

Welcome to this week's presentation & conversation hosted by the **Canadian Association for the Club of Rome**, a Club dedicated to intelligent debate & action on global issues.

The views and opinions expressed in this presentation are those of the speaker & do not necessarily reflect the views or positions of CACOR.

## **GHG Trends and Reasons for Hope and Rapid Progress on the Climate Front.**

Our speaker today is Raymond Leury, who has always been interested in science & environmental issues. Ten years ago he bought his first EV, which led him to become President of the Electric Vehicle Council of Ottawa (EVCO). Now retired from a long IT career, Raymond spends much of his time researching and advocating for EVs of all sizes from light duty to medium and heavy-duty vehicles. This led to a successful campaign to get OC Transpo to transition to e-buses.

DESCRIPTION: Climate change is an existential threat. Temperature records keep falling, climate emergencies are declared, yet we don't seem to be making much progress in addressing the threat. How much progress have we made? There is no doubt that we are going to continue to see average temperatures increase for some time. What are our prospects for keeping those increases low enough so that we can avoid total societal collapse and a return to the stone age? Are we too late? The most recent data coupled with some analysis and careful forecasting shows that there are some paths that would substantially limit temperature increases and create conditions for a "soft landing." For those paths to be realized, we need all hands on deck and unprecedented cooperation because there is not a minute to waste.

The presentation will be followed by a conversation, questions, & observations from the participants.

CACOR acknowledges that we all benefit from sharing the traditional territories of local Indigenous peoples (First Nations, Métis, & Inuit in Canada) and their descendants.

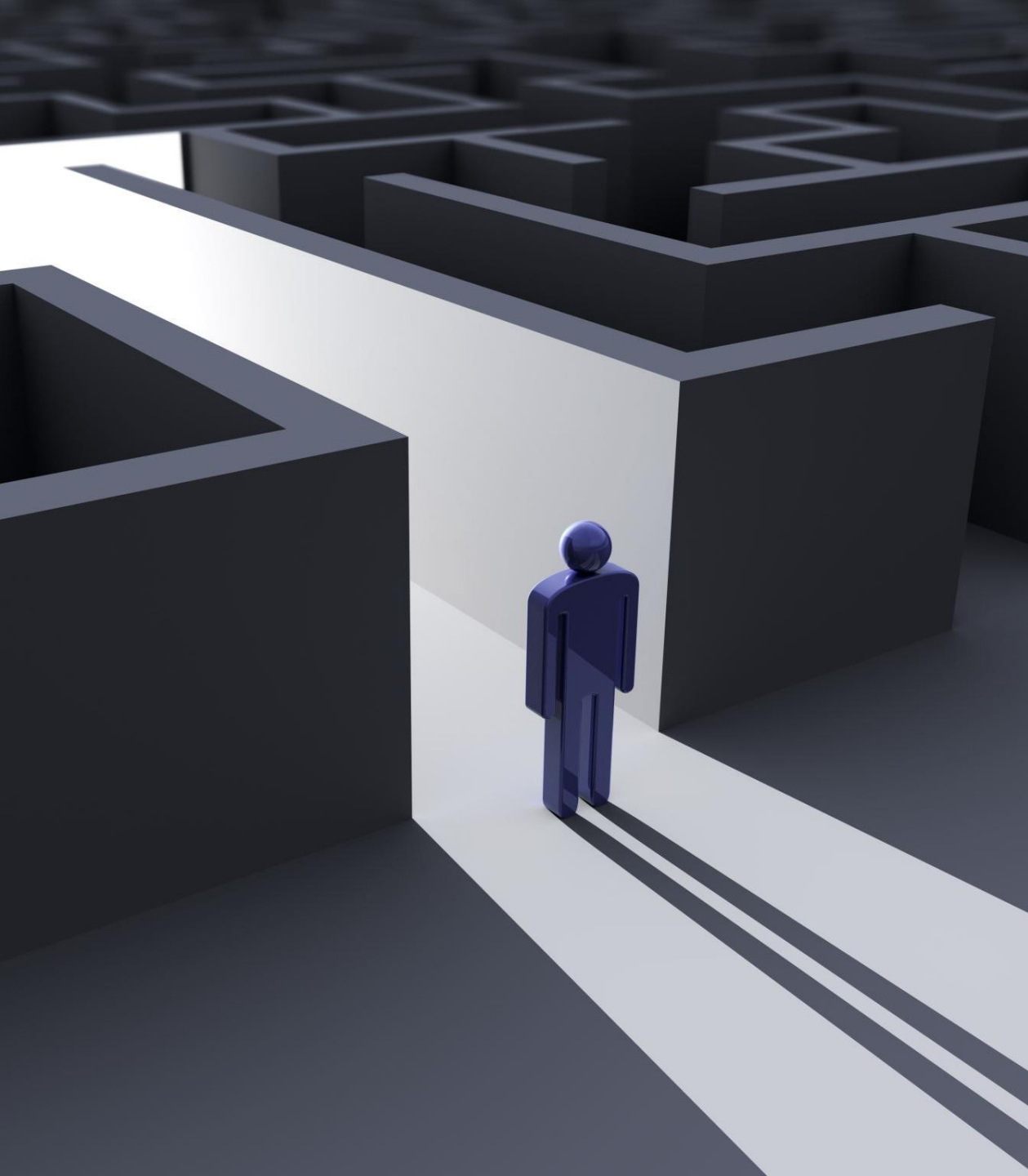


Website: [canadiancor.com](http://canadiancor.com)

Twitter: [@cacor1968](https://twitter.com/cacor1968)

YouTube: [Canadian Association for the Club of Rome](https://www.youtube.com/channel/UC...)

2024 Jan 03 Zoom #178



# Hope or reality?

GHG Trends and Reasons for  
Hope and Rapid Progress on  
the Climate Front

Raymond J Leury, MBA

January 3<sup>rd</sup>, 2024



# My background

- **Science and business training**
  - Understand technology
  - Understand what business drivers will make an organization choose a technology
  - Many decisions that look illogical are based on business constraints
- **Every project implemented change**
  - Change is hard, risky and uncertain
    - What if I lose my job?
  - *Always* opposition – some winners think they will lose
  - What is hard we will have done by tomorrow and what's impossible will take a bit longer
  - Problem? We need to find a solution – “that’s what I’m paid for”
- **My “superpower”**
  - Aggregate a large set of disparate data and distill it into viable solutions
    - Find a viable path from within a very messy reality
  - Involves understanding technology and the business/human impacts
  - Get the impossible done, make things happen
  - *No, can't, impossible* is a challenge, not a roadblock
    - Hard stuff is hard (Katherine McKenna)

# Never say never

- Must, will, always, never, don't, impossible, etc. are all extreme positions
  - Closes possibility of being wrong
- Never is a long time!
- Laws of nature are fixed, technology is not
- True or False – “it depends”
  - Technology answers change as technology evolves
  - What was false in 1990 might be true in 2023
    - Can you squeeze all the processing power required for a smart phone into a portable device? False became true
    - Note Moore's law forecasted this
- If you have extreme position, you should check if it's still correct
  - The answer may have changed!

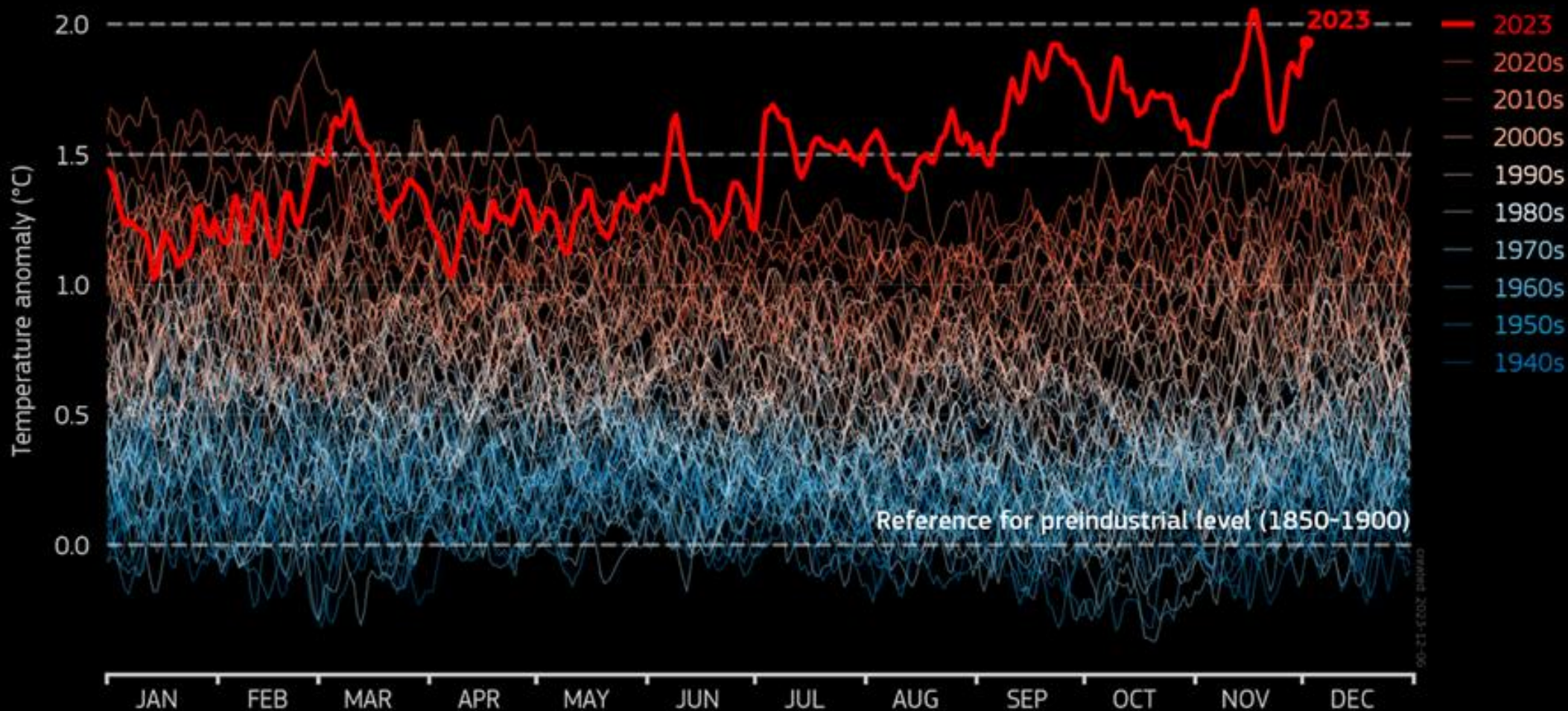
# DAILY GLOBAL SURFACE AIR TEMPERATURE ANOMALY

Data: ERA5 1940–2023 • Reference period: 1850–1900 • Credit: C3S/ECMWF



Climate  
Change Service

climate.copernicus.eu



PROGRAMME OF  
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IMPLEMENTED BY



# Fossil Fuel Industry Narrative

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- Existential crisis for the FF industry
- Hire best PR firms in the world
  - Same folks that told us cigarettes did not cause cancer
  - These people fight dirty and will go to great lengths to mold public opinion
- MBA 101 – Change public opinion
  - This is *the purpose* of marketing
  - Must *never* assume that you are being told the truth
- “We will *always* need fossil fuels”

# Fossil Fuel Industry Narrative

- “We can’t run an electrical grid with more than about 5-10% renewables”
  - Ok, now that we have grids doing this, what we really meant was
  - “We can’t run a grid on 25, 50 or 100% renewables”
  - Ok, now that BC, QC, Australia etc. are doing this...what we meant is...dunkelflaute
- “The transition to clean energy requires more stuff than the status quo”
- “We can’t transition fast enough, so we need fossil gas as a bridge”
- FF industry sees writing on the wall
  - Fighting hard to keep their markets
- Doing everything they can to slow down the transition
- Some of you have internalized these points and are doing the FF industry’s bidding by repeating them
- They have lots of money and are using all tools available, including AI to influence everyone
- I’m willing to bet that they have infiltrated some of your groups...



# What can we conclude?

- Green washing is real – and very well funded!
- Does not mean everything is green washing
- Need to call out green washing
- Must understand difference
  - Not always obvious



# CCUS Works – Is it a good solution?

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- True – You can capture carbon and store it or re-use it
  - Lose credibility when you deny that it works
- Tell me a bit more....
  - Very difficult (impossible?) to capture all the CO<sub>2</sub>
  - Requires lots of energy – no free lunch
  - What do we do with all that captured CO<sub>2</sub>?
    - There is small market, price will be low or *negative*
  - Leakage – *never* leak
- Very difficult to see how this can be economically viable
  - And it doesn't work well
- -> doesn't make sense except for very few niche situations
- -> Currently is not a viable solution
- -> this is a significant problem as we need to remove carbon from the atm.
- Need more research – lots more



What  
choices do  
we have?

# What options do we have? Option 1

- Accept that climate change can't be stopped and do nothing
- Consequences:
  - >6°C of warming
  - Massive famines
  - Massive migration, bloodshed
  - Sacrifice at least 7 B people (assumes we can support 1B)
- Who are those 7 B people?
  - The poorest of the poor first...
  - The ones who did the least to contribute to the problem
- The FF industry wants and is working hard for some version of this!!
- NOT AN ACCEPTABLE OPTION

# What options do we have? Option 2

- Go back to some past state where we live within the limits of the planet
  - De-growth, pre-industrial circa 1800
- Forego technology to avoid overshoot and stop FF
- Agrarian low impact existence
- Consequences:
  - Less warming than option 1 – baked in warming  $>4^{\circ}\text{C}$
  - Massive famines, massive migration, bloodshed
  - Sacrifice of up to 7 B people (assumes we can support 1B)
- Who are those 7 B people?
  - The poorest of the poor first...
  - The ones who did the least to contribute to the problem
- Unlikely that humans will choose this willingly – war, revolution, bloodshed are required
- NOT AN ACCEPTABLE OPTION

# What options do we have? Option 3

- Use technology to decarbonize and eliminate GHGs
  - “Electrify everything”
- Consequences:
  - Less warming than option 1 or 2, eventual reversal
  - Less famines, less migration
  - Sacrifice of less than 7 B people (assumes we can support 1B)
- Risk is that we don’t/won’t have the technology
- Humans will choose this willingly – no/low sacrifice
- **ONLY ACCEPTABLE OPTION** in my view
- Any other option condemns 7 B people to famine and death - unacceptable



# Implementing Option 3

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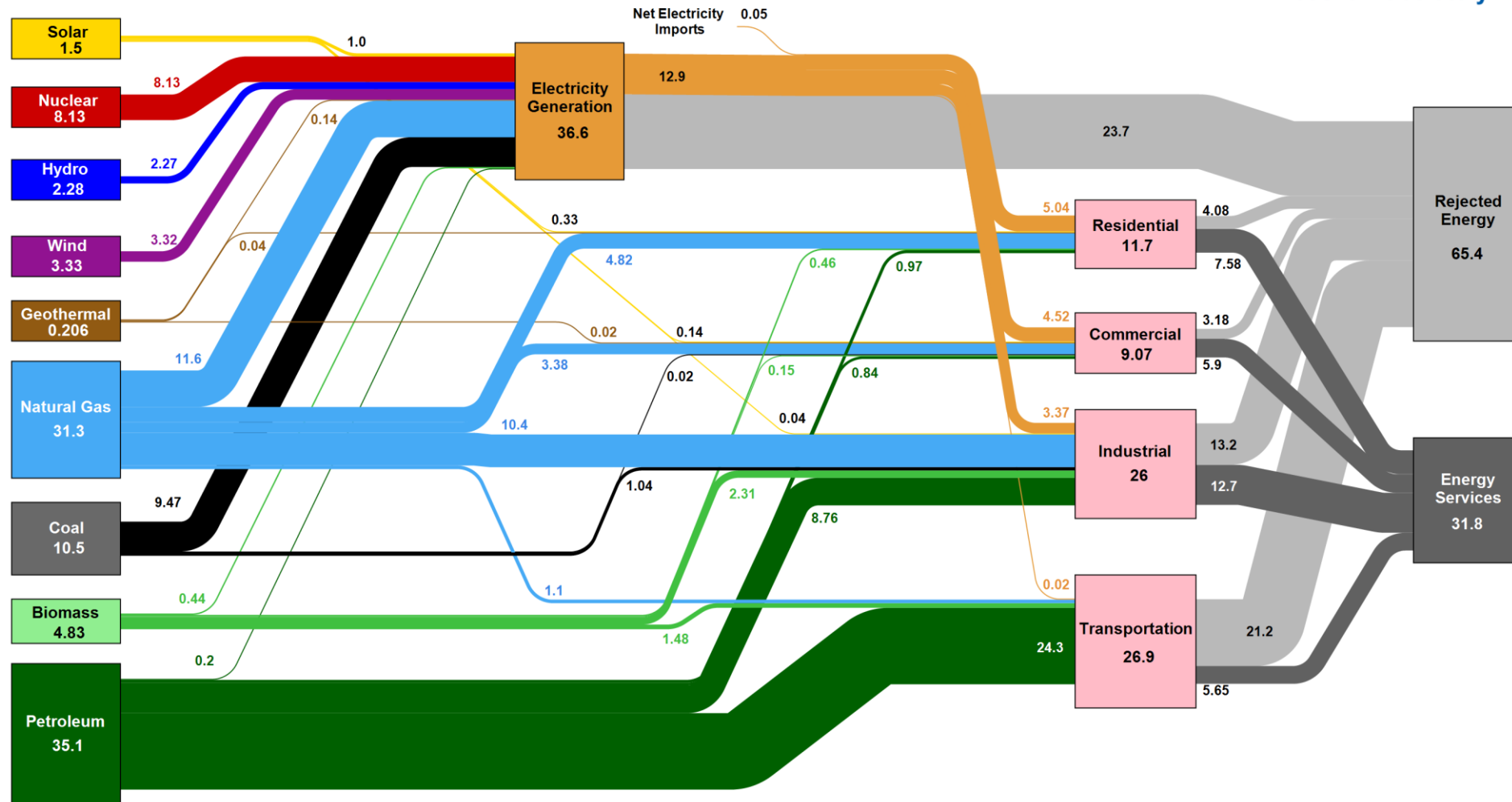
- Want to avoid revolutions and bloodshed
- That means:
  - A capitalist system
    - Strong monetary incentives
    - Note: China is most capitalist country on the planet
  - Democratic or authoritarian governments
    - Hope is that all are democratic, but not required
- Figure out how to use capitalism
  - Drive the right changes
  - Decarbonize



A bit of Background

# How big is the problem?

Estimated U.S. Energy Consumption in 2021: 97.3 Quads



Source: LLNL March, 2022. Data is based on DOE/EIA MER (2021). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant heat rate. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential sector, 65% for the commercial sector, 21% for the transportation sector and 49% for the industrial sector, which was updated in 2017 to reflect DOE's analysis of manufacturing. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527



# Forecasting Technology Adoption

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“I skate to where the puck is going to be, not to where it has been”

Wayne Gretzky

Where are we?

- FF based society
- IEA is good at historical data

Where are we going to be?

- This is a much tougher proposition
- The IEA is not very good at this...
- Vested interests want to drive narrative



# Technology Adoption S-Curve (EV)

- China is expected to see 90% EV market share by 2030.
- The EU is expected to be close behind with 80% EV market share by 2030
- RMI expects the US to be around 50% market share by that date
- EVCO prediction for Canadian EV market share in 2030 is 70%

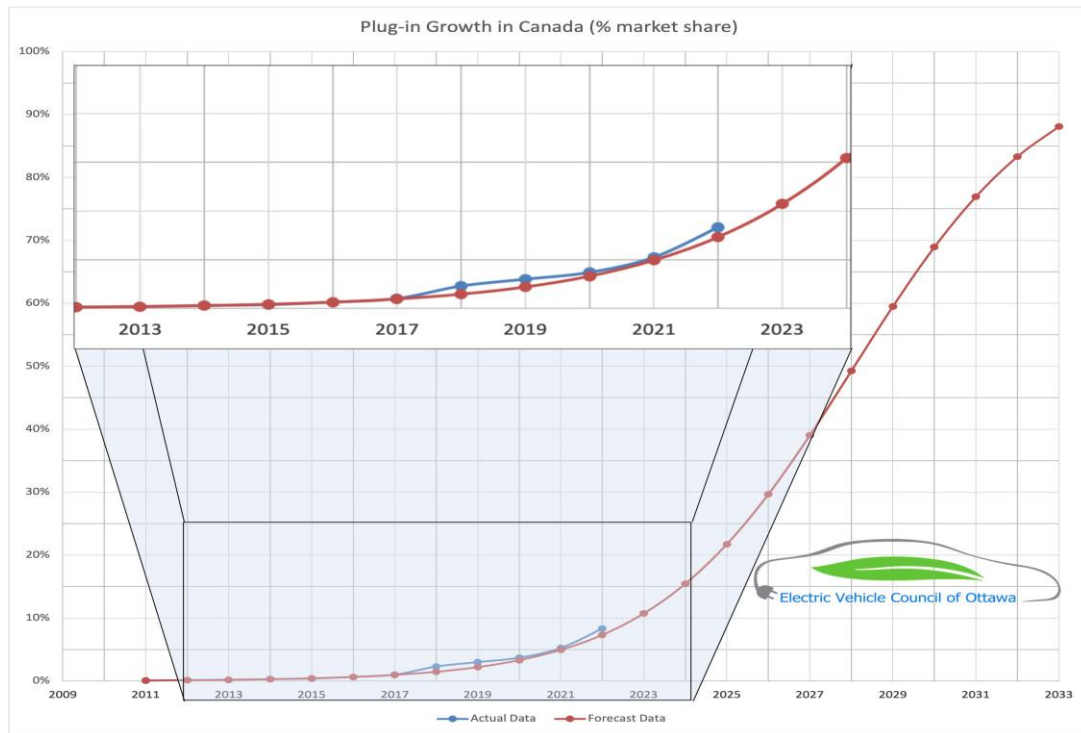
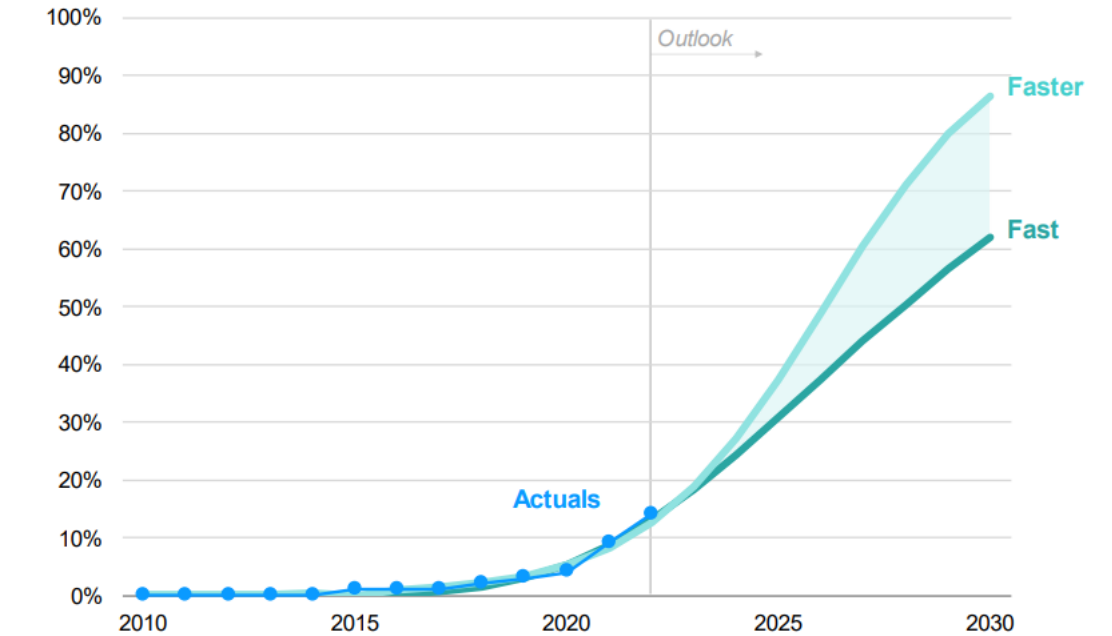


Figure 11: EV market share (%)



Source: IEA (past), RMI forecasts

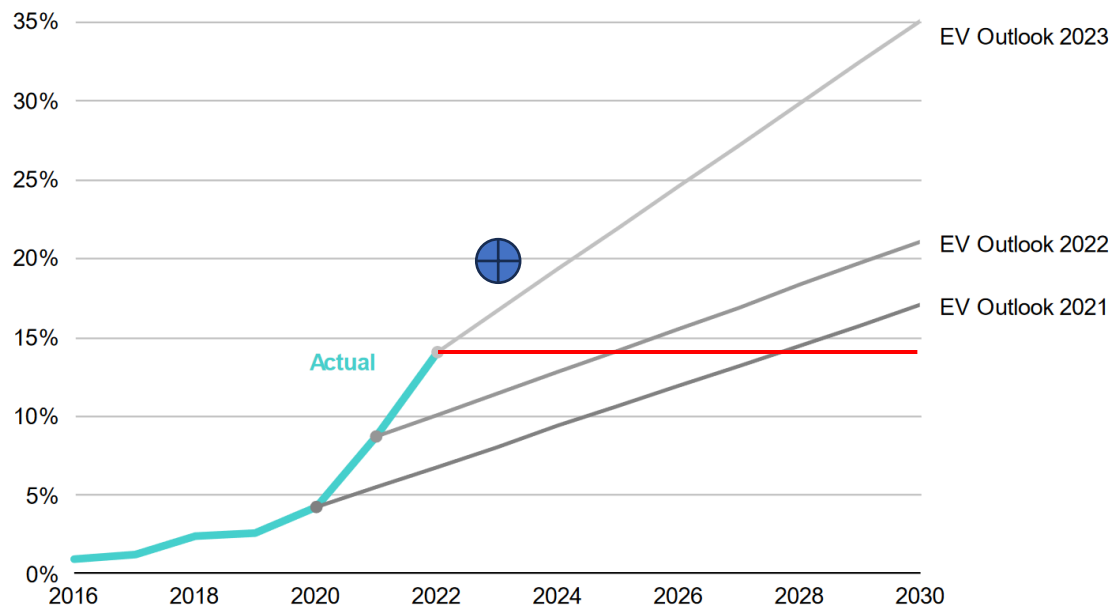
# International Energy Agency (IEA)

Well documented history of underestimating the pace of change

(Bloomberg NEF not much better)

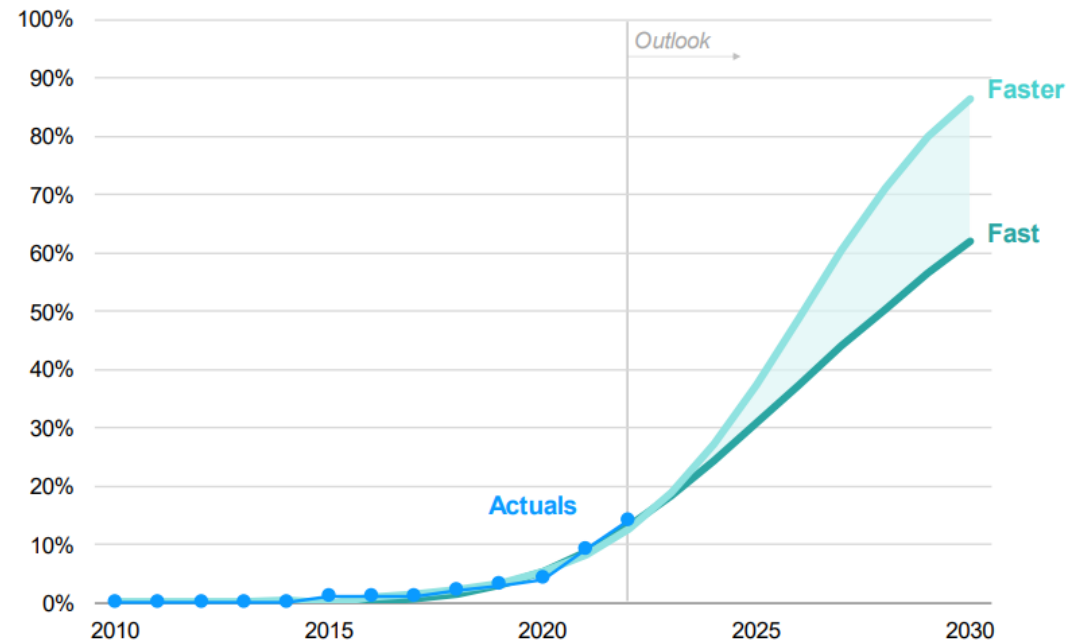
Governments are setting policy based on **wildly incorrect forecasts**

Figure 22: IEA forecasts for EV as a share of sales (%)



Source: Hannah Ritchie,<sup>99</sup> Stated Policies scenarios (STEPS) from IEA's Global EV Outlooks

Figure 11: EV market share (%)

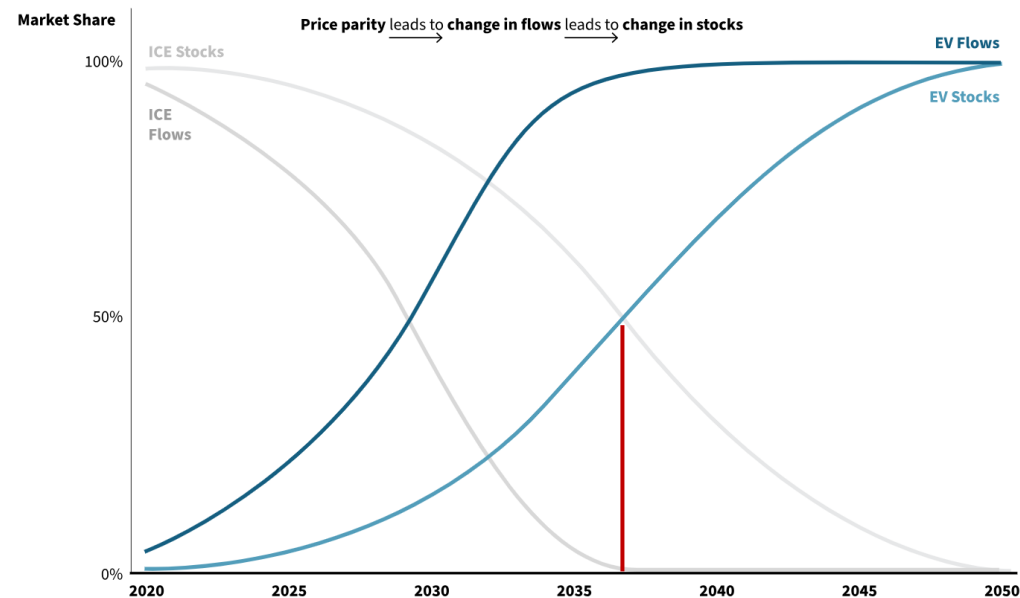


Source: IEA (past), RMI forecasts

# EV vs ICE

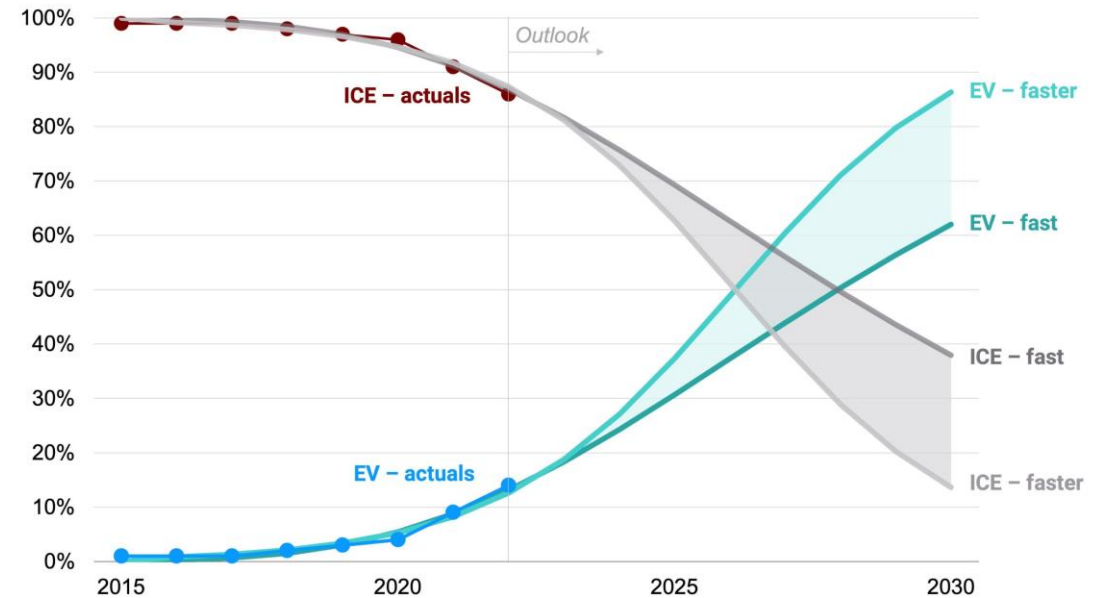
- BNEF NZE scenario – Figure 7
- It is notable that BNEF (and others) have accepted peak ICE car sales (a flow) in 2017 and BNEF forecasts that the **ICE fleet (a stock) will peak as early as 2022.**

Exhibit 7: Market share of flows and stocks in the global car sector



Source: BNEF NZE scenario

Global EV and ICE market share forecast (%)



RMI - Energy, Transformed.

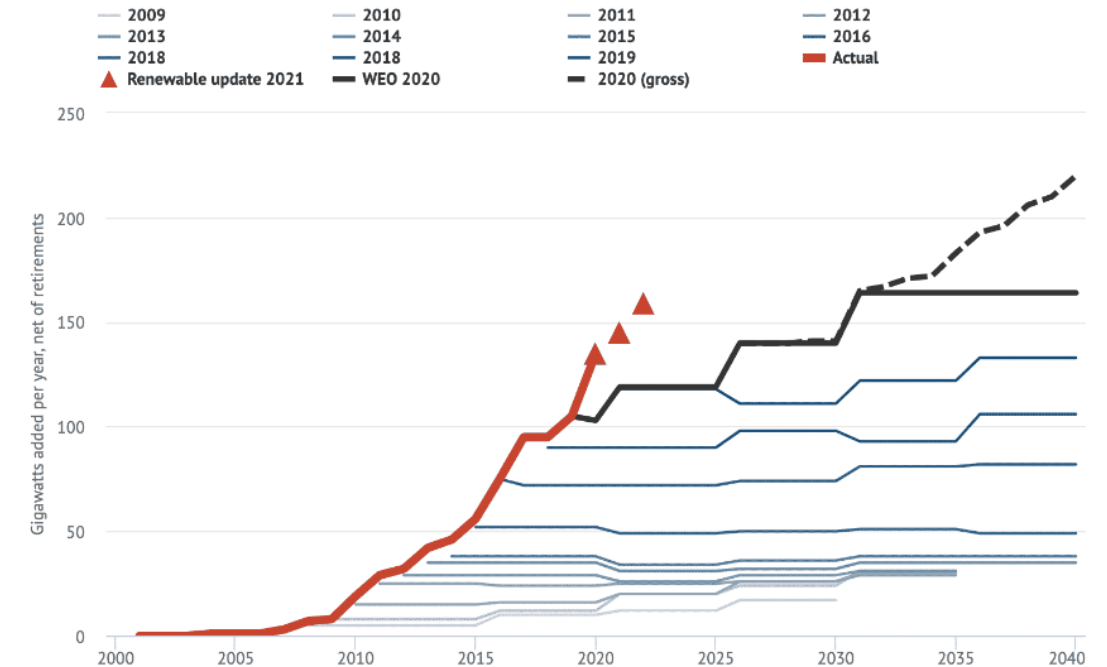
Source: IEA, RMI forecasts

# IEA – Solar Forecast vs Actual

- Consistently underestimate the pace of change
- “Global Witness’ analysis demonstrates that the Agency continues to retain an **overly-optimistic, and therefore misleading, view about potential future oil production**”

- Top Graph By Auke Hoekstra, Maarten Steinbuch, Geert Verbong: Creating Agent-Based Energy Transition Management Models That Can Uncover Profitable Pathways to Climate Change Mitigation. Complexity 2017. - <https://doi.org/10.1155/2017/1967645>, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=74604990>
- WEO – World Energy Outlook

The **new IEA solar forecast** is far more rapid than its **2020 WEO**, published in November  
The agency has raised its solar outlook repeatedly as costs fall and policy support improves



Gigawatts of solar capacity added around the world each year (red line) and the IEA renewable market update 2021 (red triangles), as well as IEA World Energy Outlooks published between 2009-2020. Source: Carbon Brief analysis of IEA reports. Chart by Carbon Brief using Highcharts.

# IEA - Wind Forecast vs Actual

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- Same pattern as EVs and solar
- Also applies to battery prices and BESS adoption

## ‘Exceptional New Normal’: IEA Raises Growth Forecast for Wind and Solar by Another 25%



By EcoWatch | May 11, 2021 2:48AM EDT

RENEWABLE ENERGY

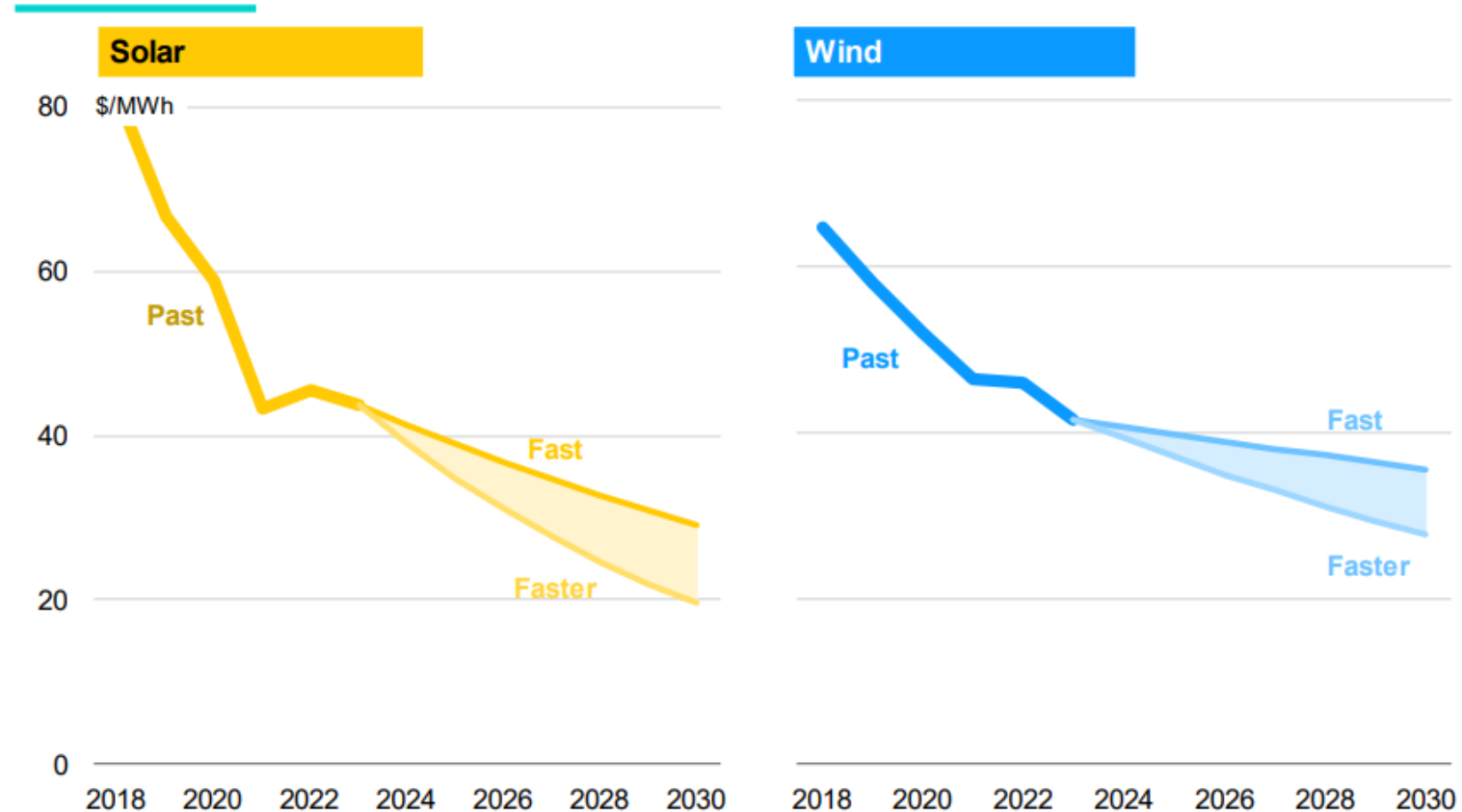


# Where will the puck be?

- Lower costs
- Same applies to batteries
- Same applies to EVs

➔ economics alone will drive adoption

Figure 9: Expected solar and wind costs at different learning rates, \$/MWh

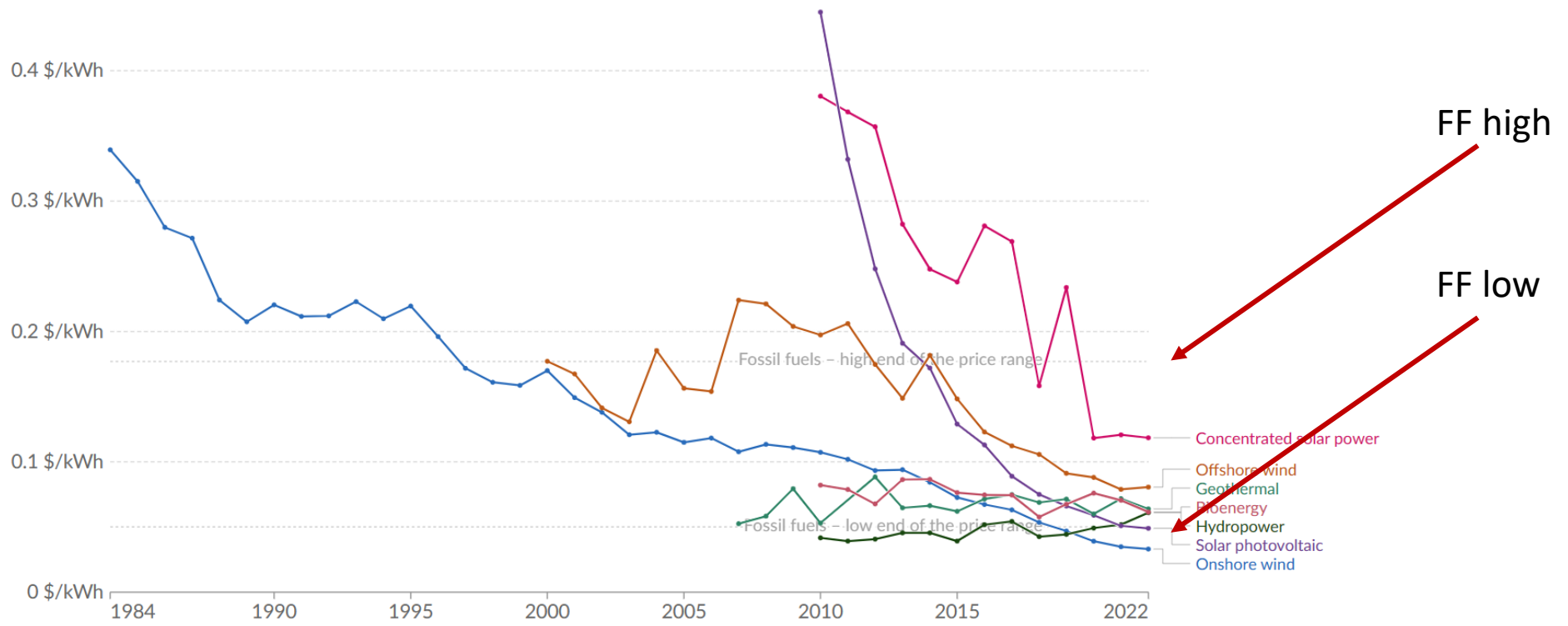


Source: BNEF,<sup>44</sup> RMI analysis

# Levelized cost of energy by technology, World

The average cost per unit of energy generated across the lifetime of a new power plant. This data is expressed in US dollars per kilowatt-hour. It is adjusted for inflation but does not account for differences in the cost of living between countries.

Table Chart Change country or region Settings



Play time-lapse 1984 2022

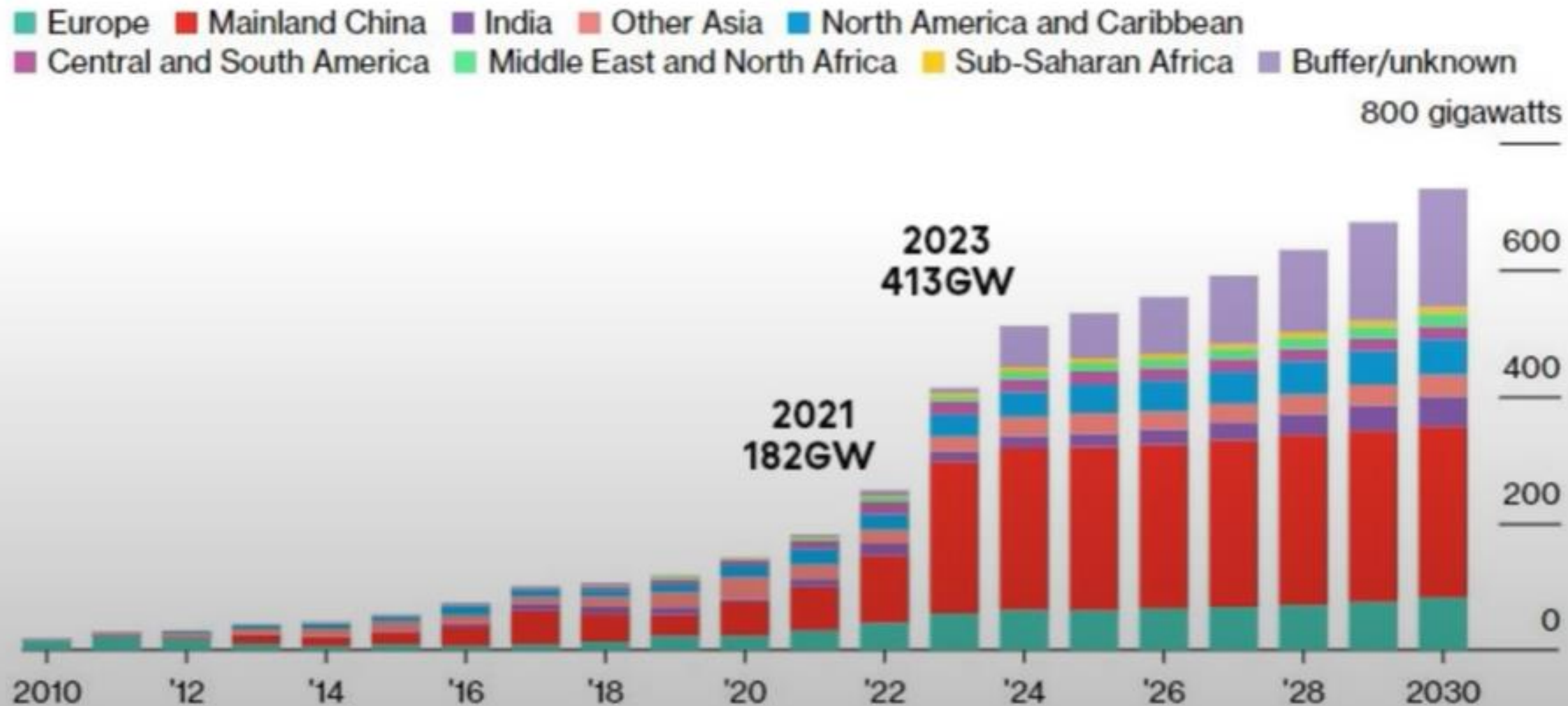
Data source: International Renewable Energy Agency (2023) - Learn more about this data  
Note: Data is expressed in constant 2022 US\$.  
OurWorldInData.org/energy | CC BY

Download Share Enter full-screen



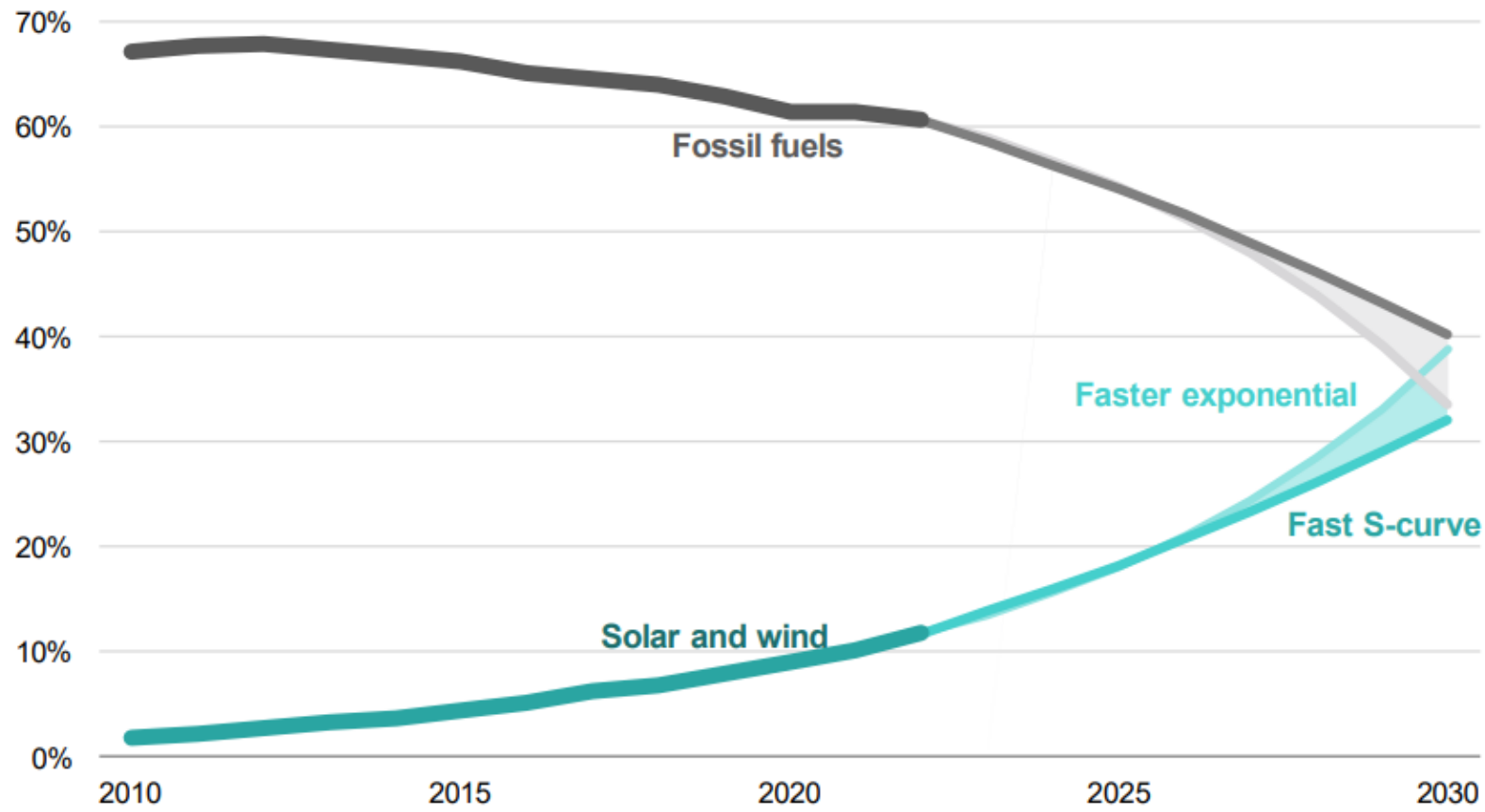
# Global Solar Build Expected to Rise 64% in 2023

Installations in mainland China are beating all previous expectations



# Global Share of Electricity by source

Figure 15: Global share of electricity generation by source



Source: Energy Institute (past),<sup>76</sup> RMI forward

Source: <https://rmi.org/insight/x-change-electricity/>

# What Does that mean for FF?

Note: Useful (not total) energy

Oil demand will crash

Tar sands emissions

High price energy

Crash even faster

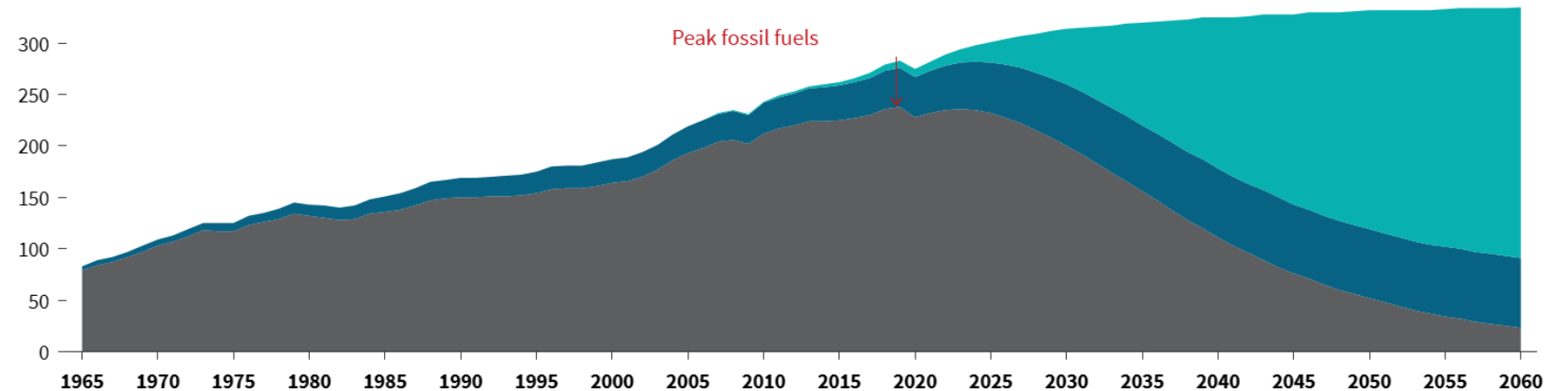
3 mbpd

~20% of GHG in Cdn

## The Energy Future Will be Different from the Past

Useful energy, EJ

■ Fossil fuels ■ Other ■ Solar & Wind



Source: Rystad central scenario

Source: <https://rmi.org/peaking-the-series/>, Rystad

# Canada High Priced Oil

Alberta, we've got a problem

Source: knoema

## Marginal Production Cost, 2014

Cost of producing an additional barrel of oil (USD/bbl)

Country	Exploration Type	Marginal Production Cost	Transportation Cost
Russia	Arctic	120	
	Onshore	18	12
Europe	Biodiesel	110	2
	Ethanol	103	2
Canada	Sand	90	15
Brazil	Ethanol	66	5
	Offshore	80	2
United States	Deep-water	57	
	Shale	73	12
Angola	Offshore	40	
Ecuador	Total	20	
Venezuela	Total	20	
Kazakhstan	Total	16	
Nigeria	Deep-water	30	
	Onshore	15	
Oman	Total	15	
Qatar	Total	15	
Iran	Total	15	
Algeria	Total	15	
Iraq	Total	6	
Saudi Arabia	Onshore	3	2
United Arab Emirates	Total	7	

# “Mining will always require lots of fossil fuels”

- FALSE!!
- Mining is moving to electric
  - Less expensive
  - Less ventilation requirements
- Largest loads are electric
  - Locomotives
  - Azepods on ships
  - Mining trucks
- When you concede that, you:
  - Stop looking for solutions
  - Put smiles on the FF industry execs



“Processing Minerals will **always** require lots of fossil fuels”

- FALSE!!
- Aluminium is processed using electricity
- Steel can be made with H<sub>2</sub> instead of coke
- *Every* part of the supply chain can be electrified

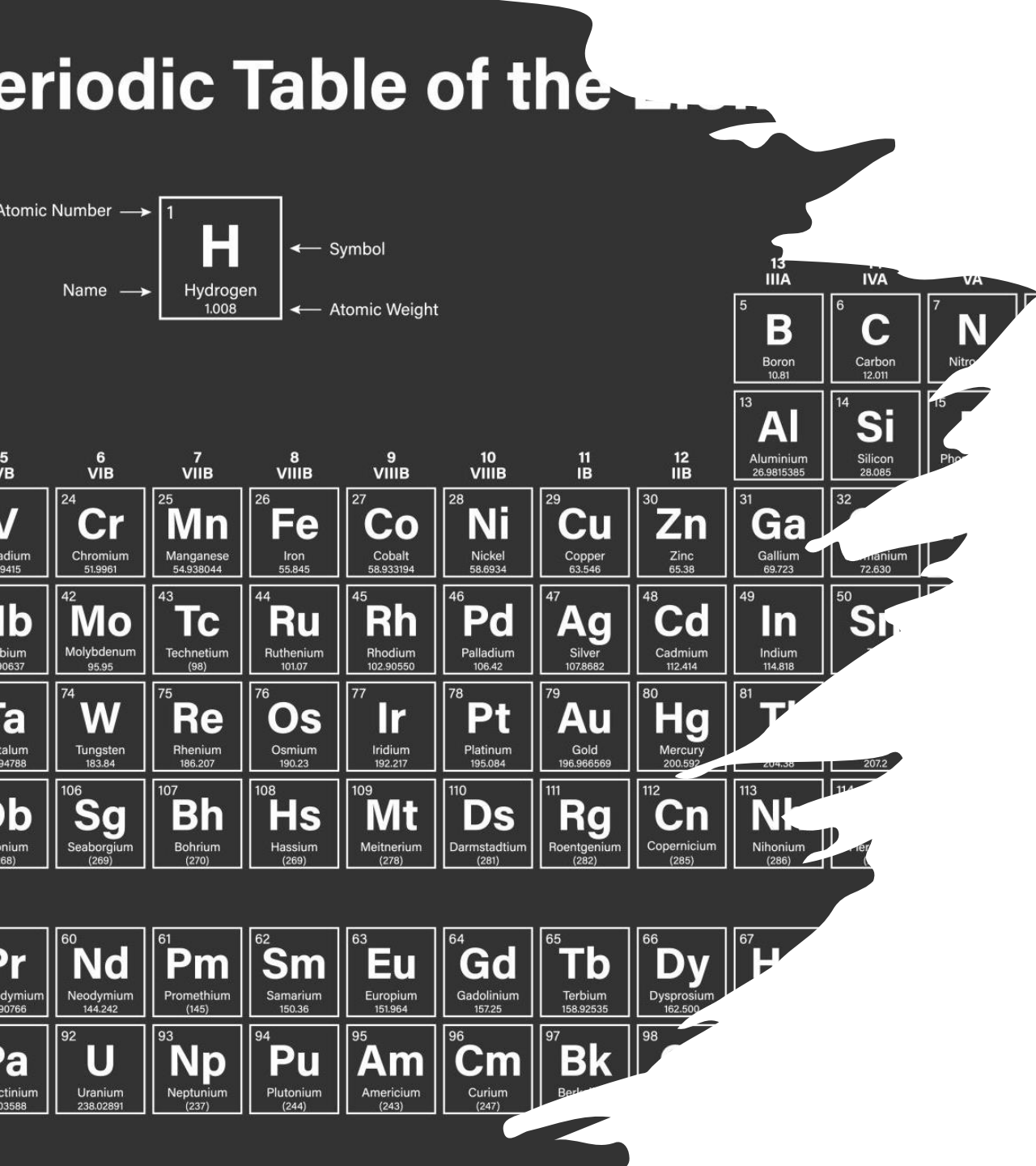


# “Recycling doesn’t work”

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- Recycling **plastics** does not work
  - There are minor exceptions
  - Oil industry pushed the recycling narrative
    - ...to sell more oil! More profit!
- Where it does work it works **very well**
  - Asphalt is by weight the most recycled product
    - Many times bigger volume than plastics
  - Lead acid batteries recycled at 99% (in US)
    - Every reason to think this will be even more so with EV batteries
  - 80% of steel in North America and Europe is from recycled steel
    - Recycled using *electric* arc furnaces
- Waste is expensive

# Periodic Table of the



Atomic Number → 1	← Symbol
H	
Name → Hydrogen	← Atomic Weight
1.008	

5 VB	6 VIB	7 VIIB	8 VIIB	9 VIIB	10 VIIB	11 IB	12 IIB	13 IIIA	14 IIIA	15 VA	16 VIA	17 VIIA	18 VIIA														
21 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr														
41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe														
71 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn												
101 Db	102 Sg	103 Bh	104 Hs	105 Mt	106 Ds	107 Rg	108 Cn	109 Nh	110 Fl	111 Mc	112 Lv	113 Ts	114 Uu	115 Uu	116 Uu	117 Uu	118 Uu										
89 Pr	90 Nd	91 Pm	92 Sm	93 Eu	94 Gd	95 Tb	96 Dy	97 Ho	98 Er	99 Tm	100 Yb	101 Lu	102 Hf	103 Ta	104 W	105 Re	106 Os	107 Ir	108 Pt	109 Au	110 Hg	111 Tl	112 Pb	113 Bi	114 Po	115 At	116 Rn
92 Pa	93 U	94 Np	95 Pu	96 Am	97 Cm	98 Bk	99 Cf	100 Es	101 Fm	102 Md	103 No	104 Lr	105 Hf	106 Ta	107 W	108 Re	109 Os	110 Ir	111 Pt	112 Au	113 Hg	114 Tl	115 Pb	116 Bi	117 Po	118 At	119 Rn

“We don’t have enough minerals”

- Nickel, Manganese, Cobalt (NMC)
  - Nickel and Cobalt expensive
- Lithium, Iron, Phosphate (LFP)
  - Iron and phosphate are cheap and abundant
  - Lithium expensive
- Sodium-ion
  - Sodium is cheap and abundant
- There is plenty of lithium, but sodium will *always* be cheaper
  - Processing sodium better for environment



“We don’t  
have  
enough rare  
earths”

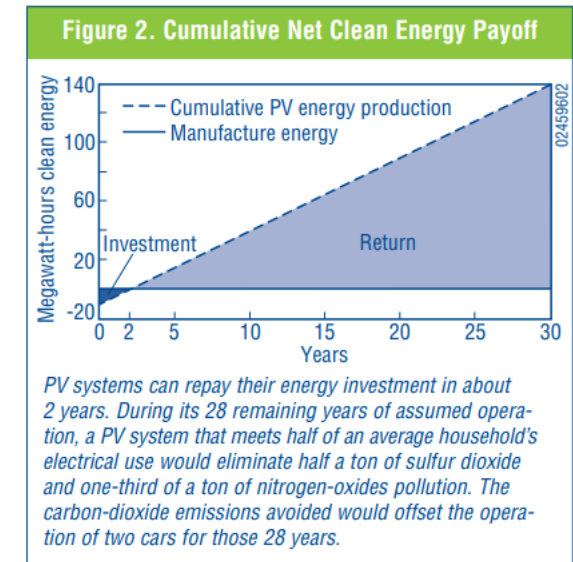
- Rare earths mainly used in permanent magnets
  - Used in EV motors
  - ICE vehicles have up to dozens of electric motors/actuators
- Rare earths are expensive
- Electric motor types
  - Permanent magnet
  - Induction – requires no rare earths
- Tesla (and others) – permanent magnets *without* rare earths
- We don’t need rare earths for EV motors
- Expensive – find alternatives



Lots of Good  
News in 2023!

# Lots of good news in 2023!


- The production, transport and processing of oil and gas results in just under 15% of global energy-related greenhouse gas emissions. This is a huge amount, equivalent to all energy-related greenhouse gas emissions from the United States.
  - -IEA – the Oil and Gas Industry in Net Zero Transitions
- Energy Return on Energy Invested (ERoEI)
  - Dropping for FF (7), Increasing for wind and solar!
  - Solar payback 2 years – expect 30+ years (NREL)
    - ERoEI 15
  - Wind 16-44!



Sources: <https://www.nrel.gov/docs/fy04osti/35489.pdf>  
<https://davidturver.substack.com/p/eroei-eroi-of-onshore-offshore-wind-power>

# Heat pump sales outpaced gas furnace sales in the US in 2022



Michelle Lewis | Mar 31 2023 - 11:03 am PT |  28 Comments



CHINA ENERGY

13 November 2023 ⌚ 0:01

# Analysis: China's emissions set to fall in 2024 after record growth in clean energy

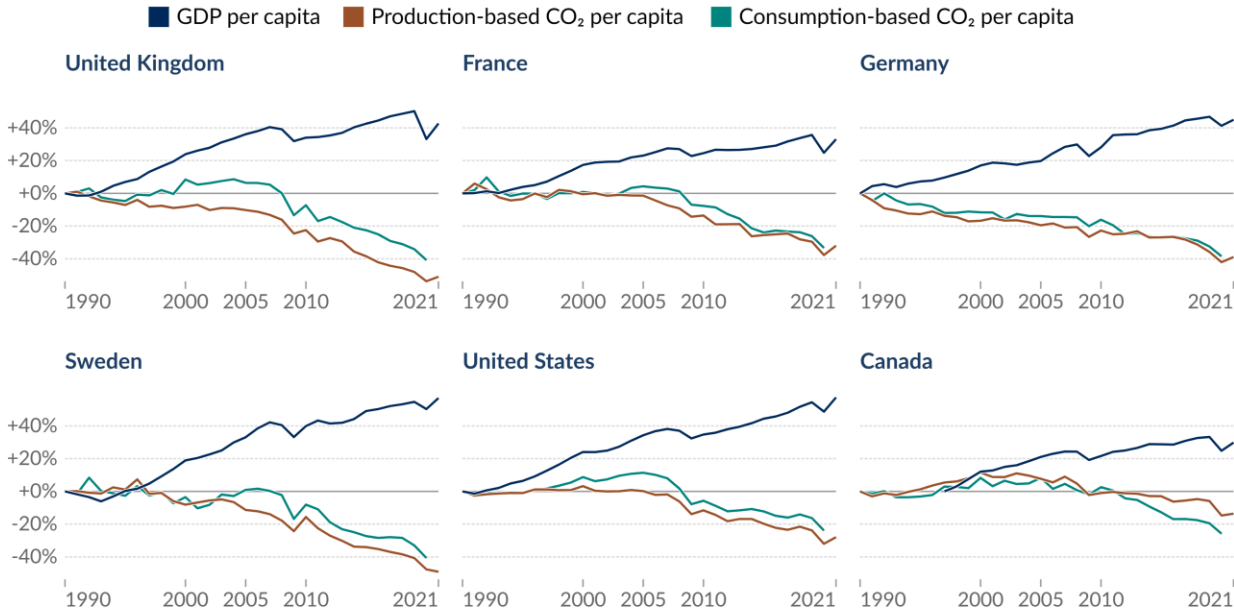


# Dr Hannah Ritchie – GHG vs GDP



## Change in per capita CO<sub>2</sub> emissions and GDP, 1990 to 2021

Consumption-based emissions<sup>1</sup> are national emissions that have been adjusted for trade. This measures fossil fuel and industry emissions<sup>2</sup>. Land use change is not included.



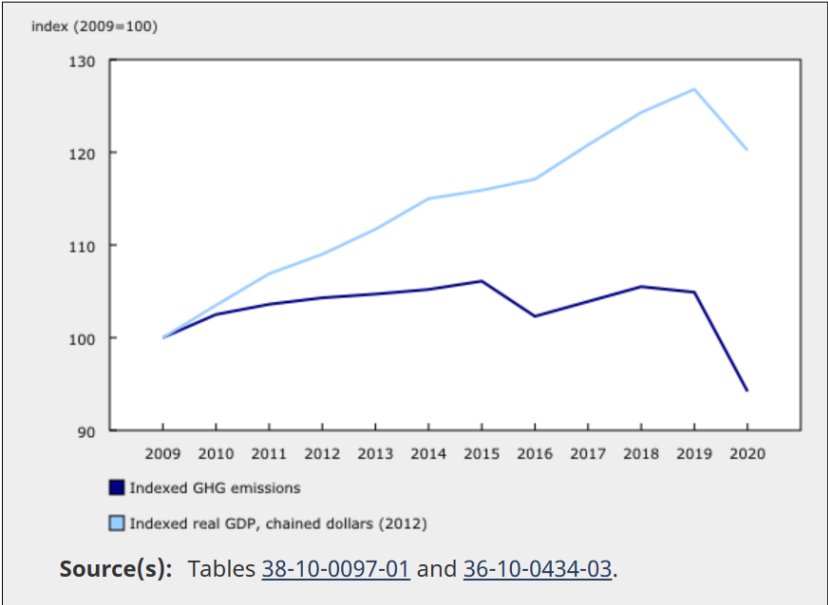
Data source: Data compiled from multiple sources by World Bank; Global Carbon Budget (2022); Population based on various sources (2023)

Note: GDP figures are adjusted for inflation.

[OurWorldInData.org/co2-and-greenhouse-gas-emissions](https://OurWorldInData.org/co2-and-greenhouse-gas-emissions) | [CC BY](https://creativecommons.org/licenses/by/4.0/)

- 1. Consumption-based emissions:** Consumption-based emissions are national or regional emissions that have been adjusted for trade. They are calculated as domestic (or 'production-based' emissions) emissions minus the emissions generated in the production of goods and services that are exported to other countries or regions, plus emissions from the production of goods and services that are imported. Consumption-based emissions = Production-based - Exported + Imported emissions
- 2. Fossil emissions:** Fossil emissions measure the quantity of carbon dioxide (CO<sub>2</sub>) emitted from the burning of fossil fuels, and directly from industrial processes such as cement and steel production. Fossil CO<sub>2</sub> includes emissions from coal, oil, gas, flaring, cement, steel, and other industrial processes. Fossil emissions do not include land use change, deforestation, soils, or vegetation.

“We have *never* been able to decouple  
GPD growth from GHG emissions”  
Incorrect – correlation diminishing  
Canada is one of worst



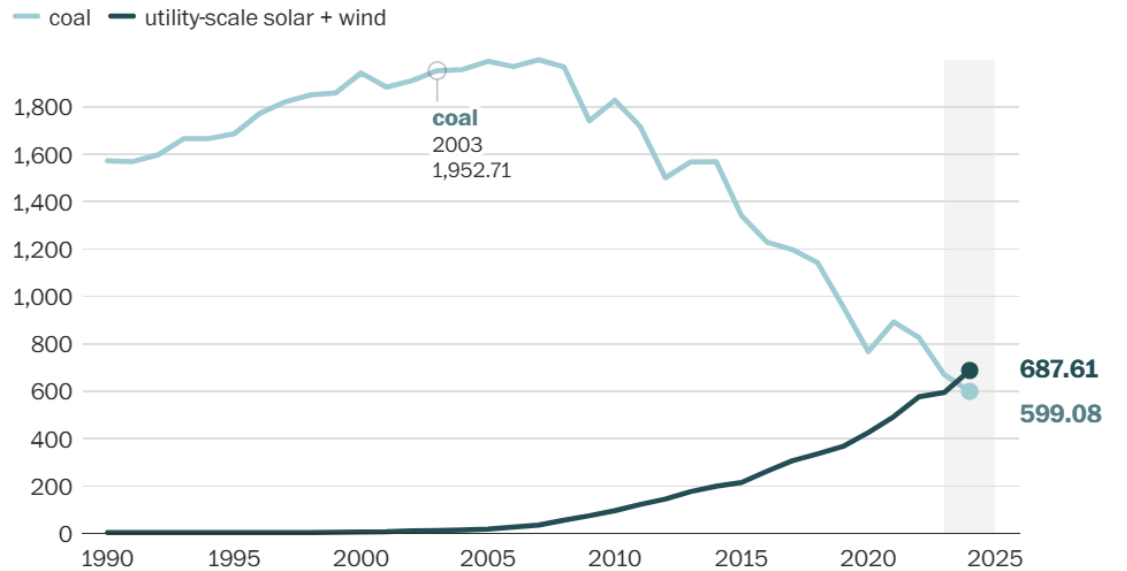
Source(s): Tables [38-10-0097-01](#) and [36-10-0434-03](#).

# US Coal Generation Dropping

- “In fact, in much of the country, it’s **already cheaper** to build and operate an entirely **new solar or wind** plant than to continue **operating an existing coal-fired** plant.”

## U.S. electricity generated by wind and solar is forecast to surpass coal-fired power in 2024

Electric power-sector net generation, billion kilowatt-hours



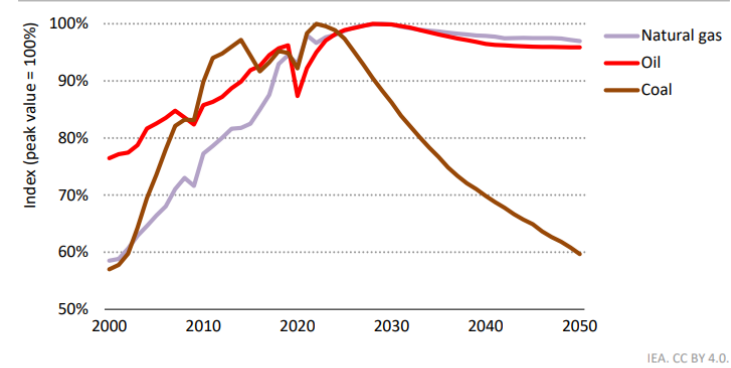
Source: U.S. Energy Information Administration

THE WASHINGTON POST

# What does all this mean?

- IEA projections don't make sense!
- Planet will fry if they are true
- Governments are using these projections to set policy

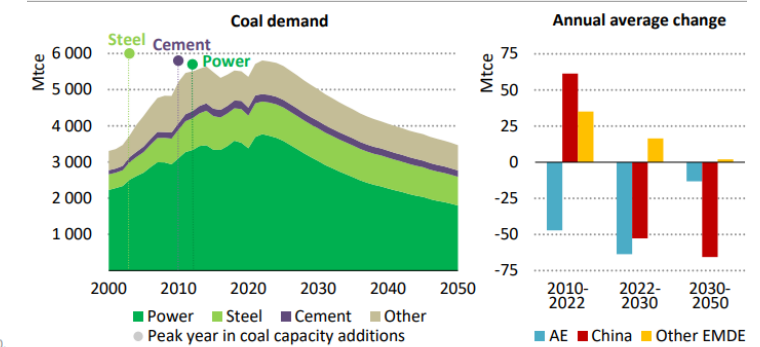
**Figure 1.1** ▶ Fossil fuel consumption by fuel in the STEPS, 2000-2050



All fossil fuels peak before the end of this decade, with declines in advanced economies and China offsetting increasing demand elsewhere

IEA, CC BY 4.0.

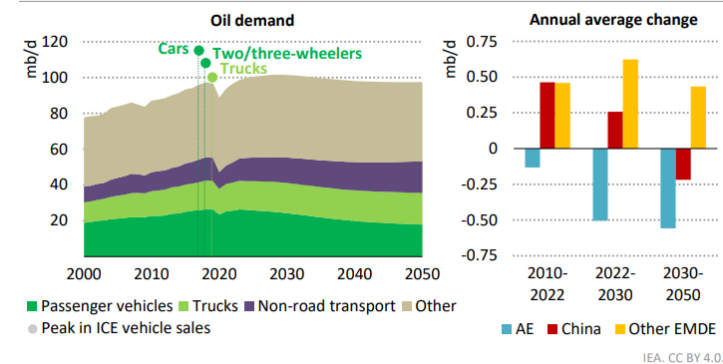
**Figure 1.2** ▶ Global coal demand by sector and annual average change by region in the STEPS, 2000-2050



Peaks in coal capacity additions reached in the power, steel and cement sectors are laying the foundation for global coal demand to peak in the mid-2020s

IEA, CC BY 4.0.

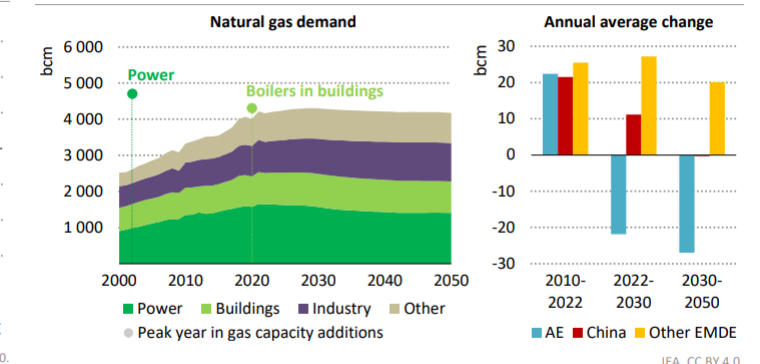
**Figure 1.3** ▶ Global oil demand by sector and annual average change by region in the STEPS, 2000-2050



Sales of gasoline and diesel passenger vehicles and trucks have already peaked, leading to a peak in oil demand before 2030

IEA, CC BY 4.0.

**Figure 1.4** ▶ Global natural gas demand by sector and annual average change by region in the STEPS, 2000-2050



Additions of new gas power plants and gas boilers in buildings are slowing; gas demand peaks before 2030 in the STEPS, though gas use in industry continues to increase

IEA, CC BY 4.0.

Source: IEA World Energy Outlook 2023  
STEPS - Stated Policies Scenario



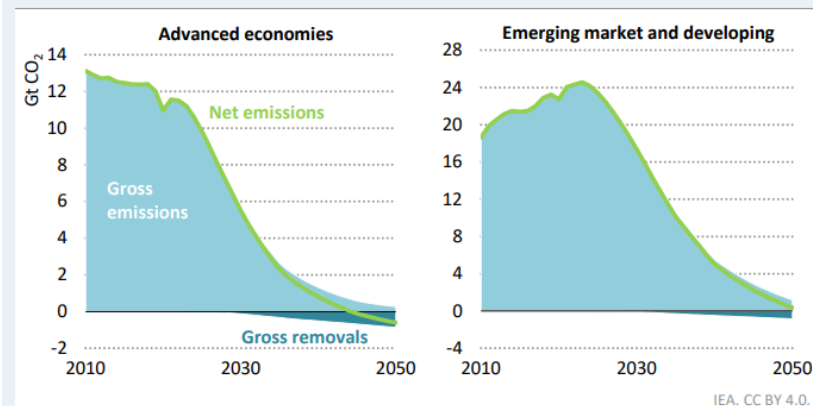
# IEA Net Zero Roadmap 2023

- The scaling up of clean energy is the main factor behind a decline of fossil fuel demand of over 25% this decade in the NZE Scenario – IEA

Source: IEA Net Zero Roadmap 2023

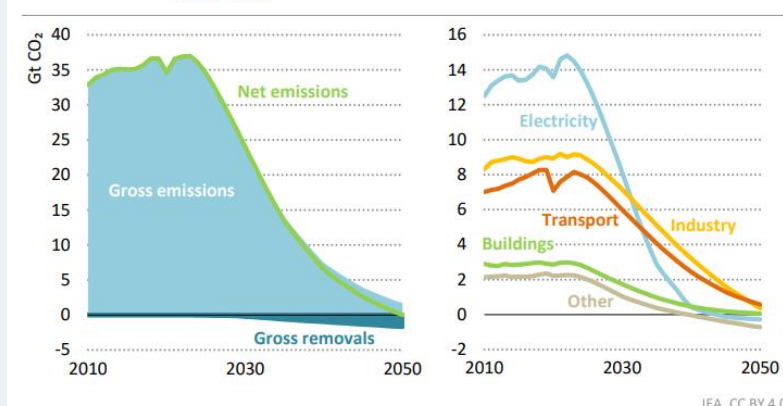
NZE – Net Zero Emissions (by 2050)

**Figure 2.1** ▶ Gross emissions and removals, and net emissions by aggregated region in the NZE Scenario, 2010-2050



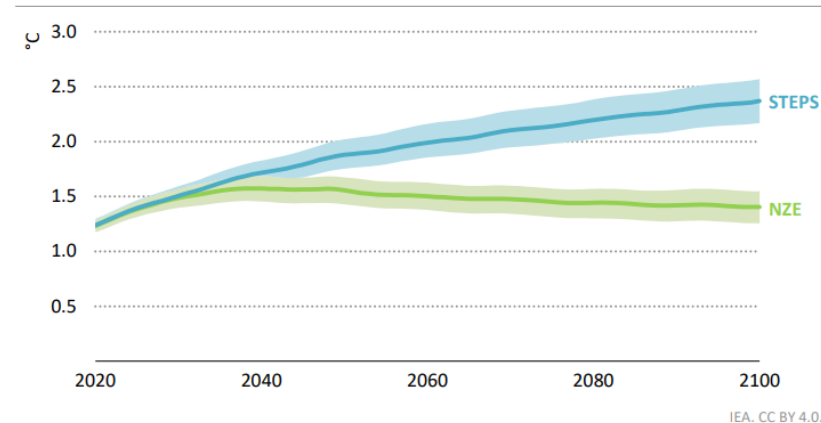
As a group, advanced economies reach net zero emissions before emerging market and developing economies, and also achieve net negative emissions by 2050

**Figure 2.2** ▶ Energy sector gross emissions and removals, total net CO<sub>2</sub> emissions, and net emissions by sector in the NZE Scenario, 2010-2050



Energy sector CO<sub>2</sub> emissions are reduced 65% by 2035 and reach net zero by 2050, with residual emissions of 1.7 Gt balanced by atmospheric removals of the same magnitude

**Figure 2.3** ▶ Median warming in the STEPS and NZE Scenario, 2020-2100

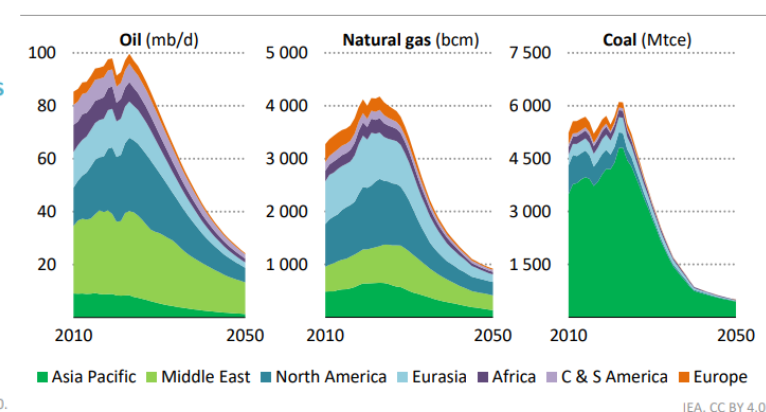


Rapid emission cuts moderate warming below 1.5 °C by 2100 with low overshoot in the NZE Scenario, while temperatures in STEPS reach 2.4 °C by 2100 and continue rising

Notes: STEPS = Stated Policies Scenario. Shaded area represents the 33-67% confidence interval. Solid line represents median warming.

Source: IEA analysis based on Climate Resource and MAGICC 7.5.3.

**Figure 2.12** ▶ Oil, natural gas and coal supply by region in the NZE Scenario, 2010-2050



Declines in demand can be met without approving new, long lead time upstream conventional oil and gas projects, new coal mines or mine lifetime extensions

Note: mb/d = million barrels per day; bcm = billion cubic metres; Mtce = million tonnes of coal equivalent; C & S America = Central and South America.

# Risks

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- Political interference
  - Alberta moratorium on green energy
    - You have to wonder why Alberta leads in green energy
    - Money talks!
  - North Dakota and coal
- Resistance from incumbents
  - Disinformation campaigns
  - Toyota
- Global shocks
  - War, climate events
- The economics will drive electrification regardless
  - “When” not “If”



# Summary

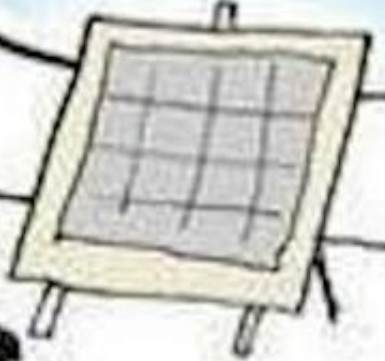
- Option 3 is the only acceptable option
- Technology evolves
  - 30 years ago we did not have the capabilities we need
  - Today we have most of what we need and paths to the rest
- We have a path to deeply decarbonize very rapidly
  - Much faster than IEA projections
- We need to accelerate the adoption of solutions that we know work
- Let's stop focusing on the details of what is happening
  - We know what the problem is
  - Work on the solutions
- We need all hands on deck
- Act like it's an emergency because it is an emergency



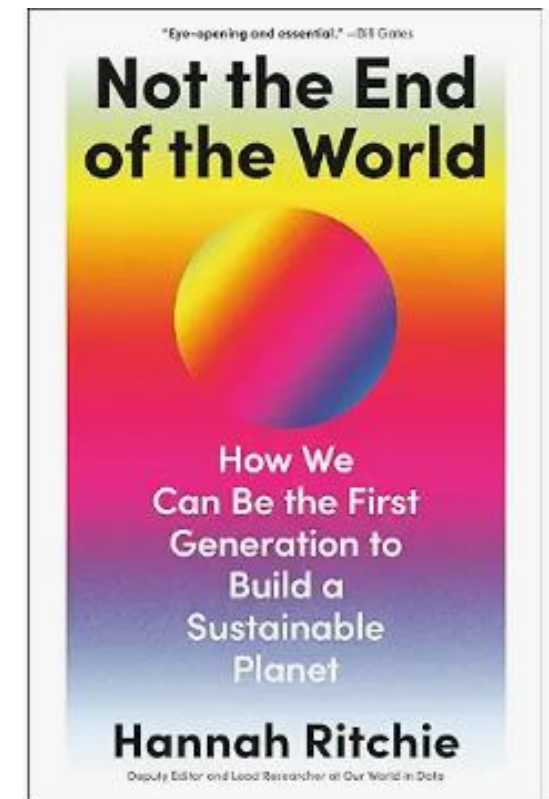
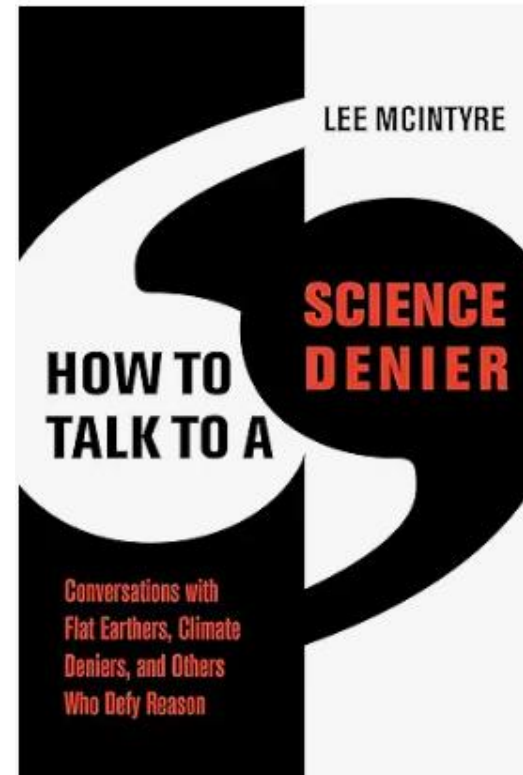
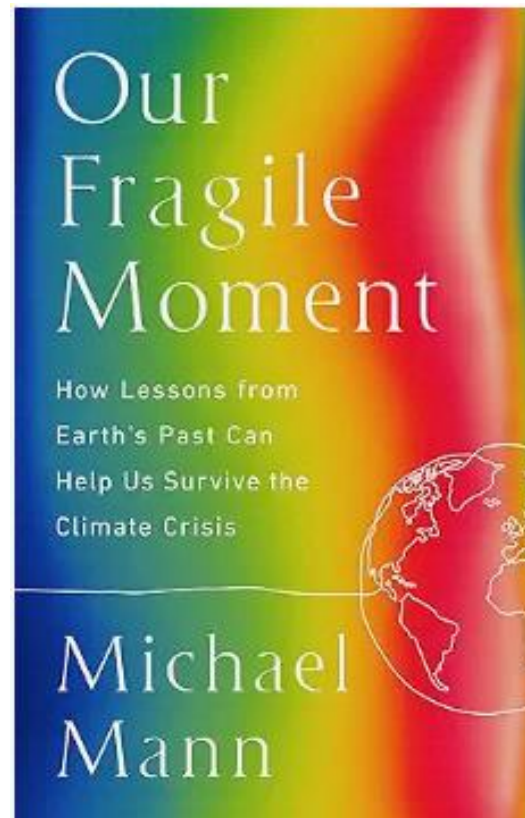
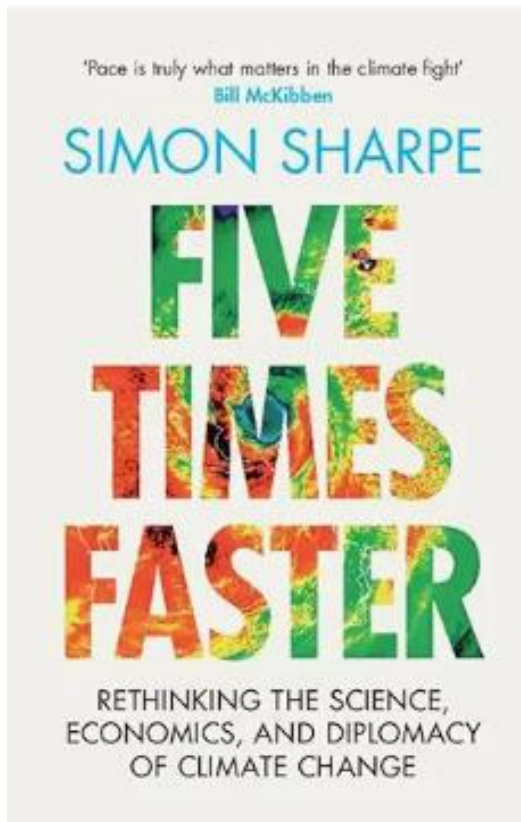
# CLIMATE SUMMIT

*What if it's not enough  
to eliminate all emissions  
and  
we decarbonize the  
world for nothing?*

- ENERGY INDEPENDENCE
- PRESERVE RAINFORESTS
- SUSTAINABILITY
- GREEN JOBS
- LIVABLE CITIES
- RENEWABLES
- CLEAN WATER, AIR
- HEALTHY CHILDREN
- etc. etc.



# Books



Hans Rosling (200 years in 4 minutes) on YouTube: <https://www.youtube.com/watch?v=jbkSRLYSojo>