

UN report takes global view of 'green energy choices'


December 2 2015, by Kevin Dennehy

How energy choices influence the human future

DEMAND FOR ENERGY

Increasing energy demand



World **energy demand** is expected to **double** by 2050.



Drivers for energy demand

-  Growing **population** from 7 billion today to 9 billion by 2050.
-  **Industrialization**, especially in emerging markets.
-  Globalization and **increasing global trade** (including transportation).
-  Growing middle class with **changing consumption patterns**.

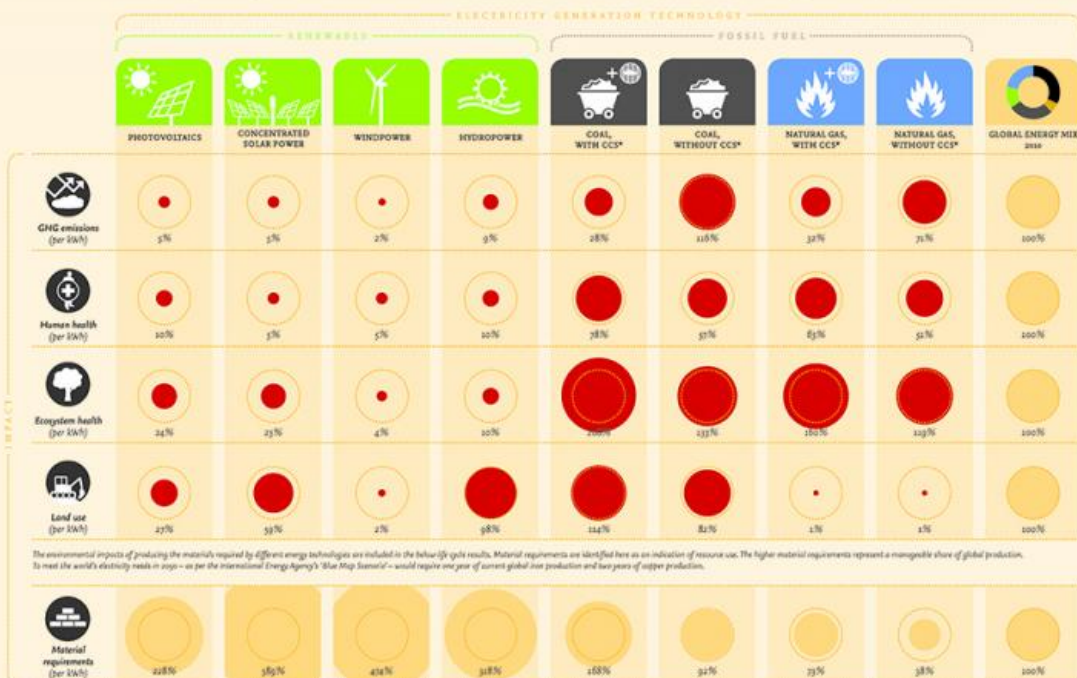
Results of energy demand

-  Electricity production is responsible for 25% of total anthropogenic **greenhouse gas emissions**.
-  **Massive investment** will be needed to meet the energy needs of 9 billion people and at the same time reduce greenhouse emissions, air pollution, toxicity, impacts on land, water and other parts of ecosystems.

The key to sound future energy decisions lies in being able to determine the right mix of technologies for local or regional situations, as well as the best policy objectives.

This infographic compares electricity generation technologies and highlights the environmental benefits, and trade-offs of each technology. The assessment is based on a comparison of clean technologies with conventional fossil fuel power plants. The graphic presents an overview over the life cycle impacts of different technology groups compared to the global electricity generation mix in the year 2050.

COMPARISON OF TECHNOLOGIES AND IMPACTS



SUMMARY

-  Throughout the life cycle the **GHG emissions** of renewable energy sources are 5-6% those of coal or 8-10% those of natural gas.
-  Damage to the **environment** from renewable energy technologies is 3 to 10 times lower than from fossil fuel based systems.
-  The **human health** impacts from renewable energy are only 10-30% those from state-of-the-art fossil fuel power.
-  Natural gas combined cycle plants, wind power, and roof-mounted solar power have low **land use** requirements, while coal-fired power plants and ground-mounted solar power require larger areas of land.
-  **Site-specific environmental concerns** include the ecological impacts of coal mines, hydropower dams and wind power. Impacts vary greatly depending on the significance of the habitat affected and its species, and can sometimes be reduced by mitigation, proper site selection or offsets.
-  **Policy** can minimize the ecological impacts of power generation through the proper selection, design and operation of mines, wells and power plants.
-  Coal- or gas-fired systems with **carbon capture and storage (CCS)** are a promising way to reduce greenhouse emissions, but have other impacts that need to be considered, such as their additional energy demand, lifetime security and environmental impacts.

SOURCES & CONTACT

This document highlights findings from the report on green energy and should be used in conjunction with the full report. References to research on which this infographic is based are listed in the full report:

► UNEP (2012) *Green Energy Choices: The Benefits, Risks and Trade-Offs of Low Carbon Technologies for Electricity Production*.

The International Resource Panel was established in 2007 to provide independent, scientific assessment on the sustainable use of natural resources and the impacts of resource use over the full life cycle.

www.unep.org/energypanel



This infographic compares electricity generation technologies and highlights the environmental benefits, and trade-offs of each technology. Credit: International Resource Panel/UNEP

Finding the right mix of green energy technologies for generating electricity will be crucial in reducing the global impact of pollution for the next generation, according to a United Nations report co-written by a Yale professor.

Without such efforts by policy-makers worldwide, the [report](#) warns, greenhouse gas emissions may double by the year 2050. The report is being released as leaders from nearly 200 countries gather in Paris to discuss a possible agreement on limiting carbon emissions.

"Green Energy Choices: The Benefits, Risks, and Trade-Offs of Low-Carbon Technologies for Electricity Production," is a comprehensive comparison of the [greenhouse gas](#) mitigation potential for a number of alternative energy methods—including wind, solar, geothermal, and hydro. The International Resource Panel produced the report for the United Nations Environment Programme (UNEP).

"Renewables come out strong in terms of reducing pollution and offer us a way to keep pollution at bay from rising [electricity demand](#)," said Edgar Hertwich, director of Yale's Center for Industrial Ecology, professor of industrial sustainability, and member of the International Resource Panel. "If we continue with fossil fuel systems we will see pollution rise."

Electric power generated by [renewable energy sources](#) causes

substantially less pollution than energy generated from [fossil fuels](#), the report says. Renewable electricity produces just 5% to 6% of the [greenhouse gas emissions](#) created by coal-fired energy plants, and 8% to 10% of those generated from gas-fired plants.

The report also investigates damage from other types of pollution, such as particulate matter and toxic metals. Damage by such pollutants to the environment from renewables is 3 to 10 times lower than damage from fossil fuel based systems, the report says. As for health implications, the human health impacts from renewables are 10%-30% of those from state-of-the-art fossil fuel power.

The report points out strengths and weaknesses for all methods of producing electricity. Offshore wind farms, for example, can produce energy for a long period of time, but they come with higher installation and maintenance costs than land-based wind farms. There also are concerns about bird and bat fatalities with wind technology, although there may be radar systems that can slow wind turbines as birds approach.

The report also provides a closer look at the environmental impact of building roads and bringing in construction equipment to develop hydro power in Africa and South America; the land-use advantages of solar technology; and the costs of large-scale energy storage.

"There are many surprises in this data, even for someone who has worked in this field for a while," said Hertwich. "I was surprised to see the toxic emissions data from coal mines, the information about mine runoff, and the long-term emissions to soil and water from coal mines."

Similar emissions are caused by the iron, aluminum, and copper mines needed to produce material for renewable systems, Hertwich noted, but

the massive scale of coal mining makes its emissions much more significant by comparison.

Choosing the best technology to generate power—and picking the best sites for those projects—will have a dramatic impact on the global environment, according to the report. The report also urged leaders in government and the private sector to act with urgency.

"The transition of [energy](#) systems takes 100 years," Hertwich said. "It's not something we can do by snapping our fingers. Renewables have been tremendously successful, and they're coming online a lot faster than people might have predicted."

More information: www.unep.org/resourcepanel/Policy_Makers_GHG_I.pdf

Provided by Yale School of Forestry & Environmental Studies

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