Climate and nuclear field report

January 2018
Key points

• CO2 emissions up again, after two year pause
• There is no plausible game plan for 2 degrees or even 3 but now the focus is on 1.5!
• Nuclear can help turn this situation but the industry model must change radically
• Some evidence this year that reality on nuclear is beginning to prevail
  ➢ although “negative emissions” is beginning to rival renewables as a panacea
Fossil fuel burning set to hit record high in 2017, scientists warn

The rise would end three years of flat carbon emissions – a ‘huge leap backward’ say some scientists, while others say the longer term trend is more hopeful.

Big polluters like China are acting to cut emissions but low rains have reduced low-carbon hydroelectric output this year. Photograph: Kevin Frayer/Getty Images
Global Carbon Project

Data: CDIAC/GCP/BP/USGS

CO₂ emissions (Gt CO₂/yr)

2000–09
+3.3%/yr

1990–99
+1.1%/yr

2016: 36.2 Gt CO₂

Projection 2017
36.8 Gt CO₂

△2.0% (0.8%–3.0%)
Pathways to two degrees

Data: SSP Database (IIASA)/GCP

Emissions from fossil fuels and land-use change (GtCO₂/yr)

2017 Estimate

Historical

net-negative global emissions
Ambitious 1.5C Paris climate target is still possible, new analysis shows

Goal to limit warming to 1.5C to avoid the worst impacts of climate change was seen as unreachable, but updated research suggests it could be met if strong action is taken.

New research suggests the aspirational 1.5C goal is more hopeful than thought. Photograph: Francois Mori/AP
Global fossil-fuel energy use, as a share of total energy use
Renewables are not coming in fast enough to displace fossil CO2

Net global electric generation added 2016, reflecting retirements (GWH)

Source: CATF from IEA [https://www.iea.org/newsroom/energysnapshots/power-capacity-additions-by-fuel-2016.html](https://www.iea.org/newsroom/energysnapshots/power-capacity-additions-by-fuel-2016.html) (This assumes all coal and gas plants retired were operating at 85% and 80% capacity factors, respectively, a highly conservative assumption; older plants were likely to be inefficient and operating at low capacity factor).
NUCLEAR COULD SPEED THINGS UP DRAMATICALLY
IPCC Nuclear Expansion Scenario to Stabilize Climate

Q. HOW ARE WE DOING?

A. NOT VERY WELL
Figure 5 | World Nuclear Reactor Fleet, 1954–2017

Nuclear Reactors and Net Operating Capacity in the World
in Units and GWe, from 1954 to 1 July 2017

- 1989: 312 GWe, 420 Reactors
- 2002: Maximum Number of Reactors: 438
- 2006: Maximum Operating Capacity: 368.2 GWe
- 7/2017: 351 GWe, 403 Reactors

Sources: WNISR, with IAEA-PRIS, 2017
Figure 40 | Global Investment Decisions in Renewables and Nuclear Power 2004-2016

Global Investment Decisions in New Renewables and Nuclear Power

in US$ billion, 2004-2016

Sources: FS-UNEP, 2017 and WNISR Original Research
**Figure 15 | Forty-Year Lifetime Projection versus PLEX Projection**

**Number of Reactors in Operation in the World**

in Units from 7/2017 to 2063

**Composition of World Fleet**
- LTO
- Lifetime > 40 Years
- Lifetime ≤ 40 Years

Sources: Various sources, compiled by WNISR, 2017
Barriers

• Cost versus fossil
• Cost versus non-dispatchable renewables
• Construction time
• Construction risk
• Business model – lack of commercial normalcy
• National serial regulation
• Public opposition
Gas is getting cheap all over!
Levelized cost of energy ($/MWH)

- Advanced nuclear (low)
- Natural gas (US at $3.50)
- On-shore wind
- Utility solar PV
- Advanced nuclear (high)
- Coal (US)
- Natural gas (US at $5.50)
- Natural gas (US at $8.00)
- Offshore wind
- Vogtle
- Solar thermal

Non-dispatchable, weather-dependent
WHAT WILL ADVANCED NUCLEAR POWER PLANTS COST?

A Standardized Cost Analysis of Advanced Nuclear Technologies in Commercial Development

AN ENERGY INNOVATION REFORM PROJECT REPORT
PREPARED BY THE ENERGY OPTIONS NETWORK
Levelized cost of energy ($/MWH)

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- Natural gas (US at $8.00)
- Offshore wind
- Vogtle
- Solar thermal
RADICAL CHANGE IN CONSTRUCTION, REGULATORY AND DELIVERY MODEL REQUIRED
UNDERSTANDING
NUCLEAR NECESSITY:
TURNING THE CORNER?
Evaluation of a proposal for reliable low-cost grid power with 100% wind, water, and solar

Christopher T. M. Clack\textsuperscript{a,b,1,2}, Staffan A. Qvist\textsuperscript{c}, Jay Apt\textsuperscript{d,e}, Morgan Bazilian\textsuperscript{f}, Adam R. Brandt\textsuperscript{g}, Ken Caldeira\textsuperscript{h}, Steven J. Davis\textsuperscript{i}, Victor Diakov\textsuperscript{j}, Mark A. Handschy\textsuperscript{b,k}, Paul D. H. Hines\textsuperscript{l}, Paulina Jaramillo\textsuperscript{d}, Daniel M. Kammen\textsuperscript{m,n,o}, Jane C. S. Long\textsuperscript{p,3}, M. Granger Morgan\textsuperscript{d}, Adam Reed\textsuperscript{d}, Varun Sivaram\textsuperscript{t}, James Sweeney\textsuperscript{t,s}, George R. Tynan\textsuperscript{t}, David G. Victor\textsuperscript{v,w}, John P. Weyant\textsuperscript{t,s}, and Jay F. Whitacre\textsuperscript{d}

\textsuperscript{a}Earth System Research Laboratory, National Oceanic and Atmospheric Administration, Boulder, CO 80305; \textsuperscript{b}Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, CO 80305; \textsuperscript{c}Department of Physics and Astronomy, Uppsala University, 752 37 Uppsala, Sweden; \textsuperscript{d}Department of Engineering and Public Policy, Carnegie Mellon University, Pittsburgh, PA 15213; \textsuperscript{e}School of Earth and Climate Sciences, University of Minnesota.
100% Renewables Plan Has ‘Significant Shortcomings,’ Say Climate and Energy Experts

Landmark 100 Percent Renewable Energy Study Flawed, Say 21 Leading Experts
A critique of seminal research on the feasibility of a 100 percent wind, water, and solar energy system finds serious shortcomings, underscoring the need for continued research and a balanced decarbonization portfolio
By Robert Fares on June 23, 2017
Nuclear, renewables to help French CO2 reduction goals, Macron says

PARIS (Reuters) - French President Emmanuel Macron said on Sunday he would not follow Germany's example by phasing out nuclear energy in France because his priority was to cut carbon emissions and shut down polluting coal-fired production.

“My priority in France, Europe and internationally is CO2 emissions and (global) warming....Nuclear is not bad for carbon emissions, it’s even the most carbon-free way to produce electricity with renewables...What did the Germans do when they shut all their nuclear in one go?... They developed a lot of renewables but they also massively reopened thermal and coal. They worsened their CO2 footprint, it wasn’t good for the planet. So I won’t do that.”
The trouble with negative emissions

Reliance on negative-emission concepts locks in humankind’s carbon addiction

Open discussion of negative emissions is urgently needed

Although nearly all 2 °C scenarios use negative CO₂ emission technologies, only relatively small investments are being made in them, and concerns are being raised regarding their large-scale use. If no explicit policy decisions are taken soon, however, their use will simply be forced on us to meet the Paris climate targets.

Detlef P. van Vuuren, Andries F. Hof, Mariësse A.E. van Sluisveld and Keywan Riahi