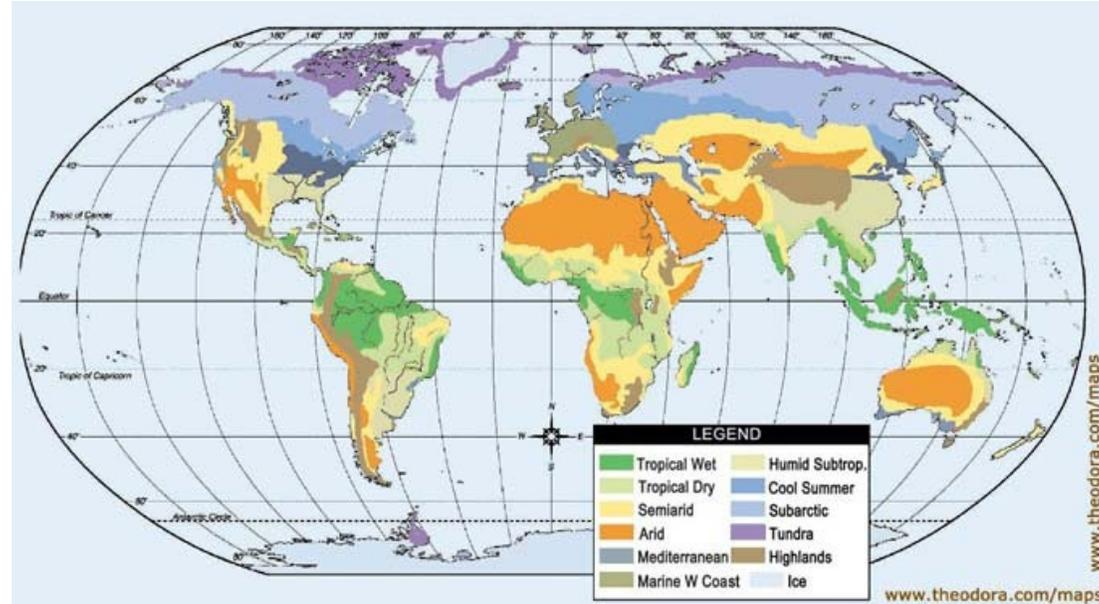
What is climate?

The definition of climate says* -

- 1) The weather conditions prevailing in an area in general or over a long period.
- 2) A region with a particular prevailing weather conditions.

Note: Diurnal temperature variations range from 10 or fewer degrees Fahrenheit (F) in humid tropical areas, to 40-50 degrees (F) in higher-elevation, arid to semi arid areas.

Could ocean temp be a better proxy?



Climate forecasts are typically looking at scenarios for a 1.5, 2.0, 2.5 and 3.0 temperature variation in degrees Celsius.

This corresponds to 2.7, 3.6, 4.5 and 5.4 degrees (F).

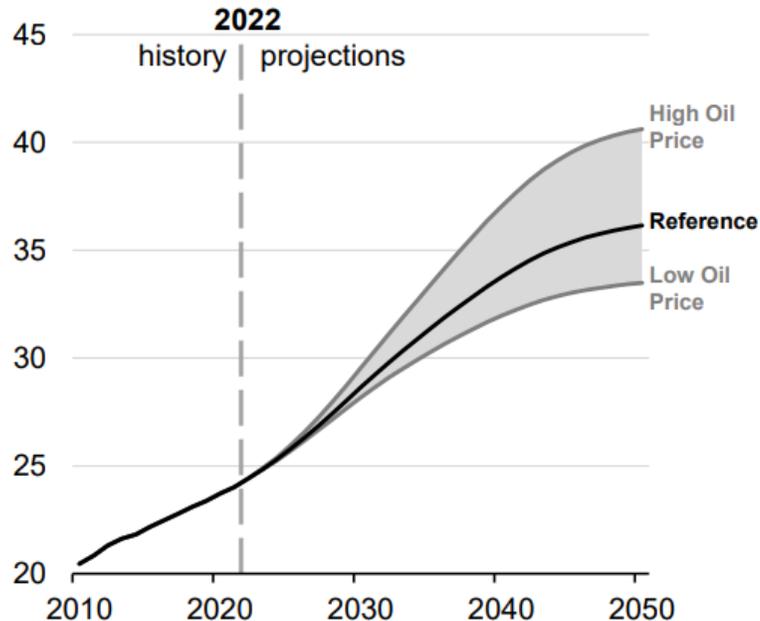
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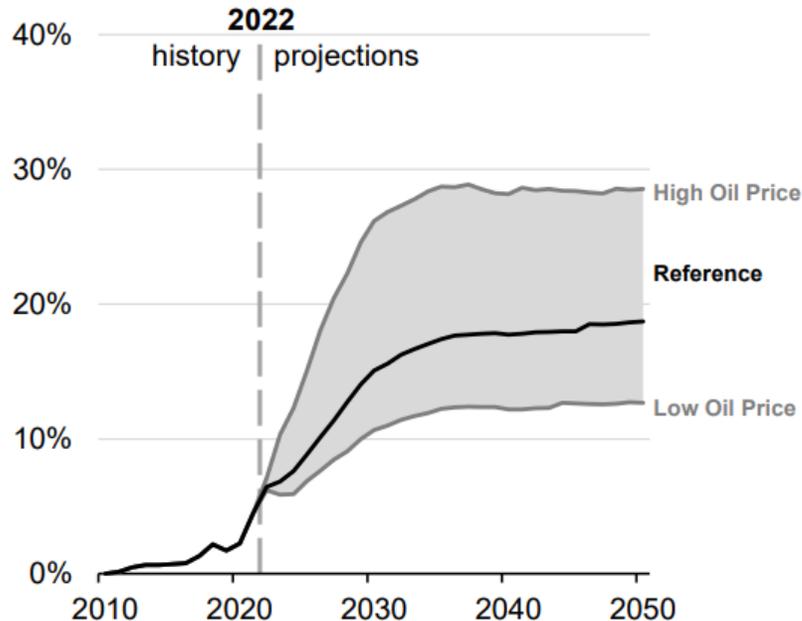
EV Uptake

Light-duty vehicle fuel economy and electric vehicle market share increase through 2050 due to rising CAFE Standards and other incentives

Light-duty vehicle average fuel economy
miles per gallon



Market share of electric light-duty vehicles*
percentage of sales



Data source: U.S. Energy Information Administration, *Annual Energy Outlook 2023* (AEO2023)

Note: *Includes battery electric and plug-in hybrid electric vehicles. Shaded regions represent maximum and minimum values for each projection year across the AEO2023 Reference case and side cases.

Starting in 2026, 43% of all new passenger cars and light-duty trucks shipped to New Mexico auto dealerships by national auto manufacturers must be zero-emission vehicles.

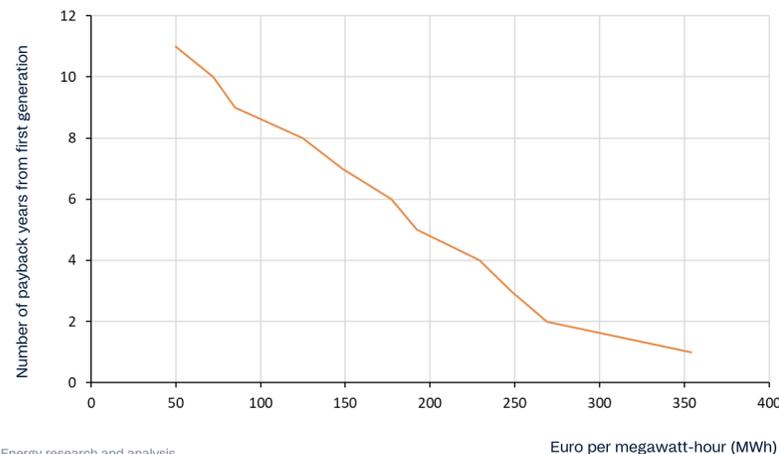
By 2032, four out of every five passenger cars shipped to the state by manufacturers must have zero emissions.

Does this make sense?

Planet friendly investments?

Capital investments in renewables have also increased significantly and are set to reach \$494 billion in 2022, outstripping upstream oil and gas at \$446 billion for the year, according to Rystad Energy research. This is the first time that investment in renewables is set to be higher than for oil and gas.

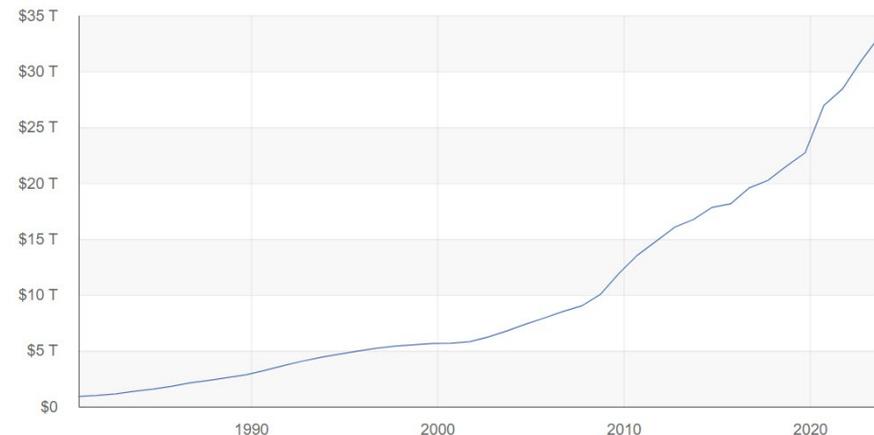
Payback years for a 250 MW solar PV asset in Germany by power price



Source: Rystad Energy research and analysis
A Rystad Energy graphic

RystadEnergy

1980 - 2023 | Complete Table US Historical National Debt



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			Environment
			Education
			Businesses

Environment



Education

Definition of existential crisis- an existential crisis is a recurring pattern of thoughts regarding your identity, purpose in life, and legacy among other things. Existential questions may appear at any point in your life and can affect your mood and overall quality of life.

How to deal with an existential crisis from WebMD:

1. Talk to people
2. Change your perspective
3. Meditate
4. Keep a journal

- Perhaps sustainability educations could benefit from teaching critical thinking and data analytics?
- A focus on moving away from fossil fuels might be a toxic selling point to sustainable plans?
- Perhaps it is not the transition, but the pace at which it is done that is causing failures

Business

One survey of over 300 businesses by Bain & Company found that 98% of sustainability initiatives fail to meet their objectives. Public spending is over \$20 trillion per year alone and we are not meeting objectives.

Ways to sustain business growth by Forbes¹:

1. Hire Top talent
2. Look for operational efficiencies
3. Prospect the right clients
4. Use sound decision making
5. Have great leadership
6. Don't be afraid to grow

Perhaps we adopt these principals to help with environmental sustainability, realize we will make mistakes along the way and be ready to pivot when the data or the situation changes.

Psychiatrists say an actionable list should consist of a max of 9 items- 1 large to do, 3 medium to dos and 5 small to dos. Anything more makes everything else less likely to be accomplished.