Energy for Humanity strongly supports the creation of the Global Agenda Council: Decarbonizing Energy, seeking to accelerate low carbon technologies over the next two years.

Global Nuclear Initiative Elements

Energy for Humanity is working with the Clean Air Task Force to develop a new Global Nuclear Initiative that seeks to address the following issues, conducting needed analysis and offering pathways forward with clarity on immediate barriers and opportunities.

- Global Nuclear Safety
  - How can reactor safety be assured by strengthening best practices and governance?

- Advanced Technology Design & Development
  - How can we accelerate the development and commercialization of better, safer, less expensive, lower waste and more proliferation-resistant reactor designs?

- Non-Proliferation
  - How can governments and companies cooperate to reduce the risk of nuclear fuel being used for weapons outside of existing norms?

- Public engagement
  - How can the benefits and risks of nuclear energy be made more transparent and understandable, so that a productive and important public debate can occur about its expansion and governance?

If good lives are indeed energy-rich lives, nuclear will be an essential element in addressing energy poverty around the world in a manner that does not destroy our climate.

www.energyforhumanity.org

NUCLEAR ENERGY, COMBINED WITH A HUGE EXPANSION OF RENEWABLES, IS CRITICAL TO ANY VIABLE EFFORT TO RAPIDLY DECARBONIZE THE GLOBAL ENERGY SUPPLY.

A GROWING NUMBER OF ENVIRONMENTALISTS SUPPORT ADVANCED NUCLEAR ENERGY TO REDUCE OUR RELIANCE ON FOSSIL FUELS.

NUCLEAR ENERGY HAS PROVEN TO BE HIGHLY SCALABLE IN WAYS THAT OTHER CLEAN ENERGY TECHNOLOGIES HAVE NOT.

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Our Values

- Global in scope.
- Optimistic, pragmatic, & pro-technology.
- Profoundly committed to improving quality of life for all people.
- Not affiliated with any political party, industrial or corporate enterprise.

"A green NGO that promotes nuclear as part of the solution, not the only solution, in a low carbon future is fantastic and absolutely vital."

UK CLIMATE AND ENERGY MINISTER MATT HANCOCK
WWW.ENERGYFORHUMANITY.ORG
To limit the world’s temperature increase below 2°C in 2050 ... 

“Emissions rise by 20% to 2040, putting the world on track for a long-term global temperature increase of 3.6 °C.”

...90% of the world’s electricity must be low-carbon by 2050.

World Energy Outlook 2014
International Energy Agency
Even if every country met the pledges it has made to date, we would still be looking at a rise in emissions. Average global temperatures would likely rise by between 3°C to 4°C by 2100 (depending on your level of optimism or pessimism) compared to 6°C increase with no action.

Source: FT COP 21 Climate Change Calculator [http://ig.ft.com/sites/climate-change-calculator/]
“World electricity demand increases by almost 80% over the period 2012-2040.”

World Energy Outlook 2014
International Energy Agency
Today nearly three billion people cook over open fires fueled by wood, dung, coal, or charcoal.

The health consequences are severe: every year, indoor air pollution causes two million premature deaths, one million cases of chronic lung disease, and half of all of pneumonia deaths among children under the age of five.
WIND AND SOLAR?

Wind power provides 2.6% of global electricity.
Solar power provides 0.5% of global electricity.
Coal provides more than 40% and is fastest growing source.

- Wind power provides 2.6% of global electricity.
- Solar power provides 0.5% of global electricity.
- Coal provides more than 40% and is the fastest growing source.
Which countries are the most reliant on coal? Here are the worst offenders.

The countries that get the most of their energy from burning coal

South Africa
China
Kazakhstan
India
Poland
Czech Republic
Taiwan
Bulgaria
Australia
Philippines
Indonesia
Ukraine
Vietnam
South Korea
Turkey
Israel
Japan
Germany
Greece
Slovakia

% of primary energy consumption from coal
Data: BP    Figure: @CountCarbon
Sources of world’s energy in 1990 and 2013

- **Oil**
  - 1990: 39%
  - 2013: 32.9%

- **Coal**
  - 1990: 27.3%
  - 2013: 30.1%

- **Gas**
  - 1990: 21.8%
  - 2013: 23.7%

- **Hydro**
  - 1990: 6%
  - 2013: 6.7%

- **Nuclear**
  - 1990: 5.6%
  - 2013: 4.4%

- **Biomass**
  - 1990: 0.3%
  - 2013: 0.9%

- **Wind**
  - 1990: 0.1%
  - 2013: 1.1%

- **Solar**
  - 1990: 0%
  - 2013: 0.2%

Source: BP World Energy Outlook Chart by Climate Gamble
“Ignore the breathless headlines. Here’s some actual data.”

What percentage of Europe’s energy comes from wind and solar? Here is the most recent data.

Data: Eurostat renewables and final energy consumption statistics (2013)  Figure: @CountCarbon
Share of fossil-free energy from world total, 1965-2013

Source: BP World Energy Outlook (Climate Gamble)
Can we afford to bet the planet by insisting on the goal of 100 per cent renewable energy?

Is it possible for the United States to run on 100% renewable energy (wind, water and solar) by 2050?

- Current US installed electric generating capacity (2015) **1.2 TW**
- Total US energy demand in 2050: **2.6 TW**
- To meet that energy demand with wind, water and solar: **6.5 TW**
Hinkley Point C land area and energy output compared to other types of energy production sites

Hinkley Point C = 430 acres
26TWh (terawatt hours) per year

This is estimated to be equal to around 7% of UK electricity consumption in 2025 and enough to power nearly 6 million homes.

Onshore wind farms = 250,000 acres*

Solar farms = 130,000 acres

*The footprint will depend on the location and turbine technology deployed. DECC estimates the footprint could be between 160,000 and 490,000 acres.
A webcomic of romance, sarcasm, math and language.

http://xkcd.com/1162/

**Science Tip:** Log scales are for quitters who can’t find enough paper to make their point properly.
Kilowatt hours of energy produced from 1kg of fuel

Coal

Enough to power a 60 watt light bulb for 4 days

Nuclear

360,000 (uranium)

Enough to power a 60 watt light bulb for 685 years
Life cycle emissions from electricity generation, gCO₂/KWh

- Coal: 820
- Gas: 490
- Biomass: 230
- Large-scale solar: 48
- Domestic solar PV: 41
- Hydro: 24
- Off-shore wind: 12
- Nuclear: 12
- On-shore wind: 11

Source: Median carbon balances of various energy sources, IPCC AR5 2014.
Accidents

Number of accidents at power stations in which five or more people died (1970 to 2008)

Coal: 1,686
Oil: 531
Gas: 186
Nuclear: 1

Hydroelectricity:
In 1975, severe flooding caused about 30 hydroelectric dams in China to fail – killing an estimated 230,000 people.

Source: Metro
Death and illness per TwH

Death and illness
Cases of illness or death per terawatt hour of energy produced (Europe)

Coal
225
25

Nuclear
0.12
0.22
0.05
0.02

Serious illness
Death from pollution
Death from accidents

Fine particles of ash from coal-burning power plants kill an estimated 3 million people around the world every year.

The estimated total death toll (over decades) for Chernobyl is expected to be 4,000 to 33,000.
Hinkley Point C: Number power

7% of UK’s electricity, enough for over 5m homes

£100m contribution annually to the local economy during peak construction or £2bn during project lifetime

9,000,000 tonnes (approximately) of CO2 avoided each year, equivalent to roughly 2 million cars

1995 Last time UK opened a new nuclear power station

3.2 Gigawatt power plant with two reactors

25,000 new employment opportunities created during construction
Leslie Dewan, CEO and Co-founder, TransAtomic Power
TransAtomic Power
Just six countries have so far achieved the goal of decarbonising electricity generation:

- Iceland (geothermal) and Norway (hydropower)
- France, Switzerland, Brazil and Sweden (combination of nuclear & renewables)
How much of Sweden's electricity generation comes from nuclear, hydro, wind and solar?

Data: BP      Figure: @CountCarbon
“No other carbon-neutral electricity source has been expanded anywhere near as fast as nuclear.”

Barry Brook and Staffan Qvist
What can we learn from the Swedish energy transition?

No renewable energy technology or energy efficiency approach has ever been implemented on a scale or pace which has resulted in the magnitude of reductions in CO\textsuperscript{2} emissions that is needed to avert catastrophic climate change.

Real world experience shows that a replacement of current fossil fuel electricity by nuclear at a pace which might limit the more severe effects of climate change is technologically and industrially possible.

Whether this will happen depends primarily on political will, strategic economic planning and public acceptance.
Climate scientists James Hansen, Tom Wigley, Kerry Emanuel, Ken Caldeira at a press conference during COP21, Paris, 2 December 2015. (Photo: D. Shropshire/IAEA)
“How much risk do you believe ... poses to human health, safety, or prosperity?”

“How much **risk** do you believe ... poses to human health, safety, or prosperity?”

\[ r = 0.47, p < 0.01 \]

“How much **risk** do you believe ... poses to human health, safety, or prosperity?”

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“How much risk do you believe ... poses to human health, safety, or prosperity?”

Racing Extinction. I want my daughter to see a whale shark.
Thank you for your attention.
Happy to take questions