

**47% of the world lives in energy poverty**



# What's the solution?

- Use more energy & better energy—help people while also protecting our environment.
- Leaders in the developed world think wind & solar are the best way to power society, but they're wrong.

# Many leaders are misguided

- They want reliable, affordable, clean energy.
- But they have misguided ideas about which energy sources will do that.
- They think the best solution is a combination of solar, wind, and batteries.
- But they're mistaken.
- They endorse common myths about energy...

# The Damage Assumption

One of the biggest errors motivating how many leaders think:

**The Damage Assumption:** The amount of energy people consume is directly proportional to the amount of environmental damage they cause.

This assumption is false. Different energy sources impact the environment in different ways.

## MYTH

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Fossil fuels are being phased out.

Solar, wind, and electric vehicles are the only things that can save the planet.

Nuclear power isn't safe.

Using more energy damages the environment.

## REALITY

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We'll continue to need fossil fuels for transportation, agriculture, and industry.

Nuclear & natural gas are better for the environment.

Nuclear power is just as safe as solar & wind.

Using more energy protects the environment.

# **We're NOT rapidly transitioning away from fossil fuels**

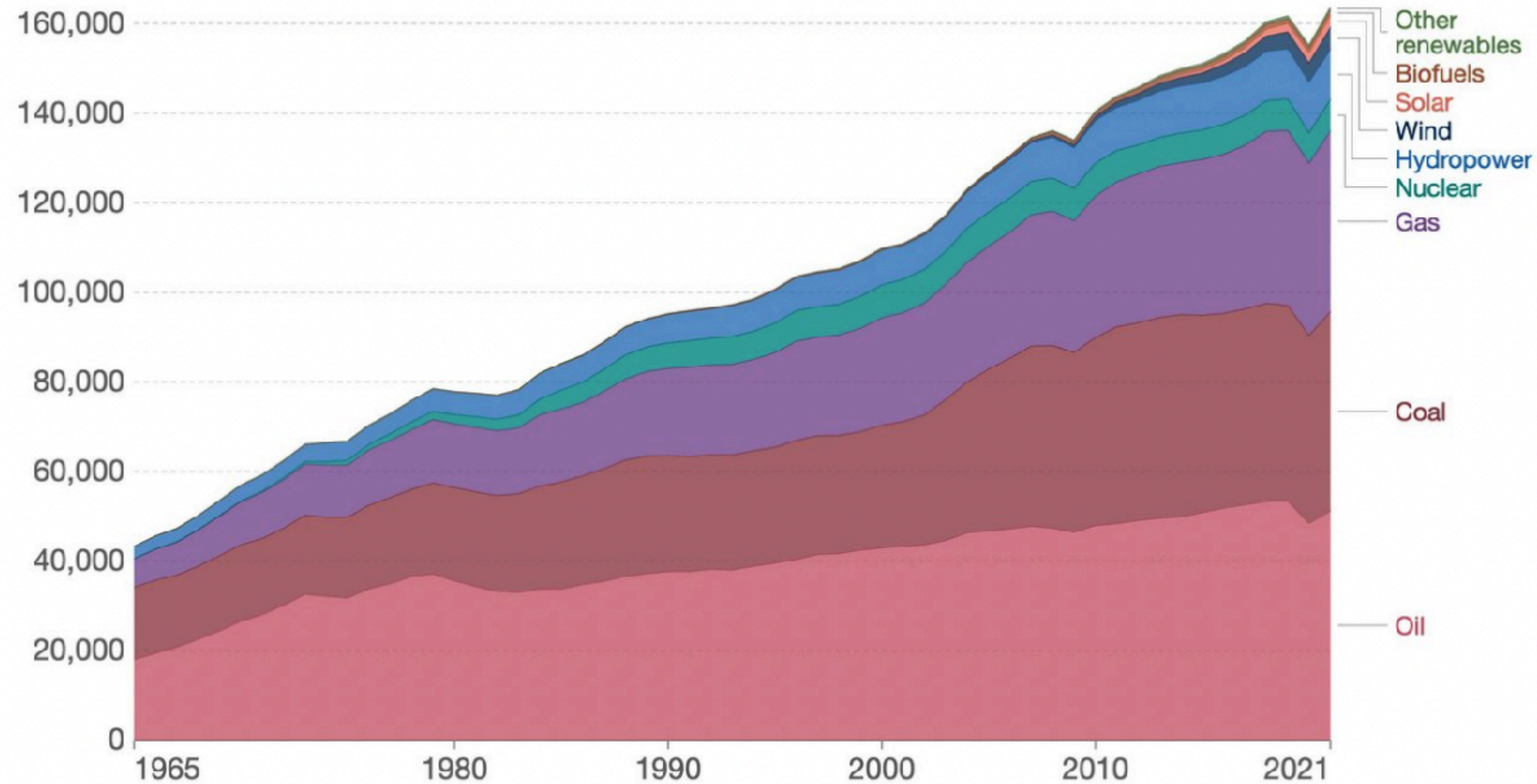
- **82% of the world's energy still comes from fossil fuels.**
- **Fossil fuel use grew 3X faster than wind & solar over the last 20 yrs.**
- **The world will consume more fossil fuels in 2050 than today based on projected growth in the developing world.**

# We're NOT rapidly transitioning away from fossil fuels

## Energy consumption by source, World

Our World  
in Data

Primary energy consumption is measured in terawatt-hours (TWh). Here an inefficiency factor (the 'substitution' method) has been applied for fossil fuels, meaning the shares by each energy source give a better approximation of final energy consumption.



Source: BP Statistical Review of World Energy

Note: 'Other renewables' includes geothermal, biomass and waste energy.

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# **Solar, wind, & batteries AREN'T better for the environment**

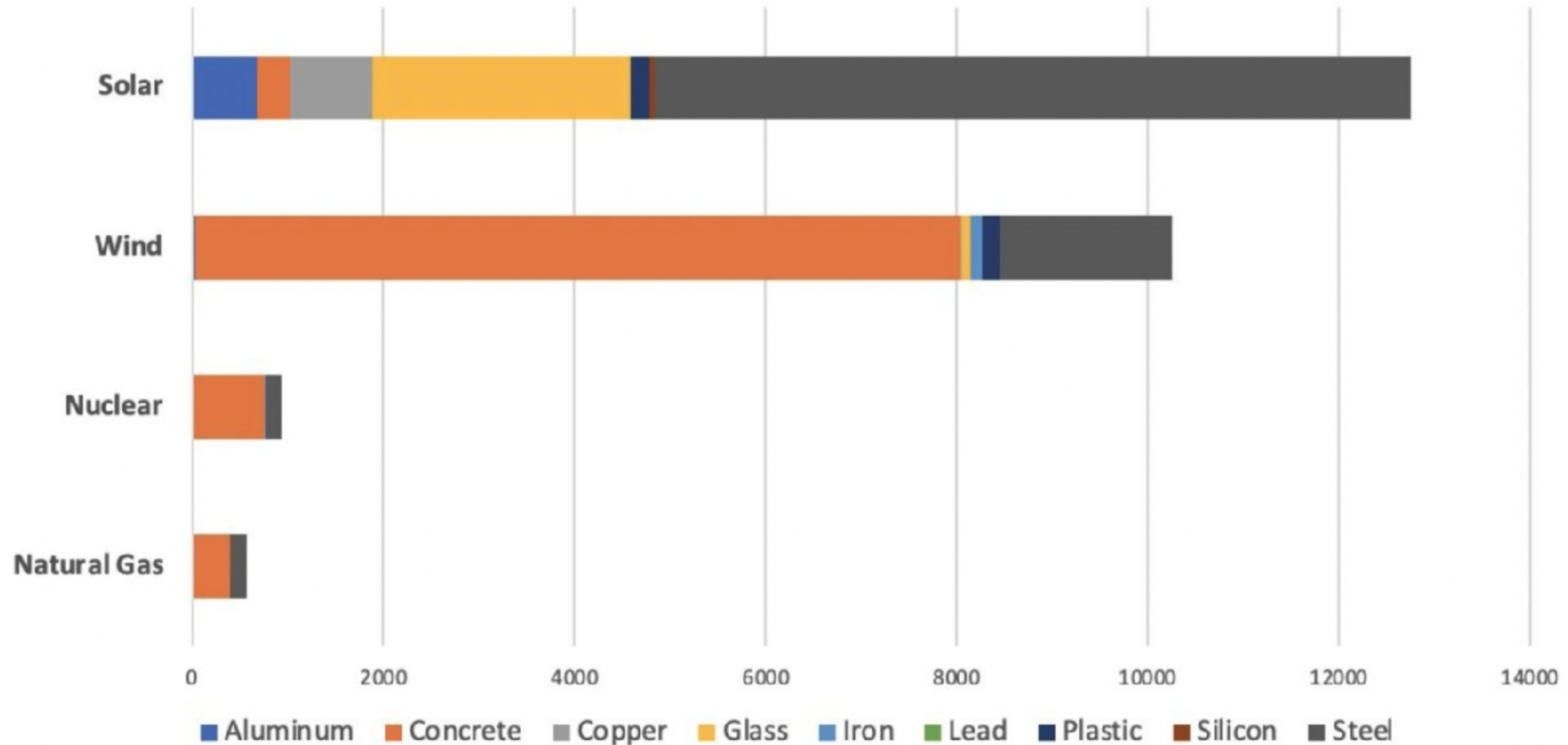
- Materials use is the most important factor that determines environmental harm.
- More materials = more harm
- Solar, wind, & batteries use more materials than nuclear & natural gas.
- Therefore, solar, wind, & batteries are worse for the environment than nuclear & natural gas.



# Less material = less environmental harm

## Material Requirements (ton/TWh)

U.S. Dept of Energy Quadrennial Technology Review 2015



# Using less land destroys fewer habits

## Land requirements of various energy technologies

<b>Technology</b>	<b>Land Required</b>	<b>Rank</b>
Small Modular Nuclear Power Plant	<0.3 m <sup>2</sup> per MWh	1
Large Nuclear Power Plant	0.3 m <sup>2</sup> per MWh	2
Natural Gas Combined-Cycle Plant	1 m <sup>2</sup> per MWh	3
Solar PV	19 m <sup>2</sup> per MWh	4
Offshore Wind Power Plant	8.4 m <sup>2</sup> to 247 m <sup>2</sup> per MWh	5
Onshore Wind Power Plant	8.4 m <sup>2</sup> to 247 m <sup>2</sup> per MWh	6

# What About CO2 Emissions?

**The biggest reduction in US CO2 emissions over the past 20 years have resulted not from shifts toward wind and solar but from shifts away from coal toward natural gas.**

Energy CO2 reductions:

- 61% = Natural gas replacing coal
- 31% = Wind
- 8% = Solar

# What About CO2 Emissions?



Large solar power plants emit 4X more lifecycle CO2 than a nuclear plant on average.

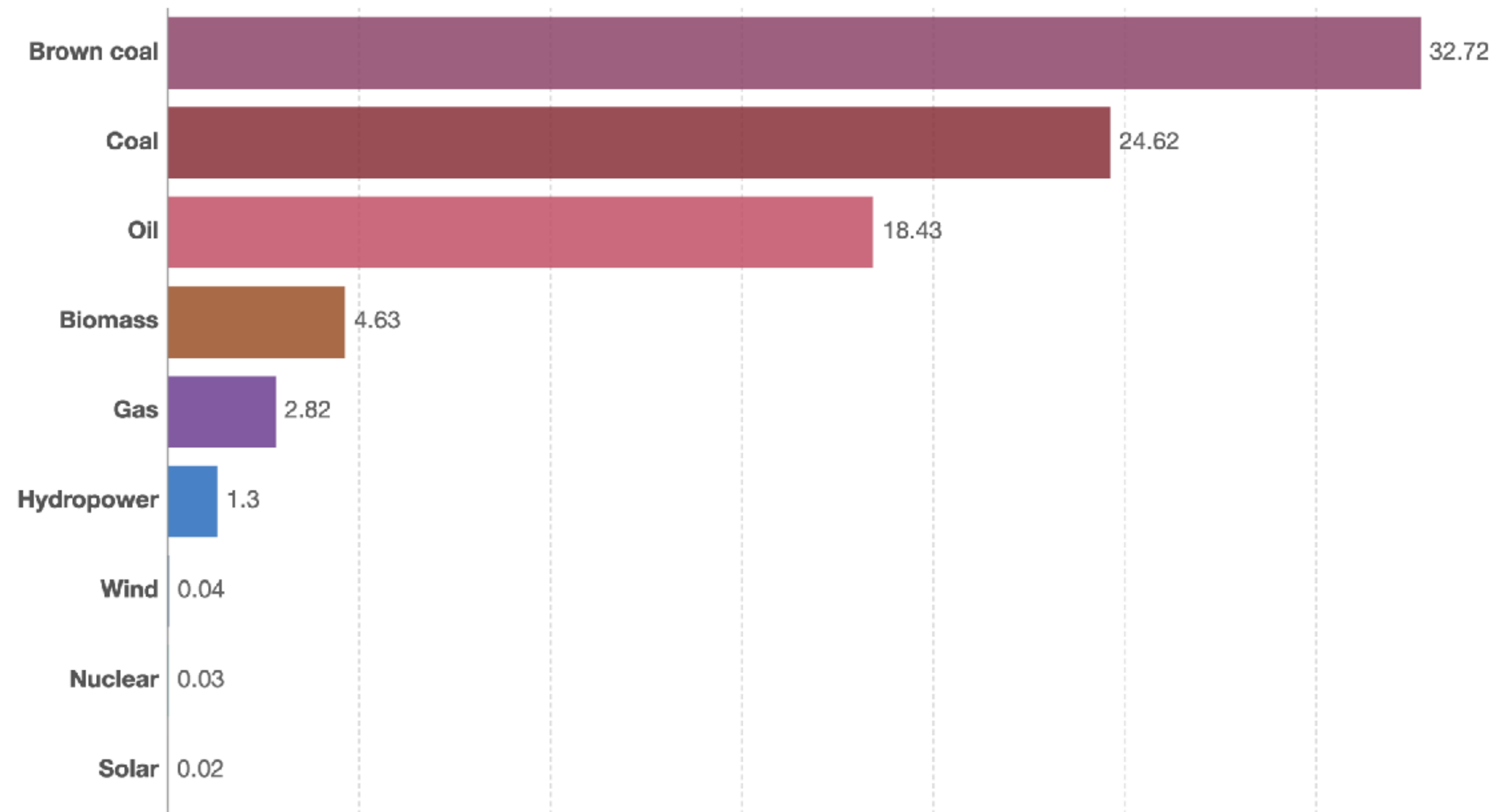
Worse: ~75% of solar panels are made in China. And solar panels made in China can emit up to 25X more lifecycle CO2 than a nuclear plant.

# Nuclear energy is safe

**Nuclear power plants are the safest way of generating reliable electricity**

## Death rates per unit of electricity production

Death rates are measured based on deaths from accidents and air pollution per terawatt-hour (TWh) of electricity.



Data source: Markandya & Wilkinson (2007); Sovacool et al. (2016); UNSCEAR (2008; & 2018)  
[OurWorldInData.org/energy](https://OurWorldInData.org/energy) | CC BY

# **Using more energy protects the environment**

**Poor countries with limited access to energy pollute more, and environmental damage increases as the gap between rich and poor countries widens.**

**Example: many people in developing countries rely on wood for cooking and heating.**

**This everyday need for wood contributes to severe deforestation.**

**As a result, poor countries have the highest rate of endangered and threatened wildlife.**

# Deforestation: Haiti vs Dominican Republic



This aerial view of the border between Haiti and the Dominican Republic illustrates the difference between using wood for cooking versus fossil fuels.

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# **The Better Energy Strategy**

**No source of energy is perfect. But some are better for people & the planet than others.**

**We need to evaluate the costs & benefits of each energy source to find the best balance of costs & benefits.**

**3 categories of costs & benefits to evaluate:**

- Human factors**
- Environmental factors**
- Local feasibility factors**

# Human & environmental factors

	Small Nuclear	Large Nuclear	Natural Gas	Solar PV	Onshore Wind	Offshore Wind
<b>Human Criteria</b>						
Security	2	3	1	5	4	4
Reliability	1	1	2	3	4	4
Affordability	3	2	1	4	5	6
Safety	2	2	4	1	3	3
Pollution	1	1	4	2	3	3
Greenhouse gas emissions	1	1	5	4	2	3
Versatility	2	3	1	4	5	5
Scalability	1	3	2	4	5	6
<b>Environmental Criteria</b>						
Materials use	1	1	2	3	4	4
Land use	1	1	2	3	4	4
Pollution	1	1	4	2	3	3
Waste	2	3	1	4	3	3
<b>Total (lowest score is best)</b>	<b>18</b>	<b>22</b>	<b>29</b>	<b>39</b>	<b>45</b>	<b>48</b>

# Local feasibility factors

Not every energy source is best for a particular geographical area. We need to evaluate which energy sources are most feasible for a given place.

**Local energy improvement:** Does an energy source provide at least as much energy to the local population as they are getting from their current sources?

**Local energy infrastructure:** Does a locality have the political, economic, and resource infrastructure to build and operate a facility that uses a given energy source?

# **The Better Energy Strategy**

- 1. Accelerate the transition from coal to natural gas and nuclear power.**
- 2. Finance power plants, transmission lines, and pipelines in the developing world.**
- 3. Reform regulations to support the rapid deployment of nuclear power plants.**
- 4. End finance restrictions on oil, gas, and coal.**
- 5. Build hydro- and geothermal plants wherever possible.**
- 6. Eliminate renewable energy subsidies that distort the price of power and are parasitic on the economics of thermal power plants.**
- 7. Build pipelines that support domestic oil and gas production and distribution.**
- 8. Build liquefied natural gas (LNG) facilities that encourage trade in natural gas.**
- 9. Upgrade and expand refinery capacity.**

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