



Nuclear Energy: Environmental Sustainability and Clean Air

Minimizing carbon emissions from the energy sector is important to reduce the impacts of climate change, but environmental sustainability also includes protecting land, water and air quality. Nuclear energy is a carbon-free energy source that supports clean air, is available as needed around the clock, and requires minimal land use.

While all energy sources have a role to play in sustainability, new technologies will continue to improve their contribution. New designs and applications offering diverse energy products advance nuclear's potential as a sustainable, reliable and cost-effective complement to other energy sources. Integrating nuclear energy also benefits the community by providing well-paying, permanent jobs to local citizens, establishing scientific expertise that benefits the entire community.

Providing a Sustainable Energy Source

For many countries, existing nuclear plants provide a reliable, clean energy foundation that will continue to support electricity demands for many decades. Many of the latest generation nuclear plant technologies would provide modular solutions to meet growing energy requirements, meaning that additional units can be built as needed.

These scalable designs can offer an even smaller footprint than current nuclear plants. And after the plant has run its lifecycle – which can be as long as 80 years – the site can be returned to its original condition.

New fuels and fuel cycles used in advanced nuclear systems further enhance sustainability. These designs allow us to maximize the energy output from each fuel element and reduce the materials that must be stored or recycled after use.

¹ <https://www.energy.gov/ne/articles/3-reasons-why-nuclear-clean-and-sustainable>

Minimal Environmental Impacts



Emissions-Free Power Generation

- Nuclear energy generates heat and electricity without producing carbon dioxide or other greenhouse gases.
- The minimal greenhouse emissions associated with nuclear plants only come through mining, construction and transportation of components to the site – putting it on par with renewables.
- Increased adoption of nuclear energy for both electric and nonelectric applications can help countries meet greenhouse gas emissions reduction targets outlined in the 2015 Paris Agreement, an international treaty on climate change.
- Nuclear water discharge is often cleaner than its intake, and future designs will further reduce -- or even eliminate -- water use for thermal electric generation.



Smallest Land Requirement per Kilowatt Hour

- Nuclear energy uses less land than any other energy source per kilowatt produced.¹
- Small land requirements could allow nuclear plants to be sited close to demand, reducing the cost of electricity transmission.
- Good site design, combined with effective government policy on site licensing, can cause minimal disruption to natural ecosystems and agriculture.



Clean Air

Air pollution contributes to the deaths of 7 million people each year² and costs societies more than \$5 trillion (USD) every year.³ Nuclear energy offers a solution to the indoor and outdoor air pollution crisis because:

- Nuclear energy produces no air pollutants: no nitrogen oxides, sulfur dioxide, carbon dioxide, aerosols or particulate matter.
- Replacing fossil fuels, energy production with nuclear power will improve air quality and reduce smog and acid rain.
- Cleaner air reduces respiratory illnesses and heart and lung diseases.
- Nuclear energy can improve indoor air quality by improving electricity access in regions that rely on burning biomass indoors for cooking.

Equitable Clean Energy Opportunity

The global energy transition is being informed by novel ideas of energy equity, environmental justice and opportunity. New technologies could make it possible to produce clean energy locally, reducing energy costs and ensuring that these communities prosper through the energy transition.

Nuclear energy sources operating in microgrids, alongside other clean energy sources, can provide an affordable, sustainable energy opportunity to cities, towns, rural communities and remote industrial sites without adding to global climate change or impacting the local environment. Many advanced nuclear plants could provide reliable heat, steam and electricity for smaller communities.

The versatility of new power plant options will make it possible for a larger number of communities to access affordable and sustainable energy, thereby addressing energy inequity and reducing energy dependence while growing the local economy through energy access, job creation and increased productivity.

² World Health Organization: https://www.who.int/health-topics/air-pollution#tab=tab_1

³ World Bank: <https://www.worldbank.org/en/topic/pollution>

In summary, implementing nuclear energy can simultaneously help countries industrialize their economies and build climate-resilient infrastructures.

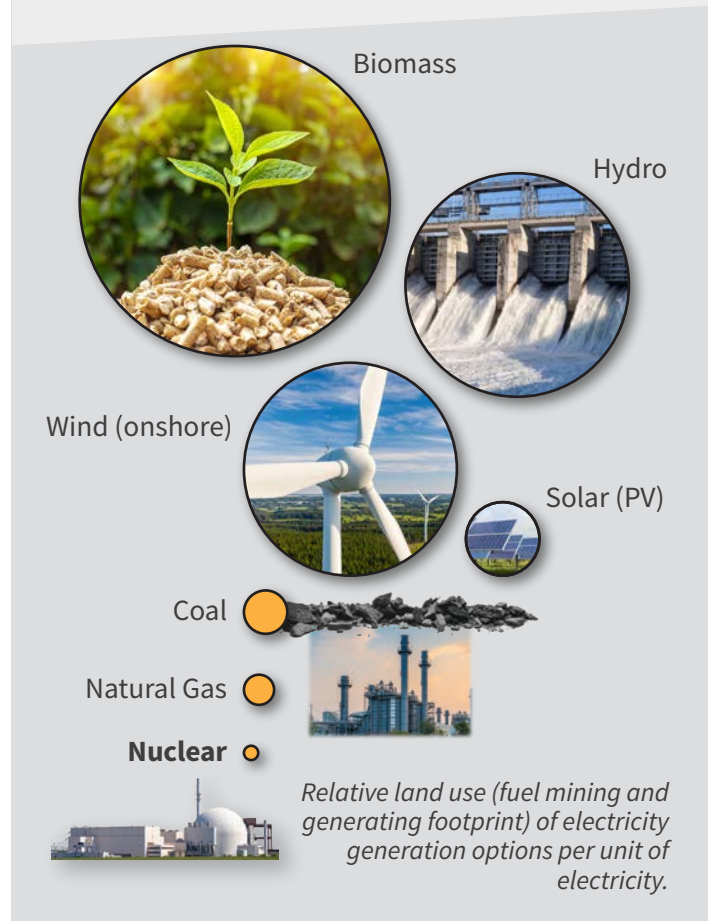
Nuclear Continues to Improve

Advancements in nuclear energy are increasing its capabilities as a reliable, scalable and environmentally sustainable energy source.

New, small-sized power plants can be scaled up in modules to facilitate incremental growth of the grid, with only moderate additional investment.

New reactor designs under development and demonstration could ramp electricity production to meet variable demands, divert energy for industry (e.g., production of chemicals, steel, concrete), produce fuels for heavy transport (such as shipping), or generate hydrogen directly.

Nuclear uses the least land among electricity generating options



Source: <https://world-nuclear.org/information-library/energy-and-the-environment/nuclear-energy-and-sustainable-development.aspx>