



Transitions to Renewable Energy

Workshop on Coastal and Ocean
Governance for Indigenous Peoples

October 21, 2025

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Burchill Wind Farm



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Sophie Lavoie, [NB Media Co-op](#)

Gretchen Fitzgerald, [Sierra Club Canada Foundation](#)

Gordon Edwards, [Canadian Coalition for Nuclear Responsibility](#)



1. History: from biomass to fossil fuels

Global primary energy consumption by source

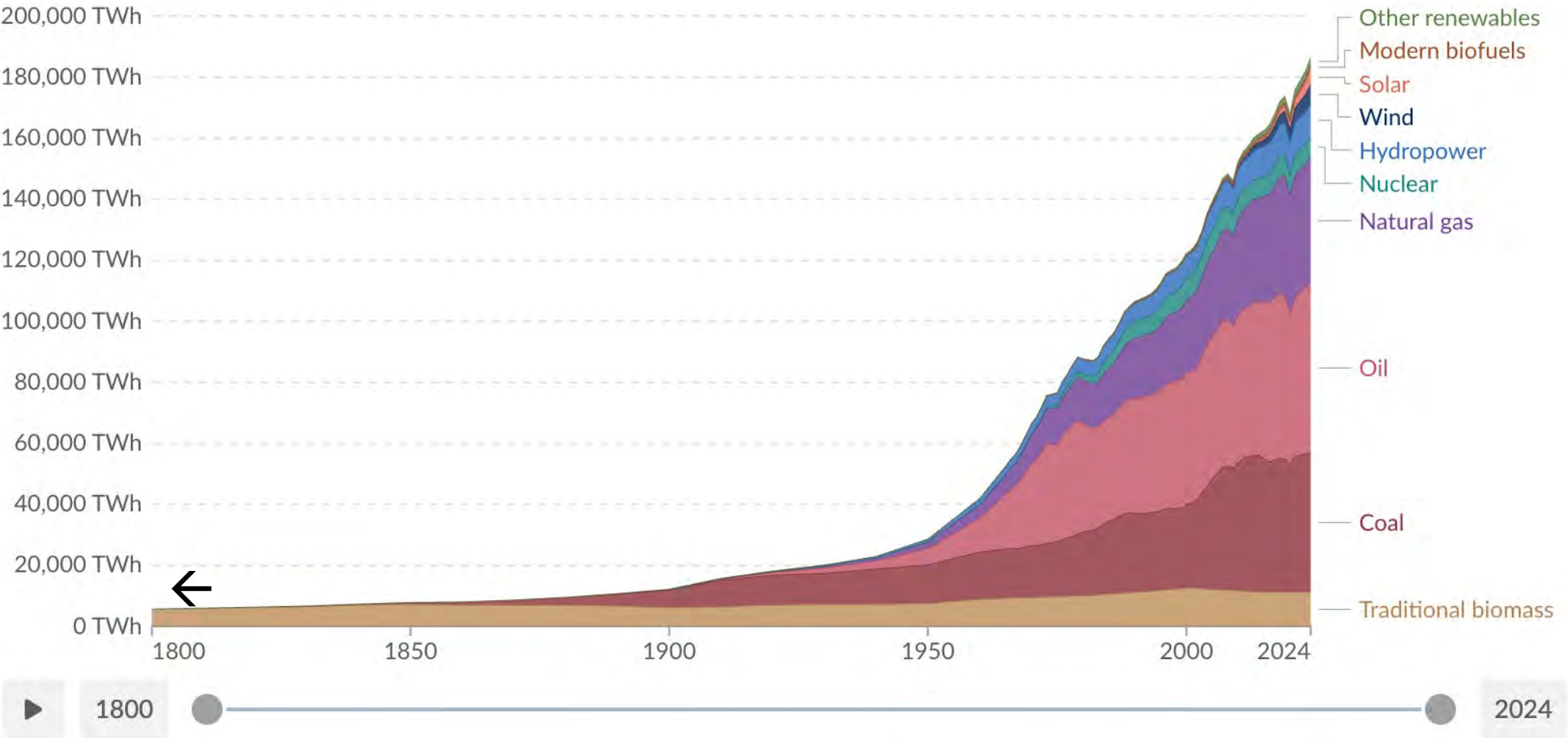
Primary energy is based on the substitution method and measured in terawatt-hours.

Our World
in Data

Table

Chart

Settings





2. Impact of the fossil fuel era

Global primary energy consumption by source

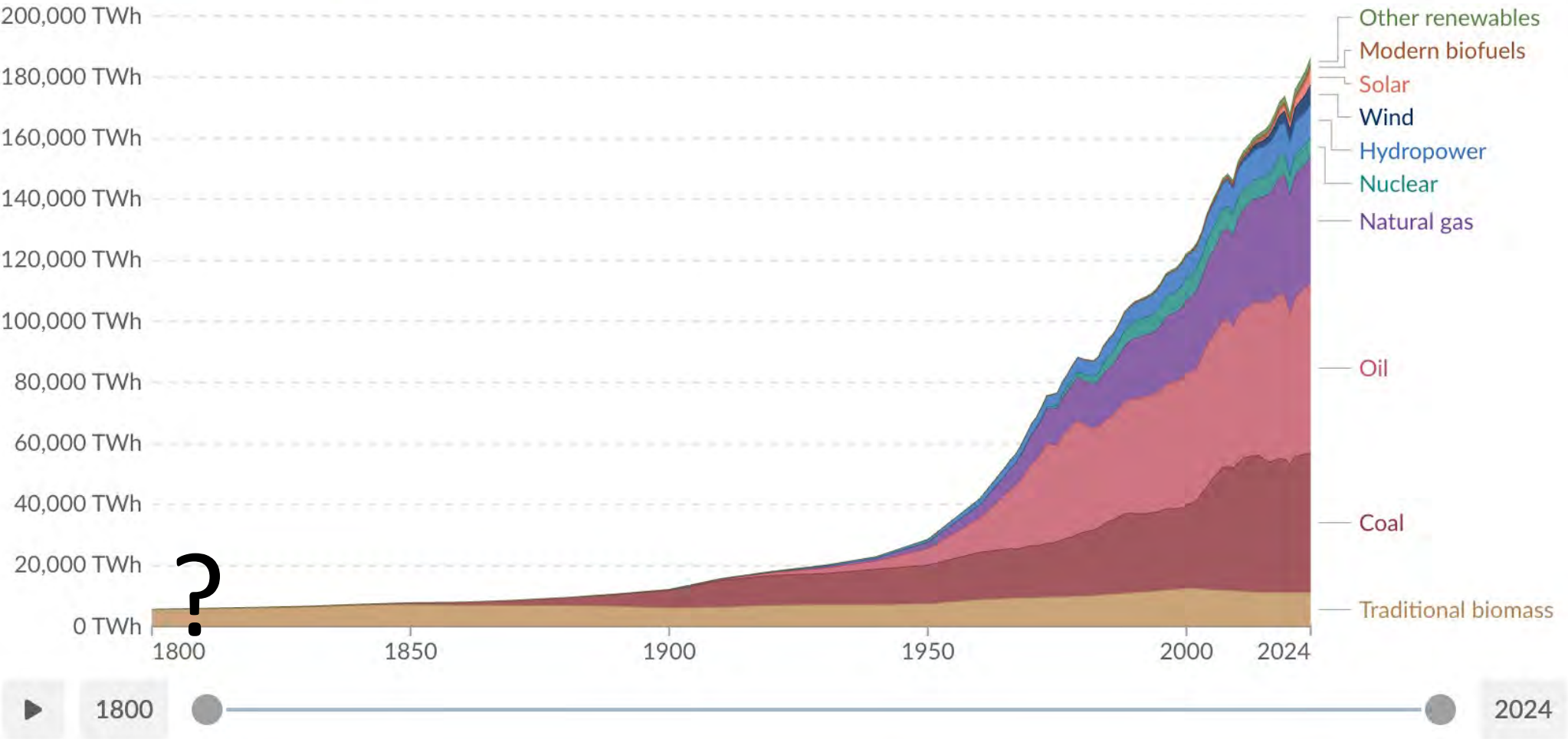
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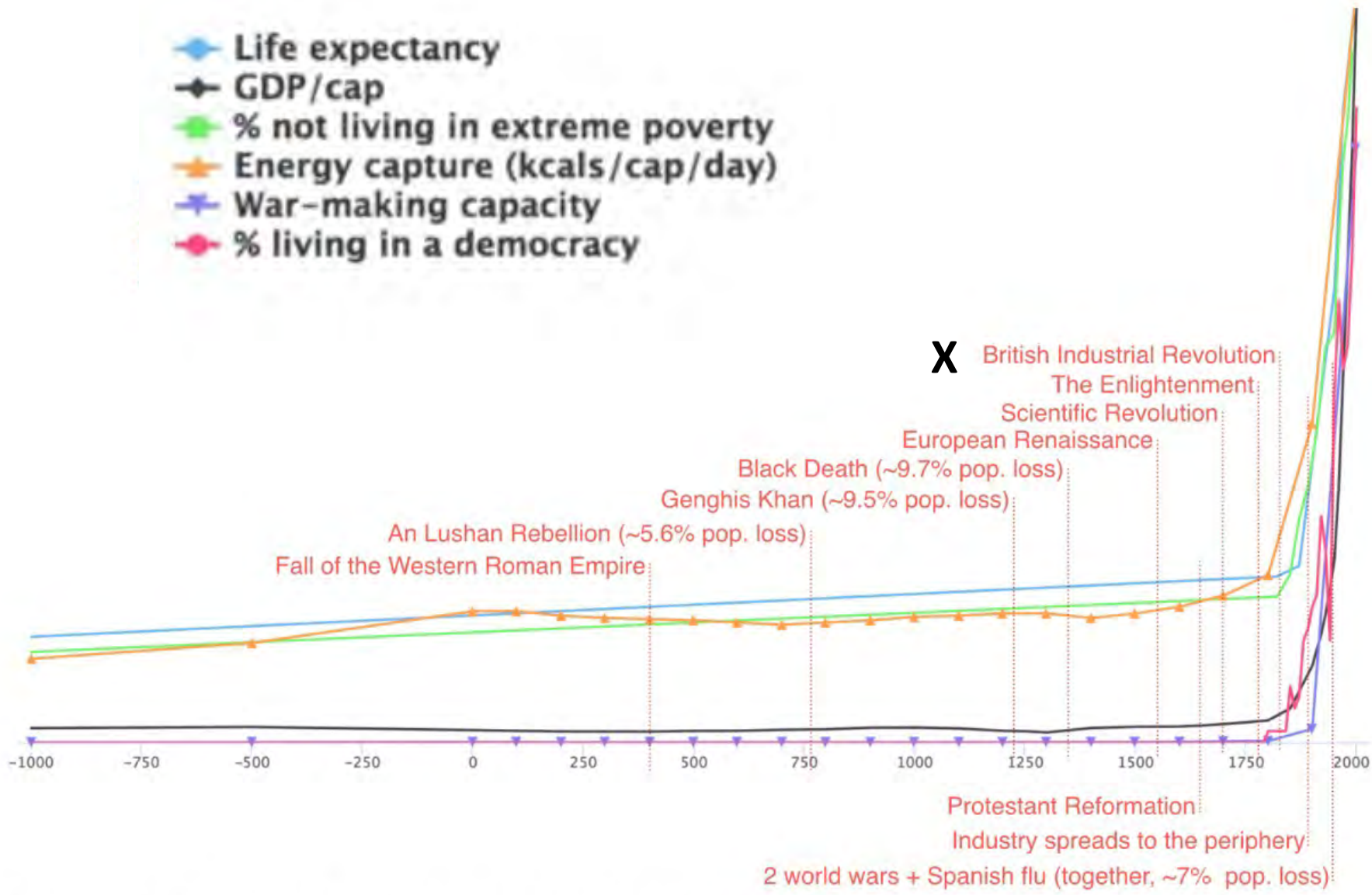
Our World
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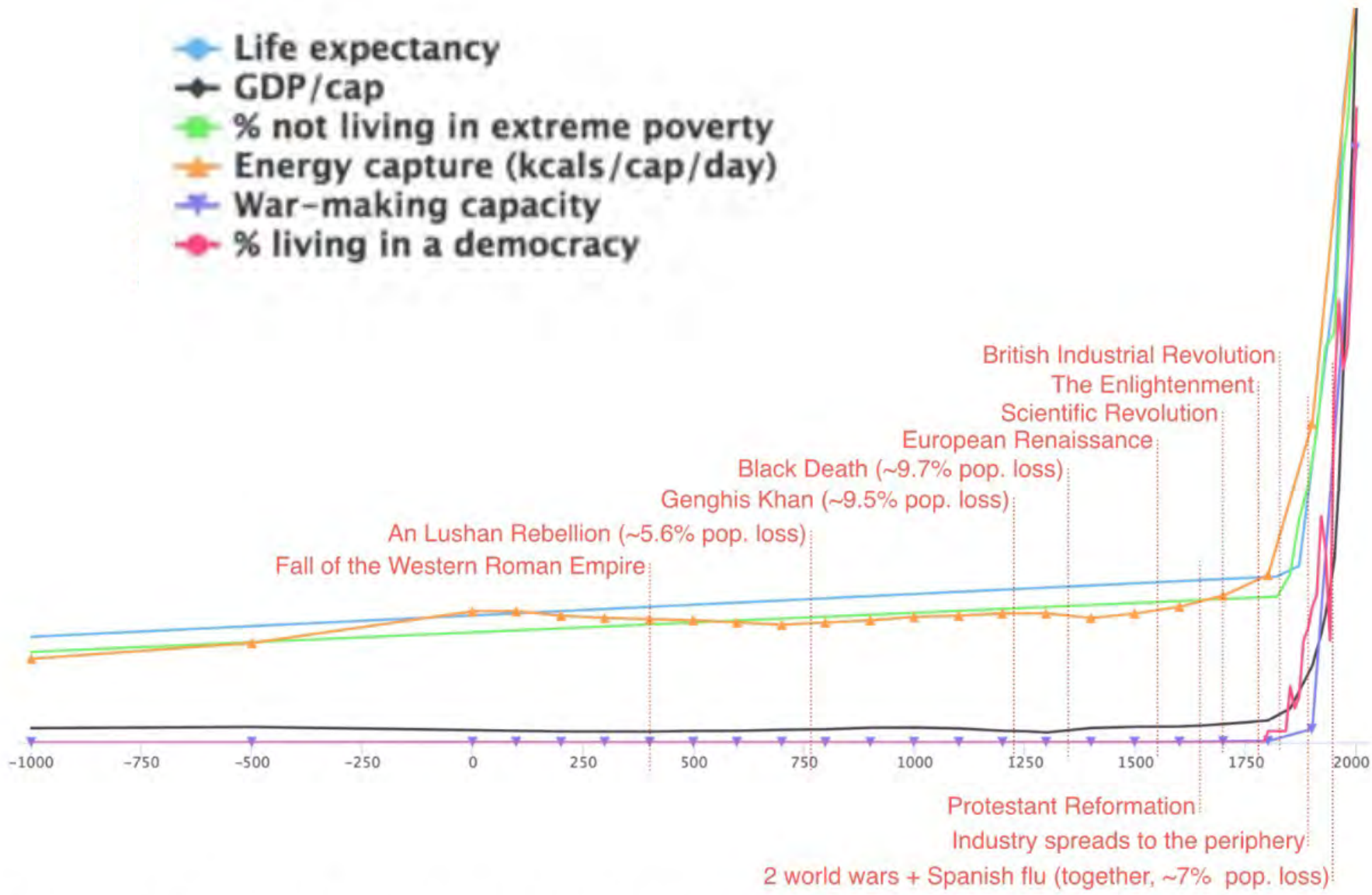
Settings





Huge rise in “global well-being” after the industrial revolution, the start of the fossil-fuel era

The impact of historical events on six measures of global well-being. By Luke Muehlhauser. Used with permission.



Achieving the huge rise in “global well-being” required huge reserves of fossil fuels

The impact of historical events on six measures of global well-being. By Luke Muehlhauser. Used with permission.

Greenhouse gas emissions by gas, World, 1850 to 2023

Greenhouse gas emissions from all sources, including agriculture and land-use change. They are measured in tonnes of carbon dioxide-equivalents over a 100-year timescale.

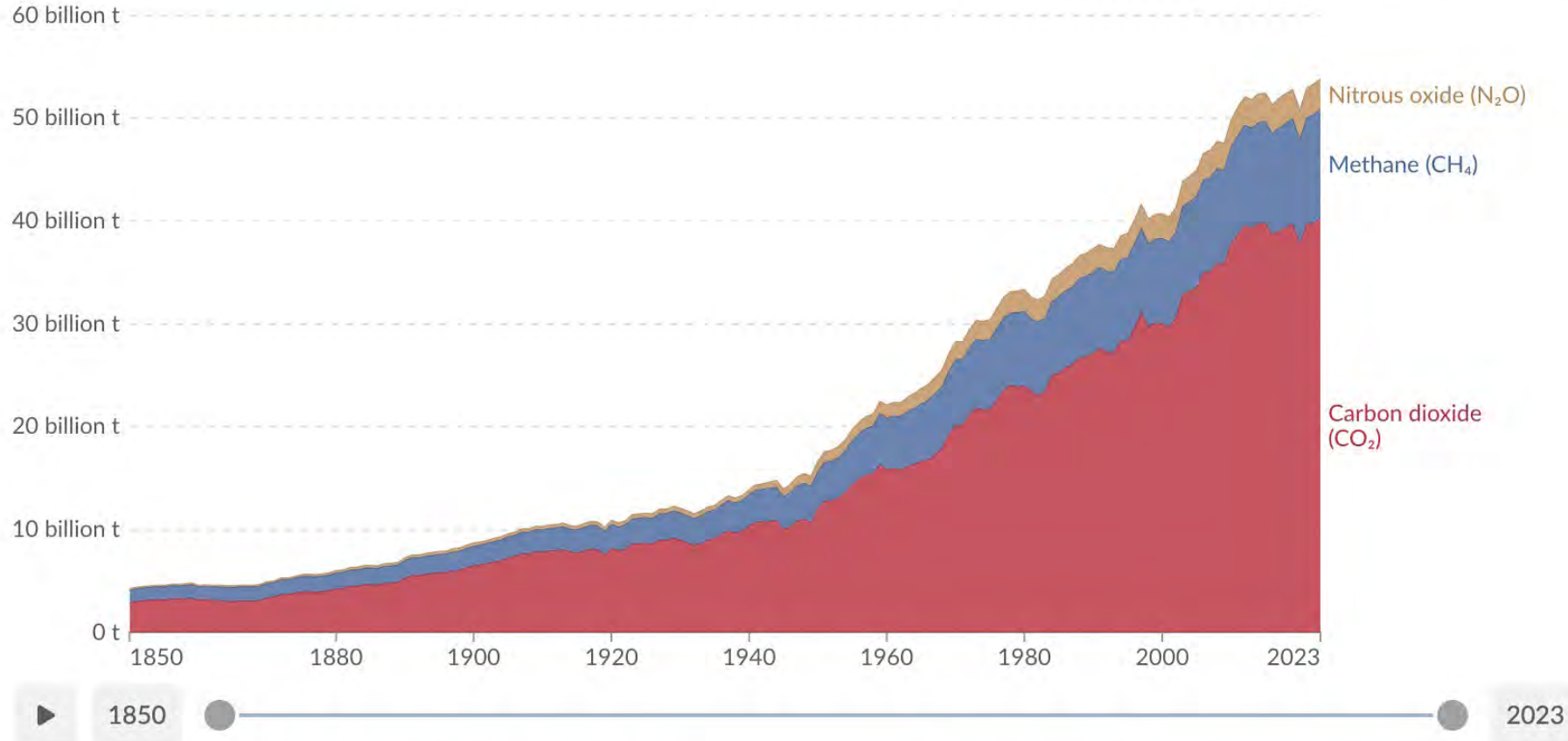
Our World
in Data

Table

Chart

Edit countries and regions

Settings



Huge rise in greenhouse gas emissions, trapping heat in the atmosphere

Data source: Jones et al. (2024) – [Learn more about this data](#)

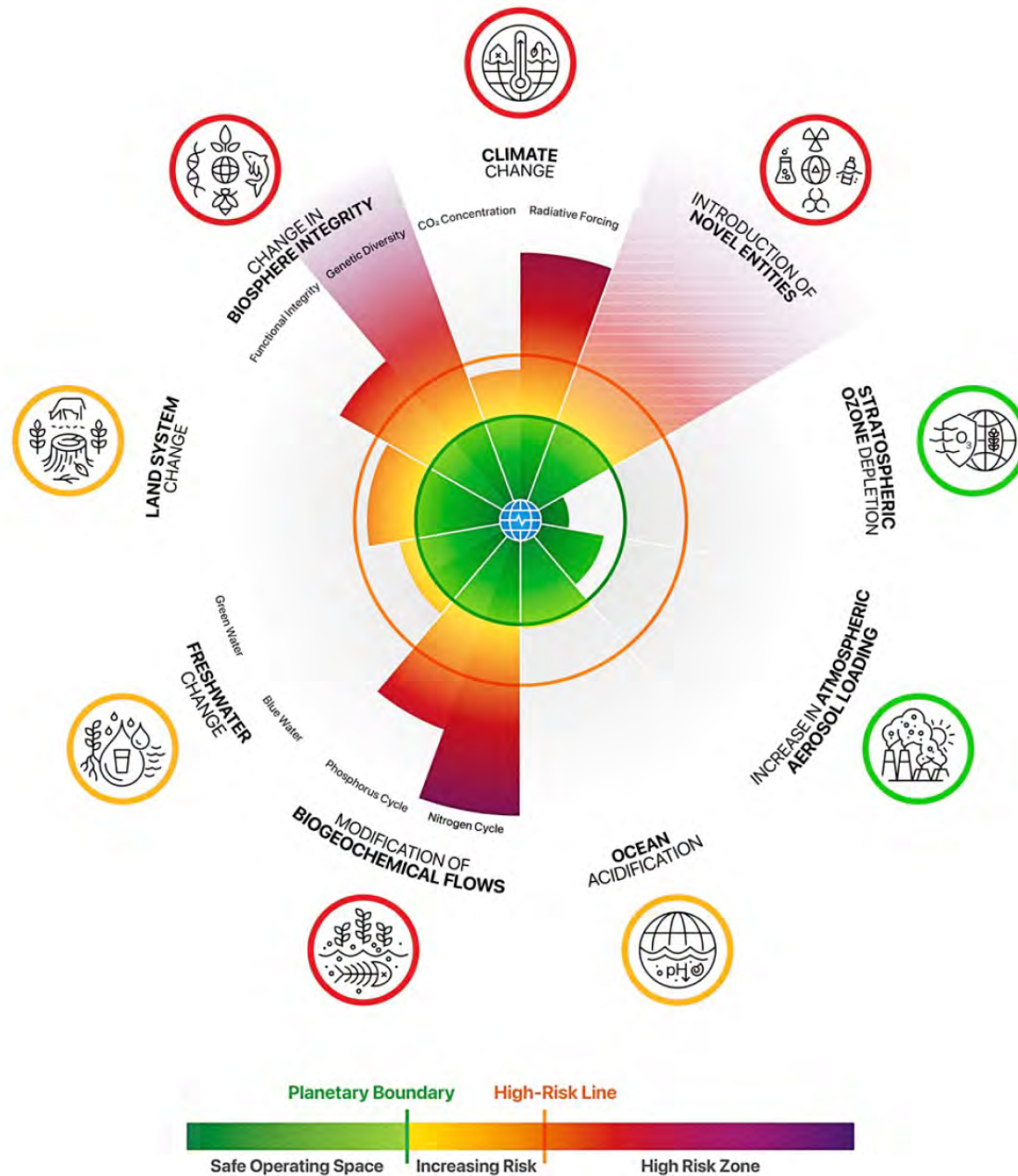
OurWorldinData.org/co2-and-greenhouse-gas-emissions | CC BY

Download

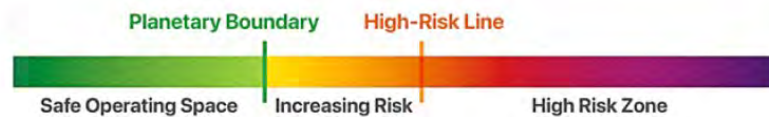
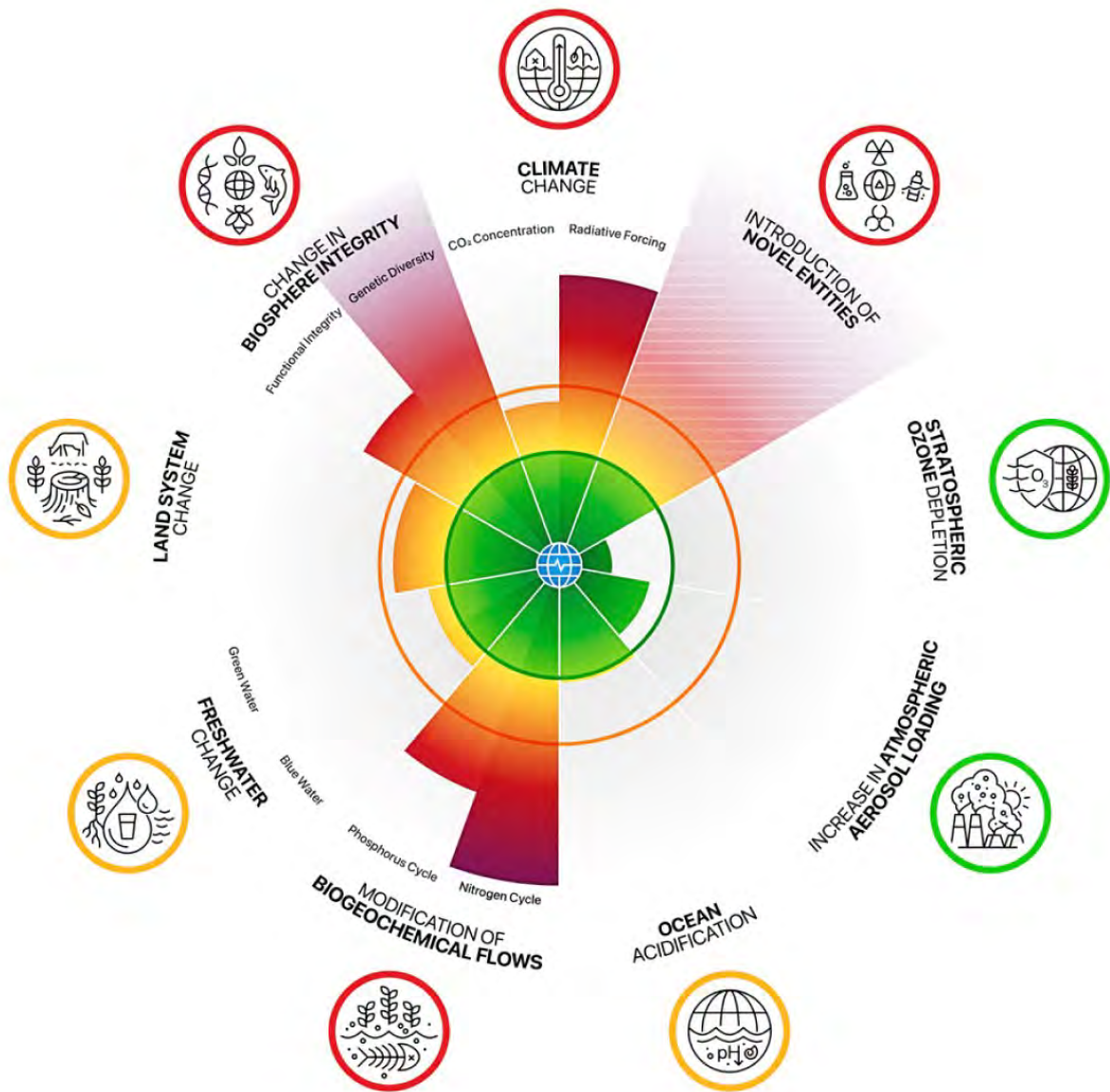
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Exceeding planetary boundaries



Planetary Boundaries Science (PBScience). 2025.
Planetary Health Check 2025. Potsdam Institute for
Climate Impact Research (PIK), Potsdam, Germany.



Exceeding planetary boundaries ... from using fossil fuels to rapidly over-use the earth's resources to give societies increased "global well-being"



3. End of the fossil fuel era

Canada's targets for reducing GHG emissions

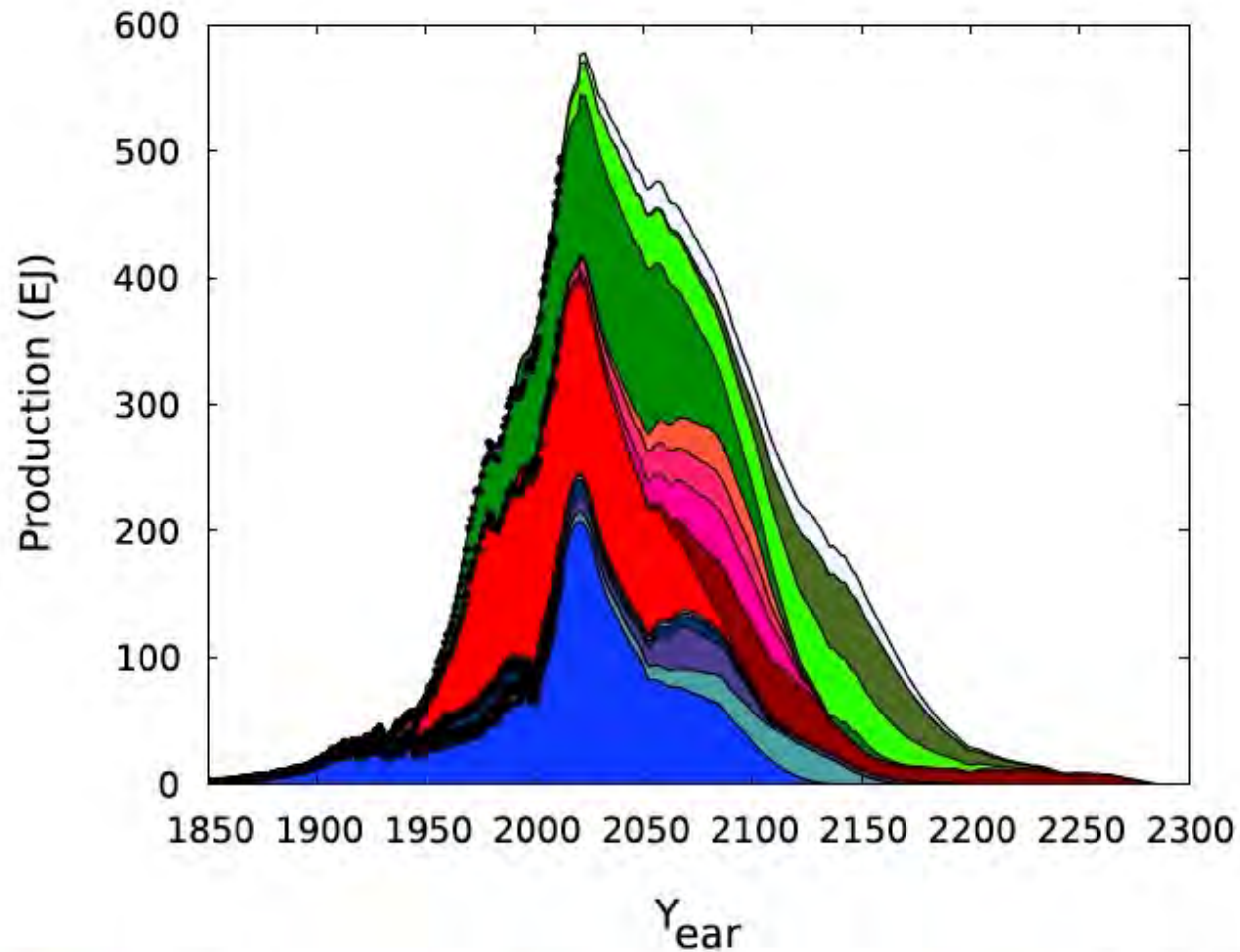
2030: total emissions 40% below 2005 levels

2030: coal plant phase-out

2035: net zero electricity grid

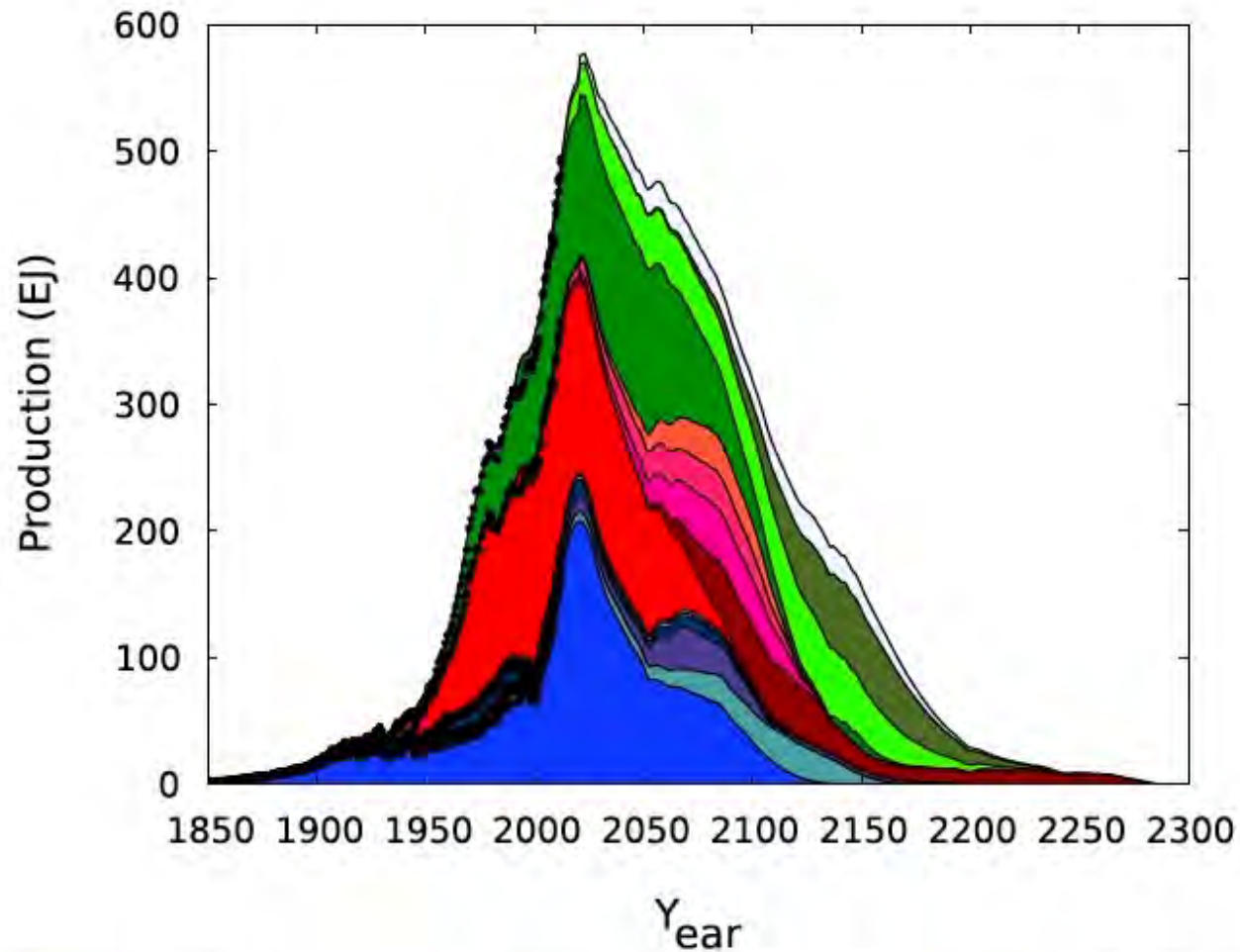
2050: net zero emissions





**Fossil fuel
production
has peaked
and now will
decline**

Moir et al., (2015) Projection of world fossil fuels by country. *Fuel* 141, pp. 120–135.



Decline in fossil fuel production

If societies actually tried to burn all these fossil fuels, the planet would be unlivable (far exceed most planetary boundaries) long before the last fossil fuels were extracted

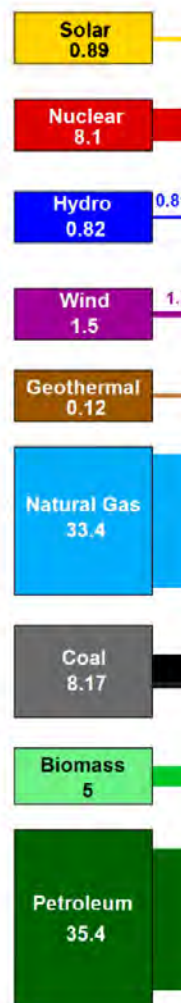


Moir et al., 2015

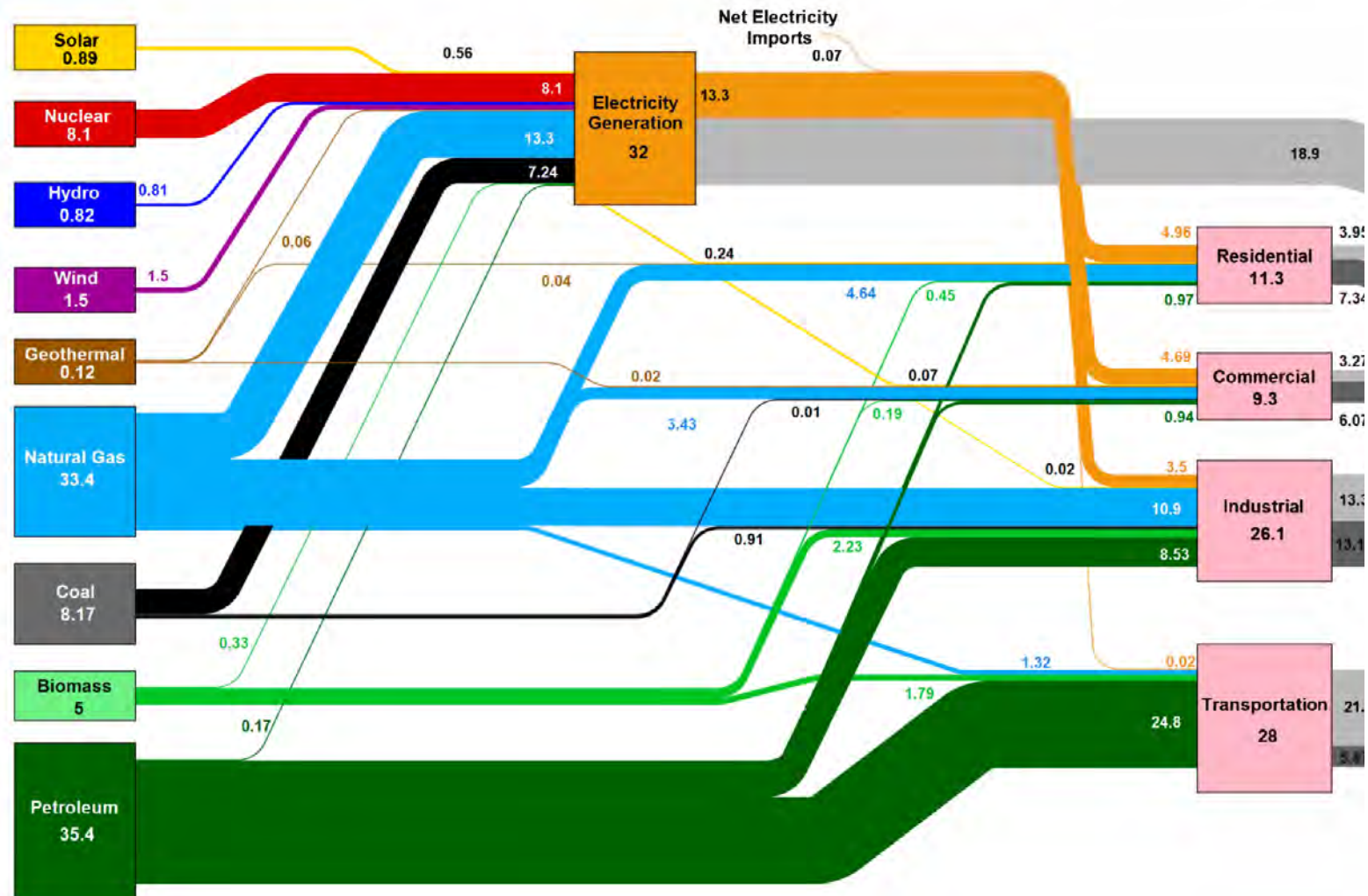


4. What comes after fossil fuels?

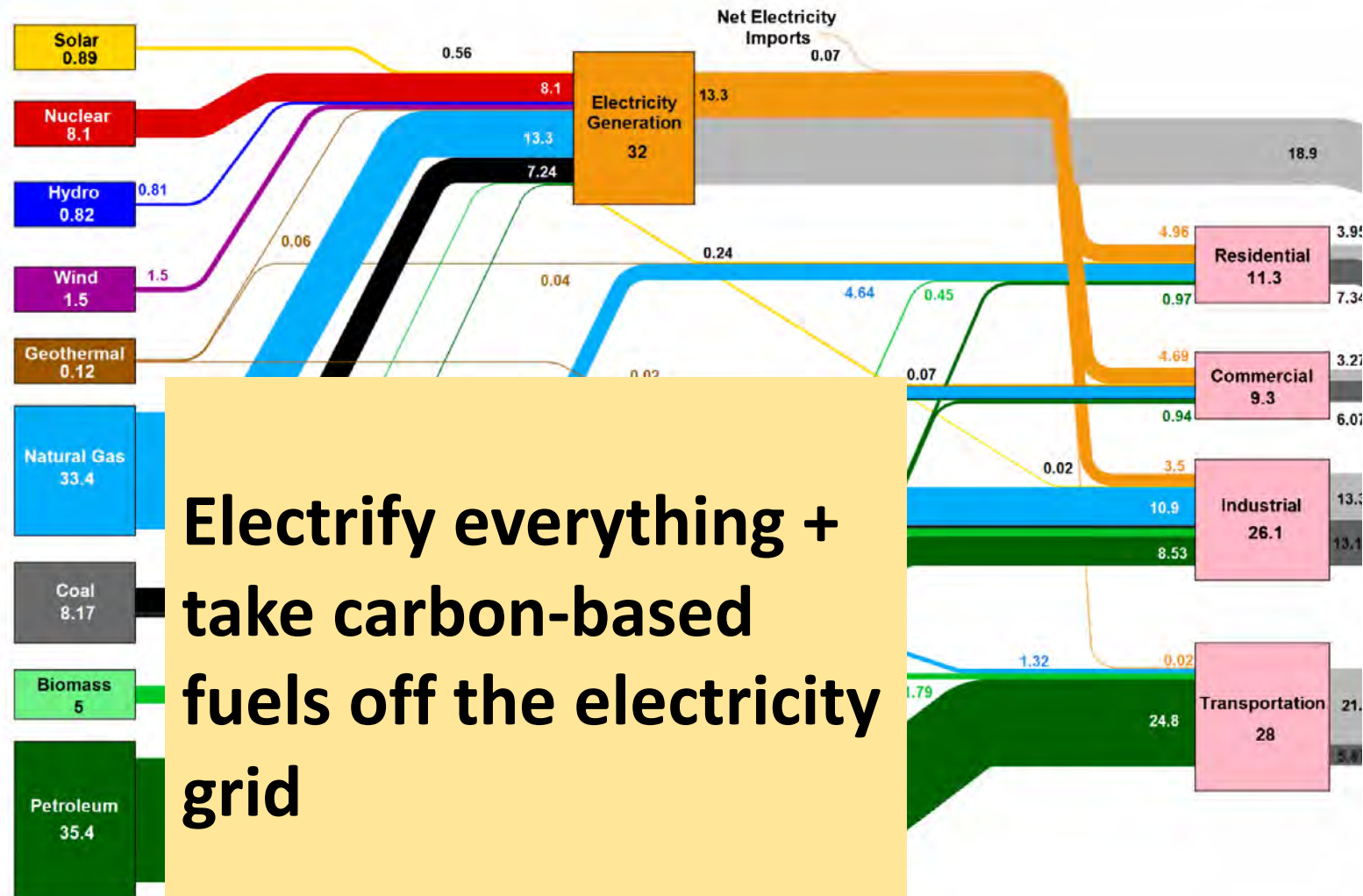
Estimated U.S. Energy Consumption in 2023: 93.6 Quads*



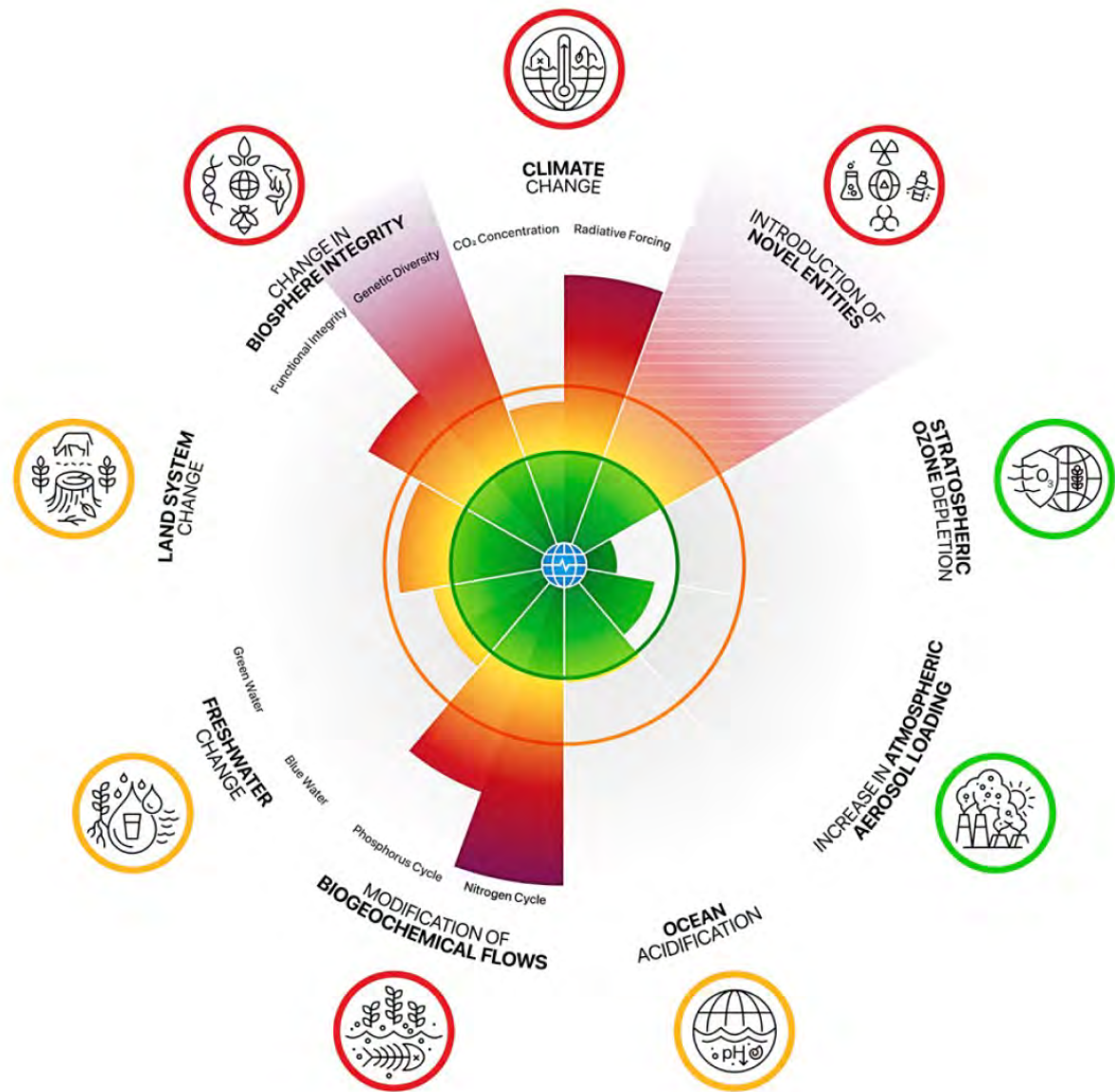
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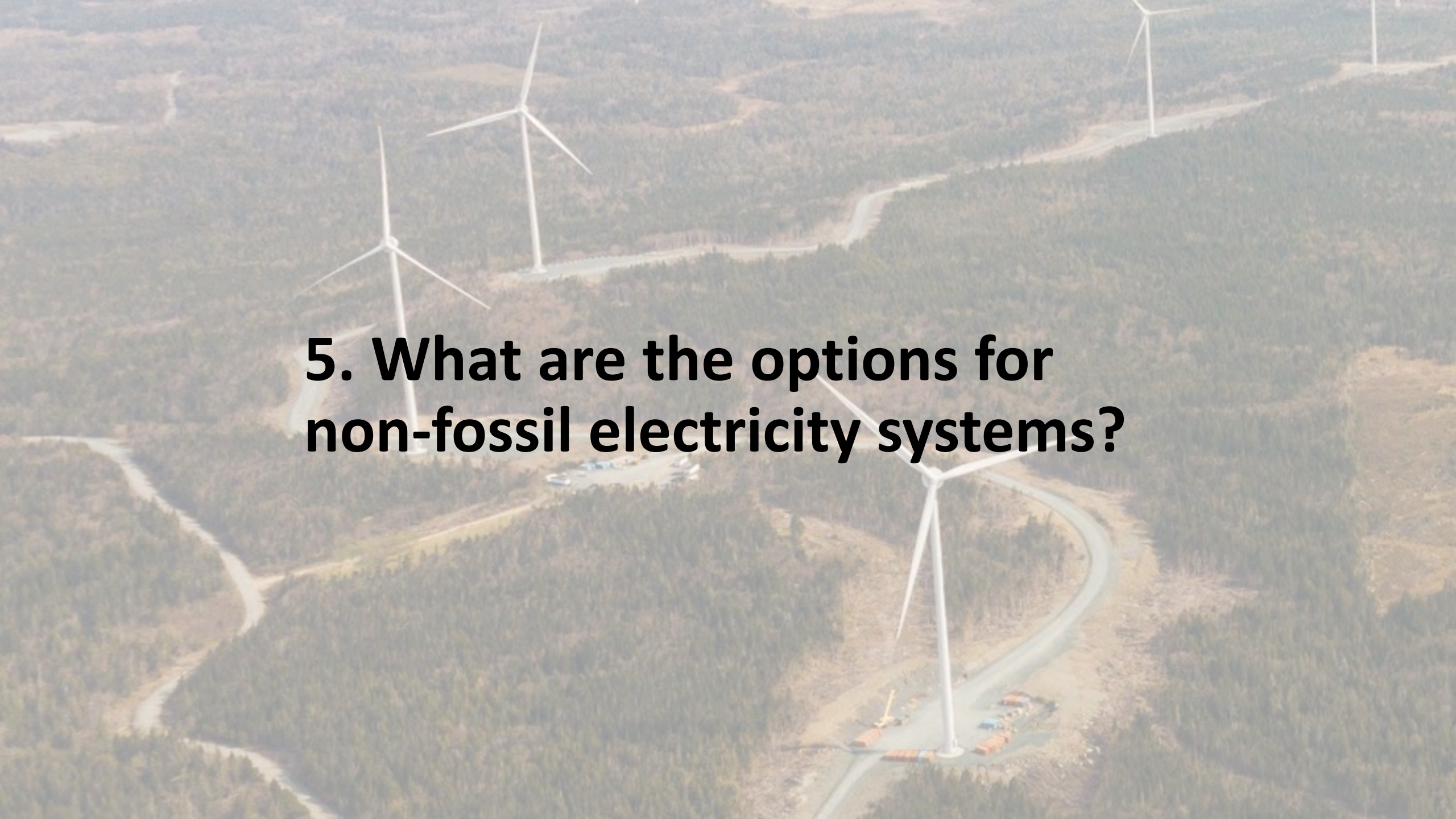


**Electrify everything +
take carbon-based
fuels off the electricity
grid**



**Electrify everything
and take fossil fuels
fuels off the electricity
grid ...**

**... While keeping
within planetary
boundaries**

An aerial photograph of a wind farm situated in a densely forested, hilly landscape. Several large, white, three-bladed wind turbines are visible, spaced out across the terrain. Winding roads or paths cut through the forest, connecting the turbines. The overall scene is hazy, suggesting a misty or overcast day. The text "5. What are the options for non-fossil electricity systems?" is overlaid in the center of the image.

**5. What are the options for
non-fossil electricity systems?**

Wood pellets
Solar power
Onshore wind
Hydroelectric
Nuclear power
Offshore wind
Tidal power
Geothermal

**8 options for
generating electricity
without fossil fuels**

Wood pellets
Solar power
Onshore wind
Hydroelectric
Nuclear power
Offshore wind
Tidal power
Geothermal

**5 options currently
operating in Canada**

Wood pellets
Solar power
Onshore wind
Hydroelectric
Nuclear power
Offshore wind
Tidal power
Geothermal

**5 options currently
operating in Canada**

**Three options are not currently
generating electricity in Canada**

***but these options are possible or
planned for future**

Non-fossil fuel electricity systems in Atlantic Canada

Wood pellets

Solar power

Onshore wind

Hydroelectric

Nuclear power

Non-fossil fuel electricity systems in Atlantic Canada

Wood pellets

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Nuclear power

**Four systems
are renewable
energy**

Non-renewable

Non-fossil fuel electricity systems in Atlantic Canada

Wood pellets

Solar power

Onshore wind

Hydroelectric

Nuclear power

**Four systems
are renewable
energy**

Non-renewable

**Some claims are made that
nuclear energy is renewable**

Non-fossil fuel electricity systems in Atlantic Canada

Wood pellets

Solar power

Onshore wind

Hydroelectric

Nuclear power

**Wood pellets carbon-based
produce greenhouse gases**

**Four other systems produce
electricity without
greenhouse gases when
operating**

Non-fossil fuel electricity systems in Atlantic Canada

Wood pellets

Solar power

Onshore wind

Hydroelectric

Nuclear power

**These three
systems take 3-5
years to grid
connection**

**These two systems
take 20+ years to
grid connection**

Non-fossil fuel electricity systems in Atlantic Canada

Wood pellets

Solar power

Onshore wind

Hydroelectric

Nuclear power

**All these
systems can
contribute to
exceeding
planetary
boundaries**

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**All these
systems can
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boundaries**

**Only one makes “forever”
radioactive waste**



6. Wood pellets (biomass)

Pellet stoves widely used for heat

- Efficient, affordable way to heat space
- If widely used, would be unsustainable (use up forests faster than they could be replaced)
- Similar to fossil fuels, emits greenhouse gases and dangerous PM 2.5 particles



Wood pellets for electricity a bad idea

- NB Power proposing to convert Belledune coal fuel with wood pellets
- Very inefficient way to make electricity
- Similar to fossil fuels, emits greenhouse gases and dangerous PM 2.5 particles

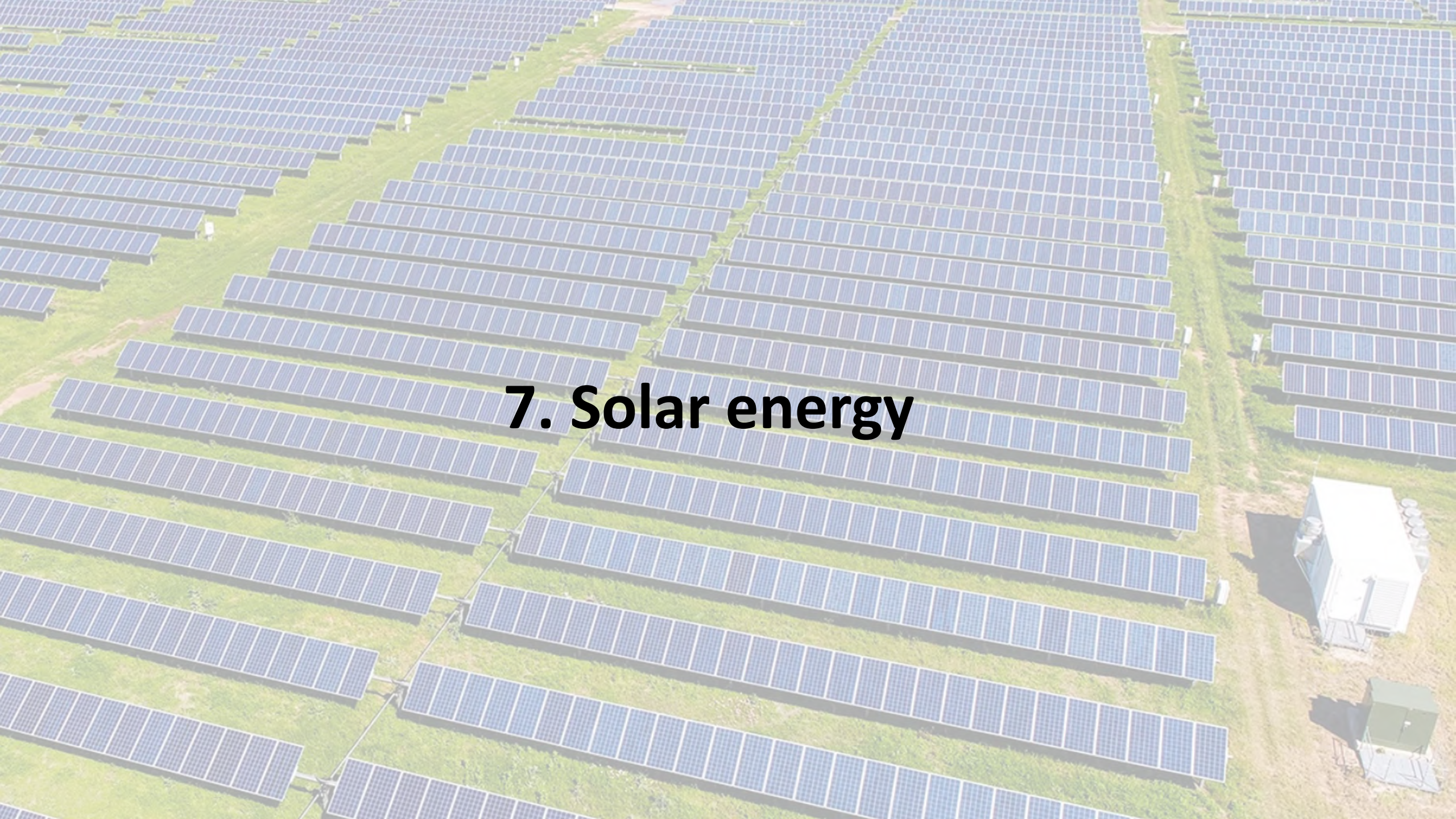


Drax biomass plant,
U.K.

Wood pellets for electricity a bad idea

- In the long term, burning wood for electricity will destroy our forests and weaken biodiversity
- Will worsen conditions for the rural communities and small businesses in the areas being stripped and where the wood is burned
- Will reduce ecosystem and social system sustainability

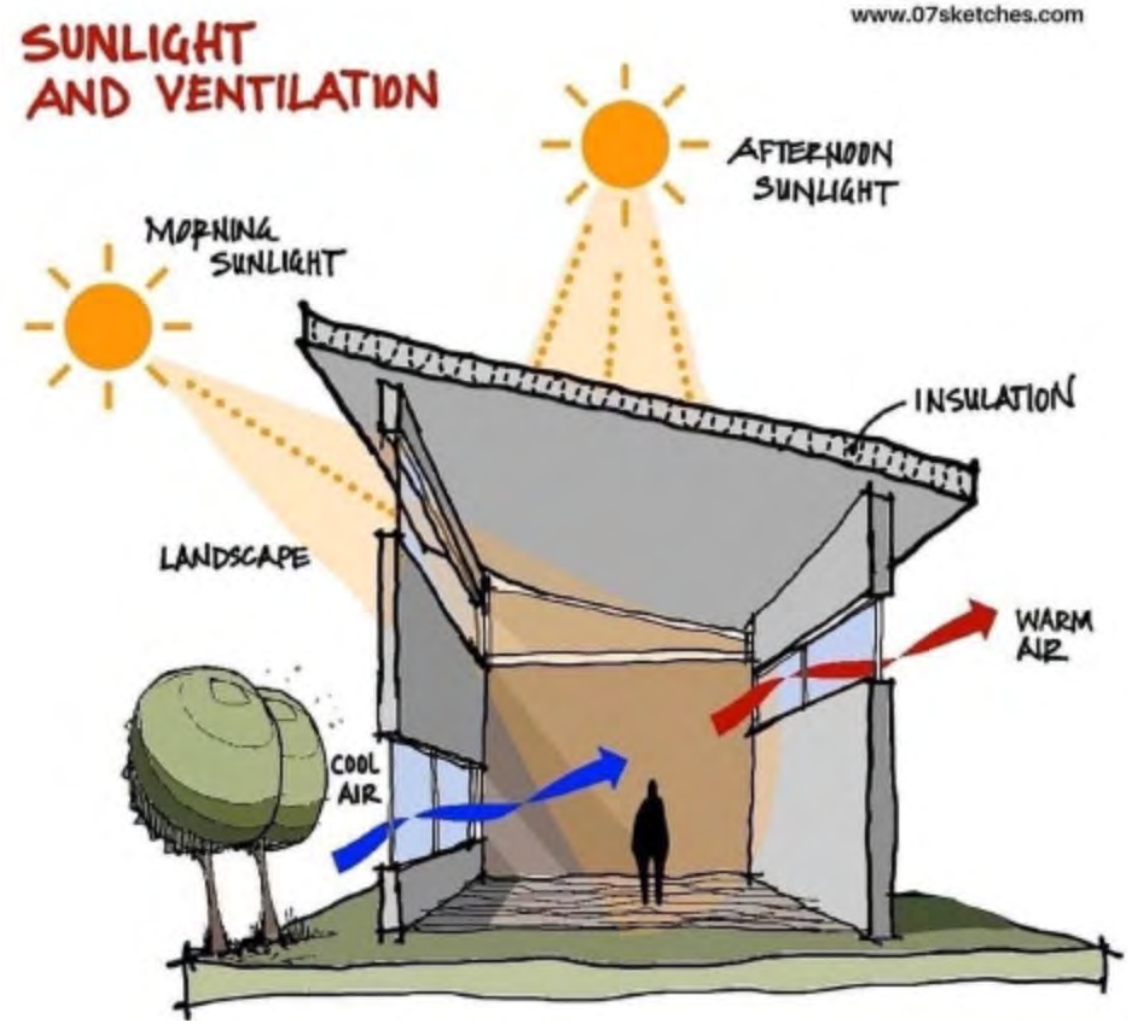


An aerial photograph of a vast solar farm. The image shows numerous long, parallel rows of blue solar panels installed on a green field. The panels are tilted at an angle to maximize sunlight absorption. In the lower right corner, there is a small, white, rectangular building with a flat roof, likely a control or maintenance structure. The overall scene is bright and clear, suggesting a sunny day.

7. Solar energy

“Passive” solar energy used to heat water and spaces

- Passive solar energy (sunshine) has long been used to heat water and spaces
- Can be done simply with glass windows or PVC pipes on roof
- Inexpensive, low-tech, will not produce any noxious gases (will not provide enough heat for Canadian winter)



Solar panels for rooftop solar increasingly popular

- Can be used to supplement grid electricity use or go off-grid in the Maritimes
- Revolutionizing energy in countries with considerable hours of sunshine
- In Canada, rollout hampered by 162% tariff on solar panels made in China
- Balance between developing a domestic solar panel industry here and providing low-cost energy options for home and small business owners



Grid (utility) scale solar electricity

- Variable power source must be paired with energy storage
- Including the cost of energy storage, utility solar is the least expensive new energy option in countries with affordable panels available
- NB Power does not want solar on its electricity grid because it does not pair well with nuclear energy (solar is less expensive than nuclear when operating)



Grid (utility) scale solar electricity

- Land for solar farms can also be used to shade crops and animals
- The challenge of recycling panels after end of life (30 years +) needs to be worked out
- Solar panels need critical minerals that currently are not often recycled or mined sustainably



An aerial photograph of a wind farm situated in a densely forested, hilly landscape. Several large, white, three-bladed wind turbines are visible, spaced out across the terrain. Winding roads or paths cut through the forest, connecting the turbines. In the foreground, a prominent turbine is shown with its base area containing some construction equipment and materials. The overall scene depicts a renewable energy installation integrated into a natural environment.

7. Onshore wind power

Wind power

- Like solar, wind power also a variable source needing either energy storage or to be used directly when operating
- Cost of onshore wind including storage slightly more than solar but less than nuclear
- NB Power also does not want wind power on its grid, also because it does not pair well with nuclear energy (wind is less expensive when operating)



Wind power

- Indigenous nations and communities are leading onshore wind power development across Canada
- CEDAR project currently studying wind power in Wabanaki homeland
- In late 2024, Ottawa gave up to \$1 billion for Indigenous-led wind projects in New Brunswick



Wind power

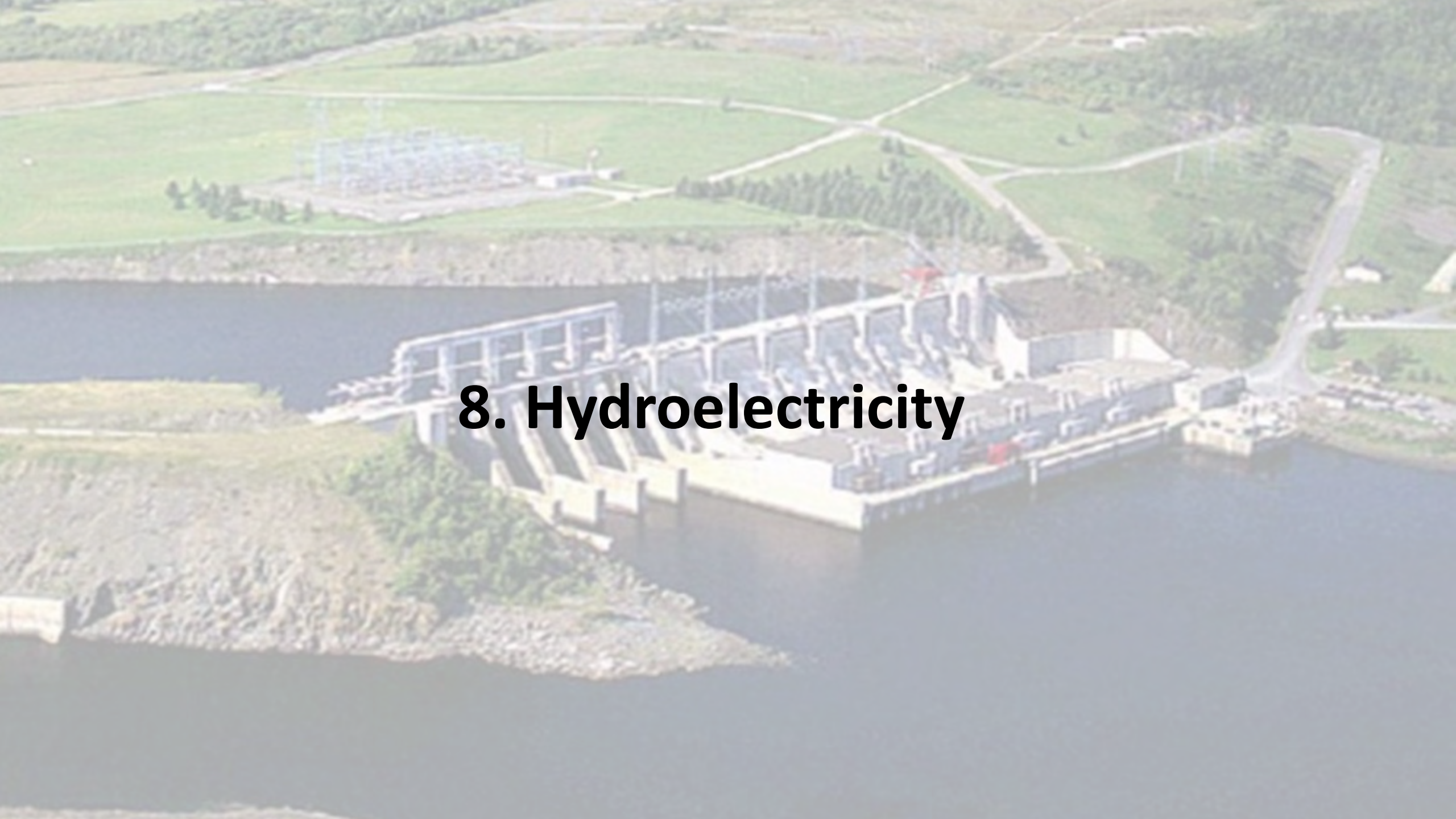
- 30+ wind projects with Indigenous partners in Wabanaki homeland in different stages of development
- 12 of these are operational - either Mi'kmaq or Wolastoqey projects
- CEDAR study (partner PRGI) analyzing these 12 projects



Wind power

- Wind power has tremendous potential for New Brunswick and Atlantic Canada
- Huge offshore wind projects in development in Nova Scotia
- Challenge is for projects to secure community acceptance through clear benefit agreements



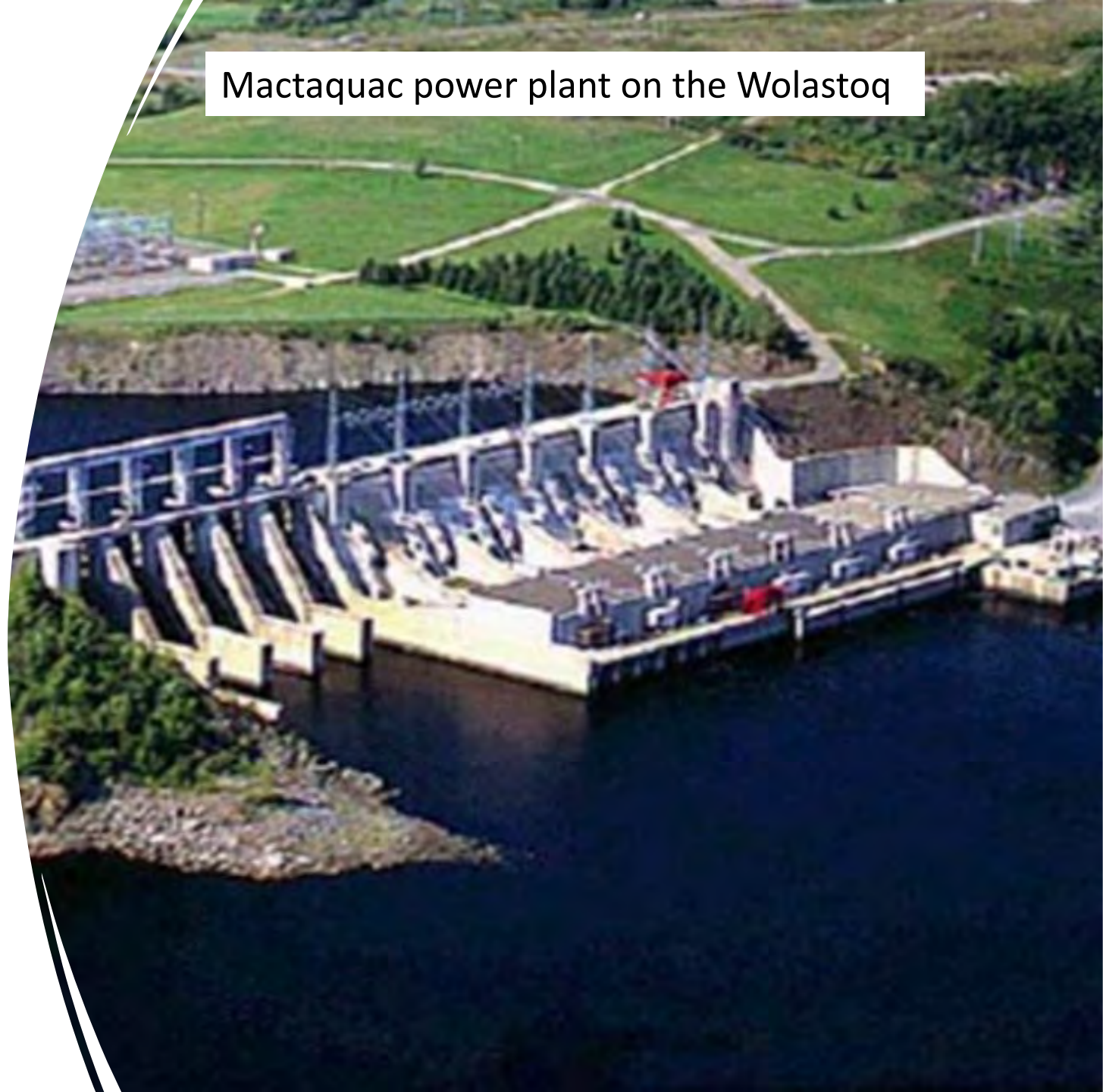
An aerial photograph of a large dam and hydroelectric power plant. The dam is a long, concrete structure with multiple spillways, situated across a wide river. Behind the dam is a large reservoir. To the right of the dam, there are several buildings and structures, likely part of the power plant. The surrounding landscape is green and hilly, with some roads and fields visible. The text "8. Hydroelectricity" is overlaid in the center of the image.

8. Hydroelectricity

Hydroelectricity

- By far the most common renewable energy source in Canada and the world
- Water power (water wheels) used for mills long before hydroelectricity was invented
- The first hydroelectric station generating power for a public grid was 150 years ago

Mactaquac power plant on the Wolastoq



Hydroelectricity

- NB Power's Mactaquac hydropower plant on the Wolastoq (largest in Maritimes) in need of major repairs
- Latest repair estimate \$9 billion (replacing with wind power would be less expensive)
- Hydroelectric plants in many countries affected by record droughts that may become permanent



Hydroelectricity

- B.C. opened a huge hydro dam earlier this year and Quebec is planning a new one in partnership with NL, in Labrador
- Likely few other hydro plants to be built in Canada
- Too expensive, too many environmental problems



Hydroelectricity – environmental problems

- New dams disrupt entire regions
- Dams disrupt fish migrations
- Mercury in soil under the reservoirs can leach into water, contaminate fish and poison humans



Hydroelectricity – environmental problems

- Silting reduces water flow for the power plant and changes composition of water
- Reservoirs emit methane, a potent greenhouse gas
- Dam failure would cause widespread devastation





9. Nuclear power

Nuclear power

- Nuclear power is the most expensive way to generate electricity
- A reactor splits uranium atoms, generating heat to make steam that turns a turbine to make electricity
- Splitting uranium atoms creates radioactive waste, and used reactor fuel the most toxic
- In New Brunswick, highly radioactive waste is stored in hundreds of aging concrete silos outside in a site near the Bay of Fundy



Nuclear power

- Nuclear power is not renewable because uranium is needed for fuel
- Radioactive mine tailings litter Indigenous lands in Canada, the U.S. and several other countries
- Radioactivity, caused by unstable uranium atoms, cannot be turned off and remains toxic for hundreds of generations
- Exposure to living things can damage cells, cause cancer and genetic damage



Nuclear power

- NB Power's Point Lepreau is the only operating nuclear plant outside Ontario
- Build and refurbishment responsible for about 2/3 or NB Power's \$5.9 billion debt
- Reactor's poor performance the main reason NB Power loses \$\$ almost every year
- Despite the financial loss, NB Power plans to build another reactor(s) on the site



Can nuclear power be renewable?

- A company called Moltex wants to extract plutonium from used nuclear fuel at Point Lepreau to make new reactor fuel
- Advocates claim that this process can make nuclear power "renewable"
- This "closed fuel" cycle has been tried and abandoned in several European countries for being expensive and polluting



Can nuclear power be renewable?

- Additional concerns include making plutonium available commercially and link with nuclear weapons
- Despite huge public subsidies, the Moltex project has not attracted the \$billions it needs in private investment
- Project unlikely to go ahead unless fully subsidized by federal government



An aerial photograph of a wind farm situated in a densely forested, hilly landscape. Several large, white, three-bladed wind turbines are visible, spaced out across the terrain. A winding road or path cuts through the forest, and a small clearing with some structures is visible near the center. The overall scene is hazy, suggesting a misty or overcast day. The text "10. Conclusion: Transitions to renewable energy" is overlaid in a bold, black, sans-serif font across the middle of the image.

10. Conclusion: Transitions to renewable energy

Transitions to renewable energy

Wood pellets

Solar power

Onshore wind

Hydroelectric

Nuclear power

Of the five non-fossil fuel electricity systems operating or in development in Atlantic Canada, only three are truly renewable: hydroelectric, wind and solar.

Transitions to renewable energy

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The standout is wind power, also the energy system for which Indigenous nations and communities are already playing a leading role. However it needs more community acceptance.

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The standout is wind power, also the energy system for which Indigenous nations and communities are already playing a leading role. However it needs more community acceptance.

Rooftop solar power has many advantages but utility solar faces challenges with sustainable mining and panel recycling. Hydroelectric will remain important but poses many environmental problems.

Transitions to renewable energy

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Wood pellets are OK for small-scale home heating but a bad idea for making electricity which would be inefficient, will generate greenhouse gasses and weaken biodiversity. It is not renewable at scale.

Transitions to renewable energy

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Solar power

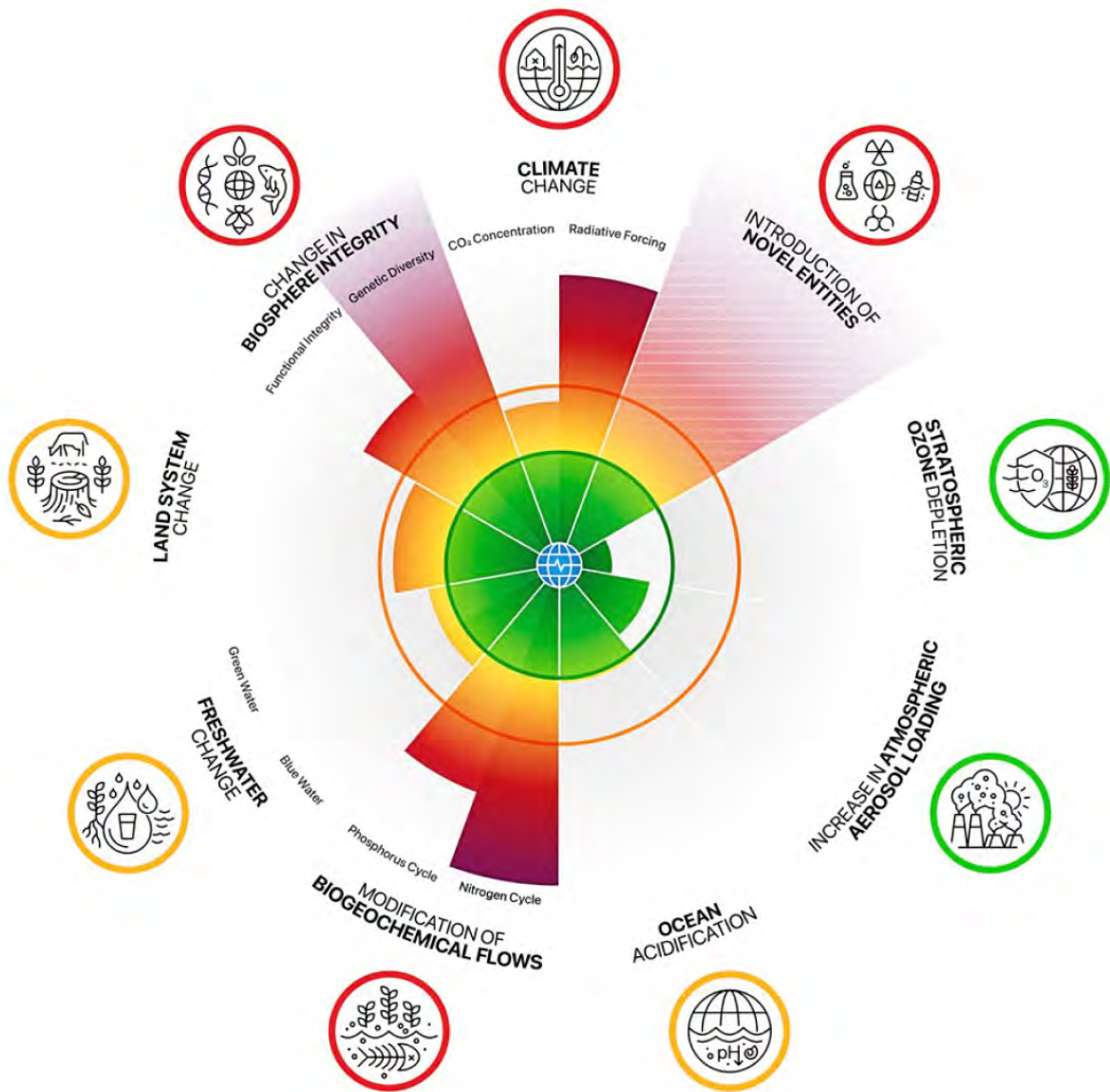
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Nuclear power is the most expensive way to generate electricity, takes a long time to build, and generates toxic “forever” radioactive waste. The claim that nuclear can be renewable is misinformation.



Conclusion:

**Electrify everything!
Take fossil fuels off
the electricity grid!**

**Keep within planetary
boundaries!**

We have a big mission ahead of us!

Thank you 😊

Dr. Susan O'Donnell

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