

Presentation to the Trinity Section

American Nuclear Society



How ANS is Advancing Nuclear Science and Technology and How You Can Help

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President, American Nuclear Society

Distinguished Scientist, Oak Ridge National Laboratory

May 12, 2023

Agenda

- American Nuclear Society highlights
- Nuclear power
- Advocacy for nuclear science and technology and how the Trinity Section can help

ANS Highlights



American Nuclear Society

ANS Vision

Nuclear technology is embraced for its vital contributions to improving peoples' lives and preserving our planet.

ANS Mission

Advance, foster, and spur the development and application of nuclear science, engineering, and technology to benefit society.

2023 outlook: PROMISING!

- Last years NETS, PHYSOR, Annual, UWC, TopFuel and Winter meetings finished ahead of projections in attendance and sponsorship
- 2023 has a lot of interesting meetings including: CONTE, NETS, Annual, PSA, NPIC&HMIT, M&C 2023, NURETH-20 and others
- Student members up 30% in 3 yrs.
- New programs (Trustees of Nuclear, Navigating Nuclear 2.0, Publications, etc.)

Publications—Overview

- *Newswire*
- Magazines
 - *Nuclear News*
 - *Radwaste Solutions*
- Technical Journals
 - *Nuclear Science and Engineering*
 - *Nuclear Technology*
 - *Fusion Science and Technology*
- *Nuclear Science and Technology Open Research*
- *Standards / Nuclear Standards News*
- Books
- Meeting publications (*Transactions and proceedings*)
- *Newswire*—Over 4,000 articles on Newswire since April '20, averaging over 80k views per month in 2022.
- Magazines—1,700 pages published this year; nearly 1,000 issues published with over 100k pages in the ANS archive.
- Journals—Impact factors and submissions continue growth trend; over 30K articles in archive.
- New OA platform to launch Q1 2023.
- Standards—88 current standards with 3 standards approved in '21 and 7 in '22.
- Books—1 book published in '21, 3 currently in the production.
- Meeting publications—jointly between Meetings and Pubs over 1,200 papers published in '21, over 1,600 in '22; nearly 20K article in archive.

Nuclear Science and Technology Open Research

- Hosted by F1000—a subsidiary of Taylor & Francis
- To be launched Q1 2023
- Will feature gateways for each professional division
- ANS members will receive a discount on the Article Processing Charge
- \$100k donation from an ANS member will cover the setup costs



NSTOR

[BROWSE](#) [HOW TO PUBLISH](#) [ABOUT](#) [BLOG](#)

Nuclear Science and Technology Open Research

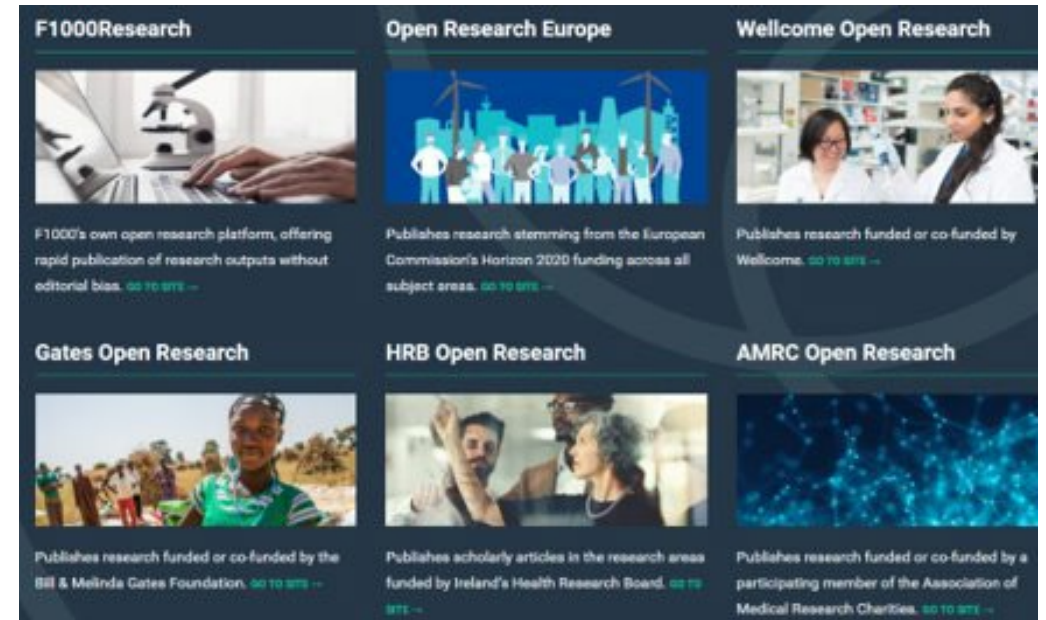
An international publishing platform of the American Nuclear Society

[SUBMIT YOUR RESEARCH](#)



Introduction to the F1000 platform

- Launched in 2013 initially only covering life sciences, but now expanding to cover all disciplines
- Rapid dissemination of research, improved transparency and reproducibility, and removing editorial barriers to publishing
- All types of research can be published rapidly e.g. traditional articles, data sets, null results, protocols, policy briefs



Brief Reports



Case Reports



Case Studies



Clinical Practice Articles



Correspondence



Data Notes



Editorials



Method Articles



Opinion Articles



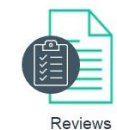
Policy Briefs



Registered Reports



Research Articles



Reviews



Software Tool Articles



Study Protocols



Systematic Reviews

Launching the Platform

Next Steps (Q1 2023)

- Establish an expert advisory board of leading and emerging researchers
- Advisors to provide input on initial strategy and help to promote the Platform launch
- Launch and nurture thematic Collections which align with the scope of the Platform
- Encourage advisors and colleagues to publish content with us during the launch phase

Representing members to non-nuclear communities



- Crisis communications/Rapid Response capability
- ANS Special Committee on Generic Standards for the Disposal of High-Level Radioactive Waste
- Engagement with new Congress and Presidential administration in 2023
- Nuclear in Every Classroom campaign

Rapid Response Taskforce

Shaping the narrative; combatting misinformation.

- Prepared for a wide spectrum of nuclear or radiation-related events or emergencies
- 30+ independent technical professionals in diverse nuclear fields
- Online media help center for journalists



THE WALL STREET JOURNAL
WSJ



The
New York
Times



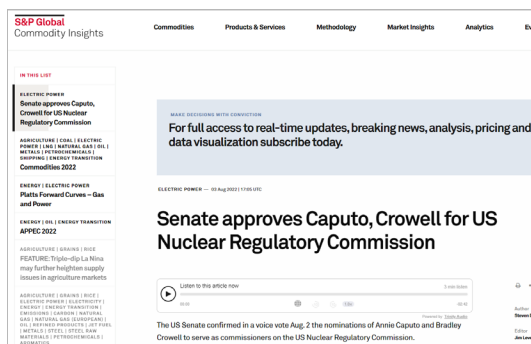
News Coverage



Diablo Canyon

The New York Times – Aug. 23

“The American Nuclear Society’s convention, held for four days in the shadow of Mickey Mouse, couldn’t have picked a better venue to uplift spirits.”



Federal Policy

S&P Global – Aug. 3

“[A] full five-member commission is essential to the effectiveness of the NRC in protecting public health and safety while enabling the deployment and applications of new nuclear technologies.” – Steven Arndt & Craig Piercy



Zaporizhzhia

The Washington Post – Aug. 6

“It is unjustifiable for a civil nuclear facility to be used as a military base or be targeted in a military operation.” – Steven Arndt & Craig Piercy

News Coverage



Zaporizhzhia

Associated Press – Sept. 12

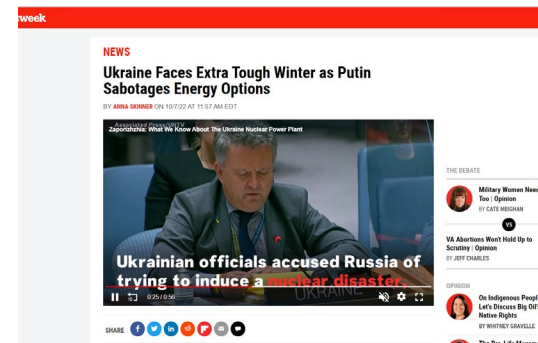
“A cold shutdown enormously reduces the meltdown risk... Every hour that goes forward, the possibility of a meltdown of fuel becomes less and less.” – Steven Arndt



Zaporizhzhia

NPR – Sept. 9

Even in the worst case scenario, the reactors at Zaporizhzhia are a modern design surrounded by a heavy "containment" building, Nesbit says. "It's reinforced concrete, typically about three to four feet of that; it's designed to withstand very high internal pressures." That could allow it to hold in any radioactive material.



Ukraine

Newsweek – Oct. 7

"France [and Ukraine are] well suited because of their large nuclear content," Arndt said. "I think it's going to be a long hard winter all over Europe, including Ukraine. Any lack of industrial facilities is going to be a challenge."

Draft Recommendations for New Generic Environmental Standards for the Disposal of High-Level Waste

- Current generic disposal regulation 40 CFR part 191
 - Out-of-date
 - In many cases inconsistent with the international state-of-the-practice
- Modern, transparent standards needed to support potential efforts to site and license a geologic disposal facility other than Yucca Mountain
- ANS Special Committee on Generic Standards for Disposal of High-Level Radioactive Waste established in 2021
 - Draft report issued February 17, 2023

ANS Special Committee on Generic Standards for the Disposal of High-Level Radioactive Waste



- Purpose to develop technical bases for updated generic public health and safety standards for disposal of used fuel and high-level radioactive waste
 - Purpose consistent with recommendations from the Blue Ribbon Commission on America's Future (BRC 2012), American Nuclear Society (ANS 2020), the National Academies of Science, Engineering and Medicine (NASEM 2022), and others
 - Final report in summer 2023 after consideration of input from stakeholders

Diablo Canyon Advocacy



- Proactive advocacy
 - Annual meeting rally
 - Communicating with key decision makers
 - Support to local, state and national leaders
- Partnering with key stakeholders
 - Original parties to the shutdown agreement
- Provisional success
 - NRC approved timely renewal protection

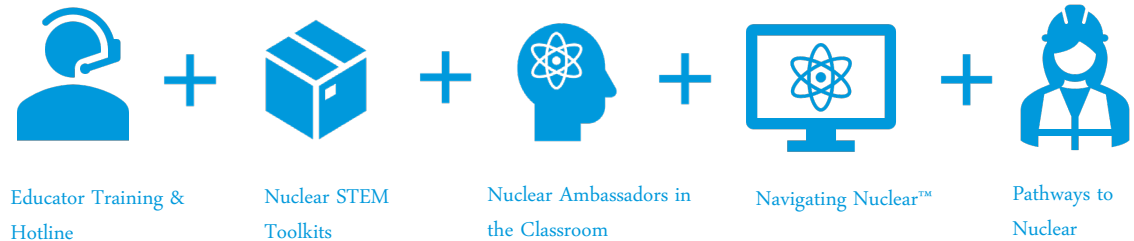


K-12 STEM Academy

Our vision

Nuclear science & technology is taught in every classroom in the nation – with a focus on students from under-served communities.

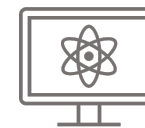
Our programs



By-the-numbers



Engaged over **5,000 teachers** served



Navigating Nuclear reaches **1.6 million students** & counting



Over **\$2 million** invested in K-12

The **American Nuclear Society** is a 501(c)3 not-for-profit. Program support is tax-deductible as allowed by law.

The results?

- Upper primary (middle school) curriculum launched in 2018
 - More than 500,000 students in 2018-2019 academic year
- Lower primary (elementary) and secondary (high school) materials now available
- More than 1.5 million students to date
- Virtual field trips most popular
 - More than 50,000 views
 - Viewings rose 3000% from 2019 to 2020
 - Idaho National Lab video 2nd most popular of ALL Discovery Education videos
- Top referring domain is Google classroom
 - Teachers are embedding materials in lessons

13th Clean Energy Ministerial and 7th Mission Innovation ministerial ANS



**Advanced Nuclear Reactors:
A Possible Solution to Global Warming
and Global Energy Poverty**

Thursday, Sept. 22 | 1:45PM - 2:45PM
13th Clean Energy Ministerial | Pittsburgh, PA
Room 303 | David Lawrence Convention Center

SPEAKERS

- 
Sola Talabi
Pittsburgh Technical
- 
Kris Singh
Holtec
- 
Rita Baranwal
Westinghouse
- 
John Hopkins
NuScale
- 
Olu Omotowa
Terrapower
- 
Toshio Kaneko
IAEA

GLOBAL CLEAN ENERGY ACTION FORUM
CEM13/MI-7 USA 2022

NASA

- Side event organized by ANS members Sola Talabi and Temi Adeyeye
- Promoted by ANS to public and media

International Ministerial Conference on Nuclear Power in the 21st Century ANS

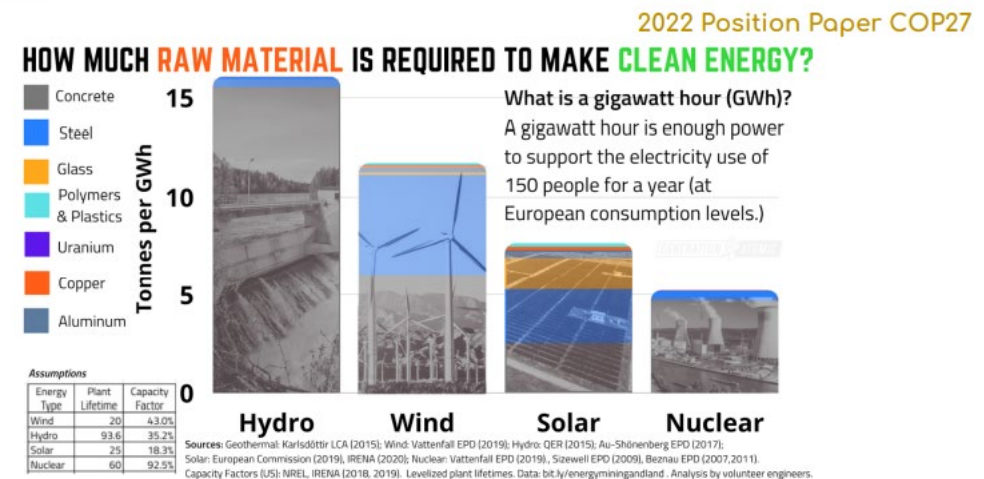
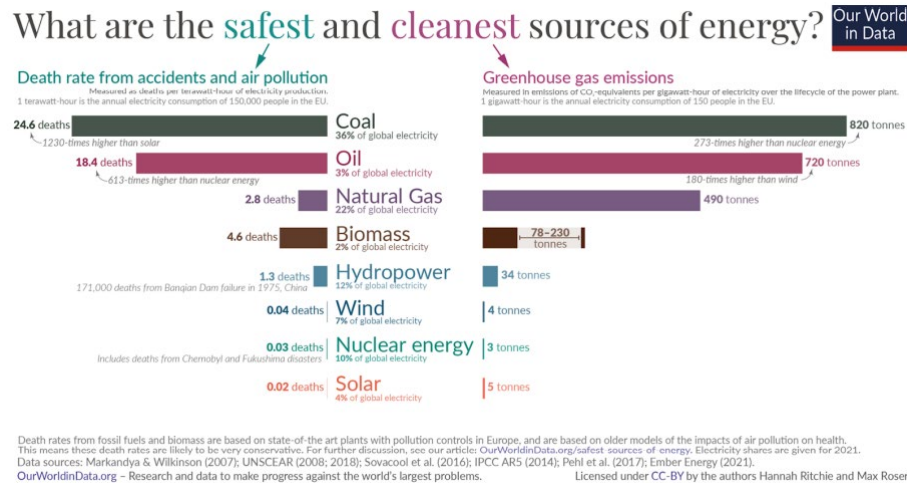


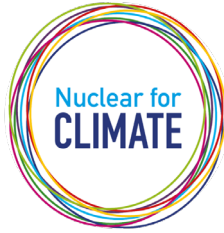
- Meeting with Nuclear Energy Agency and Canada's nuclear waste management organization
- Sessions on Fulfilling the promise, Enabling the Environment for wider development of nuclear energy, supply chain, inspiring youth, etc.

ANS at COP27



- **Nuclear For Climate** advocacy in blue zone
 - Grassroots initiative of nuclear professionals and scientists from over 150 associations worldwide
 - European Nuclear Society, UK Nuclear Energy Institute's Young Generation Network, and Generation Atomic
 - Advocacy and booth in blue zone
- **#NetZeroNeedsNuclear** messaging at COP27
- Signatory to **Nuclear for Climate's COP27 Position Paper, "The Fastest Path To Net Zero For A Sustainable & Energy Secure Future For All"**



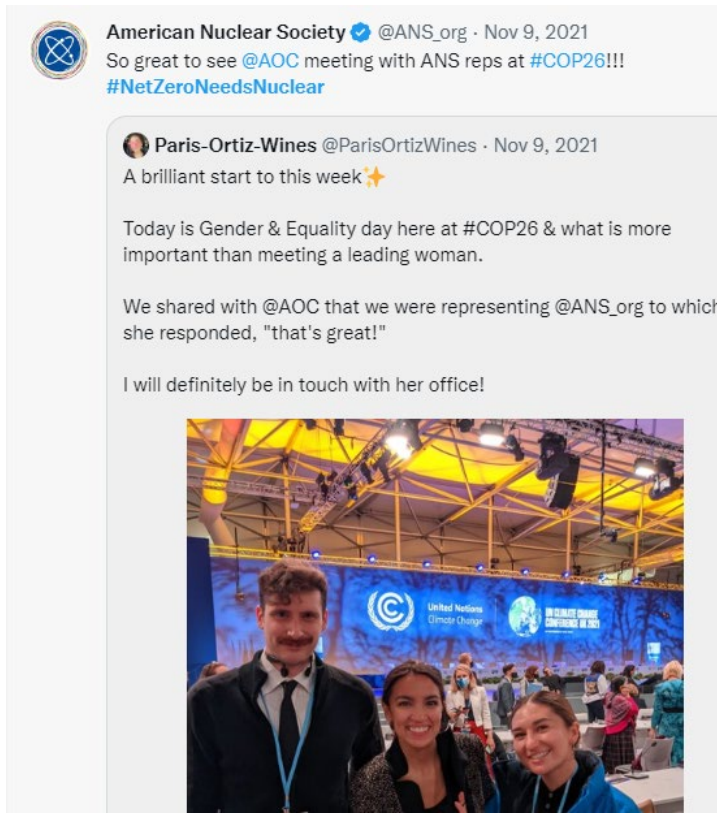


ANS delegates at COP27



- 10 ANS members attending (Additional 2 spots for YGN)
- N4C bluezone advocacy
- #NetZeroNeedsNuclear messaging
- Media interviews

- ANS President participation on 1st week panel – *“Live from COP”*
- 2nd week, ANS-organized panel featuring ANS delegates, *“Nuclear Power: The Robin Hood of Energy Exploitation”* (combatting climate change and poverty)
- ANS delegate on *“Changing the game for climate - female leaders in the nuclear”* panel with Katy Huff
- In talks with DOE for additional panel



Certification Program Goals

- Provide nuclear professionals a means for learning and/or demonstrating knowledge
 - Different focus than nuclear professional engineering exam
 - Fill knowledge gaps between education and employer needs
- Offer employees a standard means of qualifying candidates
- Establish new products to advance ANS mission and generate revenue
- Increase membership and meeting participation
- Enhance ANS position in the industry

Certification Committee Scope



Milestones & Schedule

- Establish special committee
- Market analysis (Jan–Mar)
- Business Plan for Recommended Path Forward (Apr–May)
- Begin Body of Knowledge Development (May-Jun)
- Board Approval for Program Development (Jun)
- Transition Standing ANS Committee (Jun 2023)
- Job Task Analysis / Exam Specification (i.e., Blueprint) (Jul-Sept)
- Exam Bank Development (Sept-Feb 2024)
- Select vendor to administer exam (1Q24)
- Pilot Exam / Cut Score (2Q24)
- First Exam (by end of 2024)

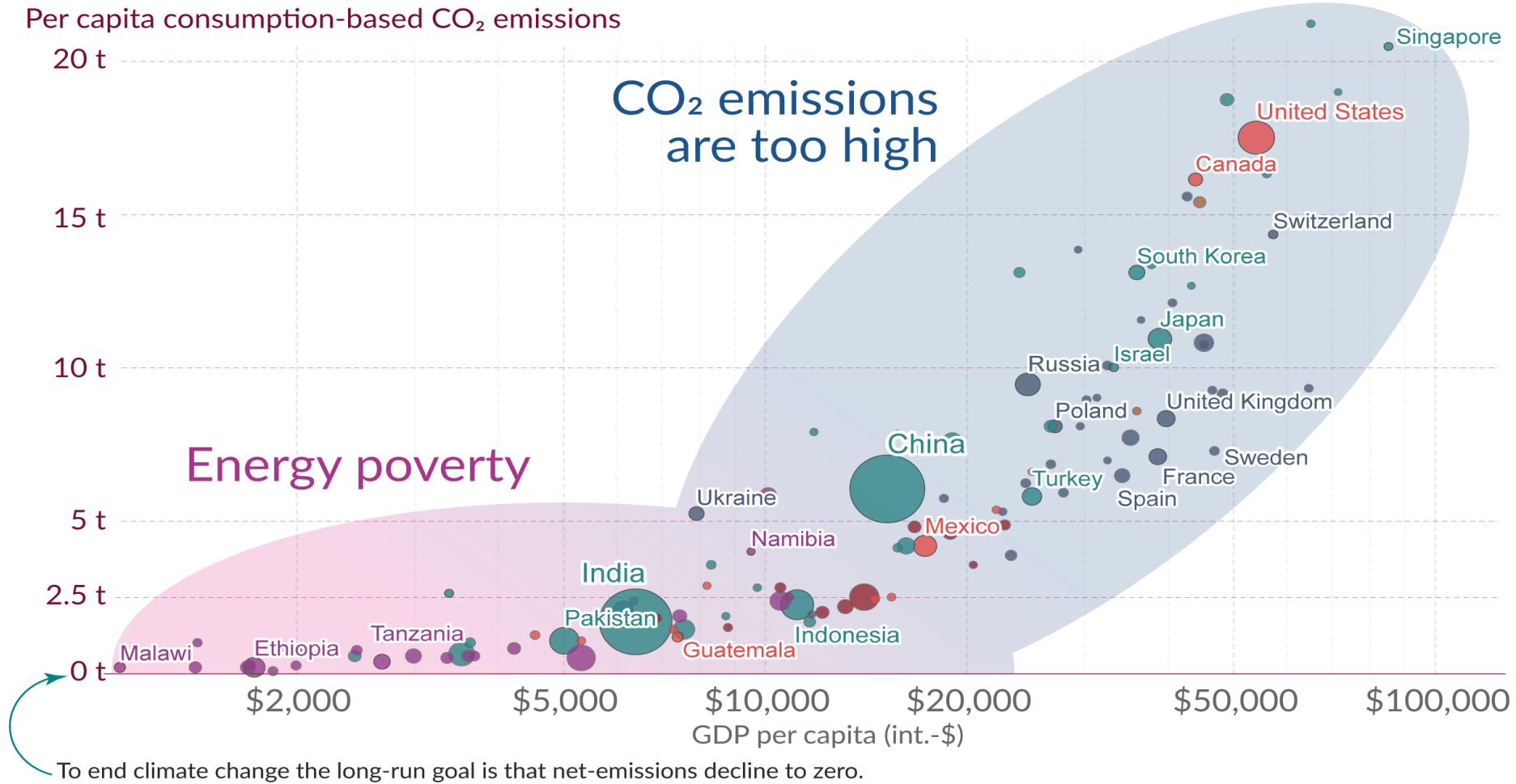
Nuclear Power



American Nuclear Society

CO₂ emissions per capita vs GDP per capita

Our World
in Data



Data for 2017: Global Carbon Project, UN Population, and World Bank.

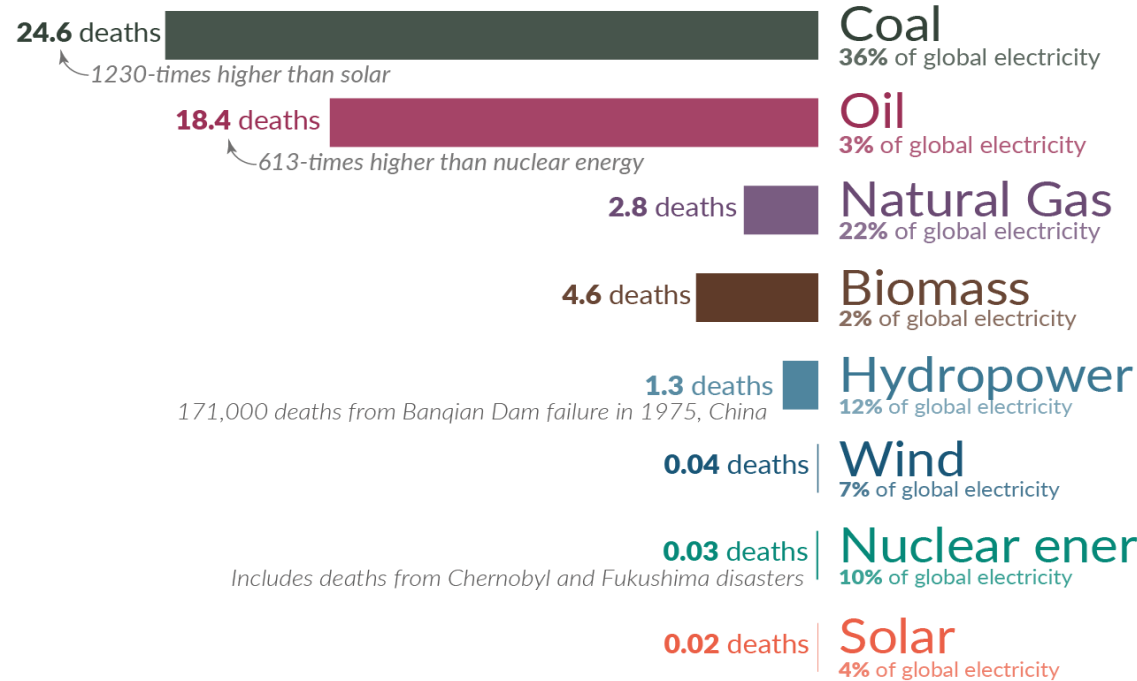
OurWorldinData.org – Research and data to make progress against the world’s largest problems.

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What are the **safest** and **cleanest** sources of energy?

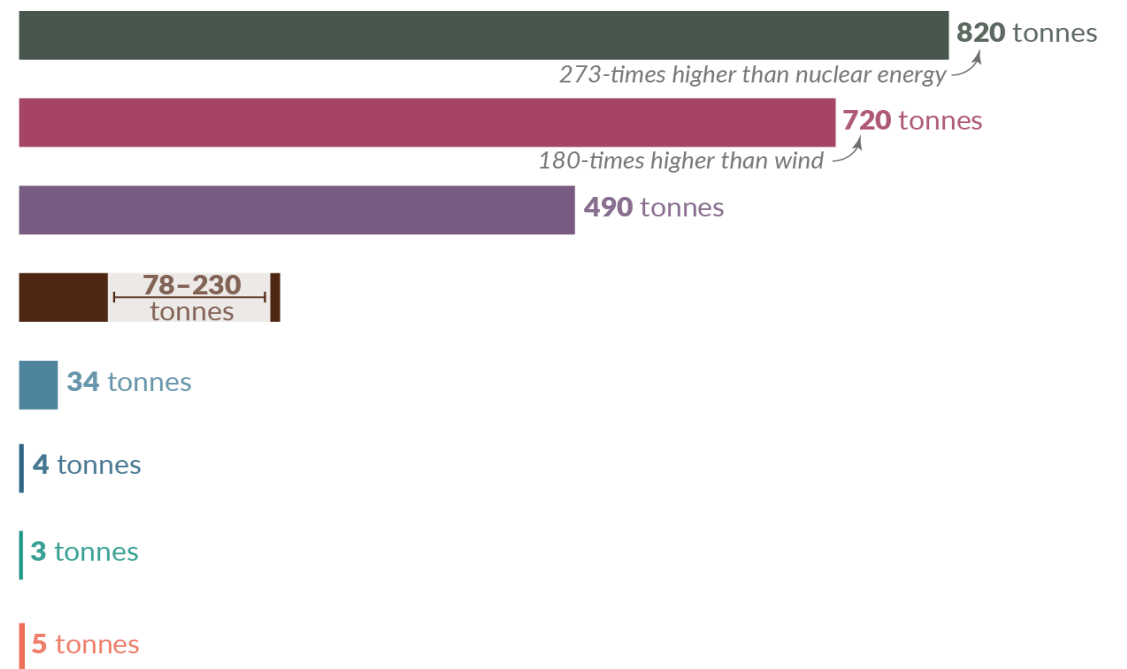
Death rate from accidents and air pollution

Measured as deaths per terawatt-hour of electricity production.
1 terawatt-hour is the annual electricity consumption of 150,000 people in the EU.



Greenhouse gas emissions

Measured in emissions of CO₂-equivalents per gigawatt-hour of electricity over the lifecycle of the power plant.
1 gigawatt-hour is the annual electricity consumption of 150 people in the EU.



Death rates from fossil fuels and biomass are based on state-of-the-art plants with pollution controls in Europe, and are based on older models of the impacts of air pollution on health. This means these death rates are likely to be very conservative. For further discussion, see our article: [OurWorldinData.org/safest-sources-of-energy](https://ourworldindata.org/safest-sources-of-energy). Electricity shares are given for 2021. Data sources: Markandya & Wilkinson (2007); UNSCEAR (2008; 2018); Sovacool et al. (2016); IPCC AR5 (2014); Pehl et al. (2017); Ember Energy (2021).

[OurWorldinData.org](https://ourworldindata.org) – Research and data to make progress against the world's largest problems.

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Nuclear Power

- A lot of great news
 - Investors, including venture capital
 - Bipartisan government support
 - New technology and new applications
 - Improved development and construction methods
 - Enhanced analytical tools
 - Heighten understanding of energy security

Nuclear Power

Advanced Reactor Types, Sizes, and Applications

Technologies	Sizes	Applications
LWRs	Microreactors (1-20 MWe)	Electricity Production
Molten salt reactors		Renewable Integration
High temperature gas reactors	Small modular reactors (20-300 MWe)	Process Heat
Liquid metal reactors		Hydrogen and Ammonia Production
		Off-grid applications
		Desalination
		District Heat

Source: Pillsbury Winthrop Shaw Pittman

Government Action



- Inflation Reduction Act (IRA) Production tax credits
 - Up to \$ 15 per megawatt-hour
 - Available for facilities in service in 2024 to 2032
 - Supports the Civil Nuclear Credit program in the Bipartisan Infrastructure Law
- IRA Investment tax credits
 - From 6 percent to 30 percent
 - From 2025 to 2031 or when CO₂ emissions fall
- High-Assay Low-Enriched Uranium
 - IRA invests \$ 700 million to support the development of a domestic supply chain

Proactive Support for Demonstrations



Advanced reactor demonstrations

- TerraPower/GE-Hitachi Sodium sodium fast reactor with a molten salt energy storage system
- X-energy Xe-100 HTGR, with matching investment from industry

Risk reduction awards

- Kairos Power Hermes reduced-scale test reactor, a precursor of the company's commercial fluoride salt-cooled high temperature reactor
- Westinghouse eVinci, a heat pipe microreactor
- BWXT Advanced Nuclear Reactor, a transportable microreactor
- Holtec SMR-160, a LWR reactor
- Southern Company Services Inc. Molten Chloride Reactor Experiment, a precursor to TerraPower's Molten Chloride Fast Reactor

Small Modular Reactors

- Examples
 - NuScale VOYGR
 - Design Certification
 - Utah Associated Municipal Power Systems (UAMPS), VOYGR-6 plant in Idaho is expected to be fully operational by 2030
 - Numerous other projects in development
 - Holtec SMR-160
 - US and Canadian design approval process
 - Potential siting at shutdown power plant locations

Dow goes nuclear

- Nuclear power from small modular reactors should be a central part of the chemical industry's drive toward achieving carbon neutrality said Jim Fitterling, chairman and chief executive officer of Dow Inc. at the International Petrochemical Conference in March 2022
- In August 2022, Dow announced that it will install advanced nuclear reactors at one of its Gulf Coast sites
- Dow X-energy's XE-100 HTGR

Other promising signs

- West Virginia lifts ban on nuclear power plants, Illinois General Assembly is working on it
- TRISO-X announced plan for fuel plant by 2025
- U.K. energy strategy calls for new reactors
- EU added nuclear to “green” technologies in taxonomy
- Clean hydrogen hubs including nuclear
- White house decadal vision for Fusion

Challenges

Nuclear Power

- High capital cost
- Infrastructure
 - Lack of research facilities and supplier infrastructure
 - Long construction times and availability of labor
 - Challenges with quality assurance
- Long time frames for licensing
- Nuclear fuel supply
- Spent nuclear fuel
 - Consent-based siting

What needs to change?

Policy Level (Congress / Administration)

- Science-based policy
 - Spent fuel repository / interim storage (how best to frame the debate)
 - Equal treatment with respect to incentives (technology neutral)
- Level playing field
 - Grid access
 - Trade and security
 - Reduce the cost to be regulated

Regulatory

- Set the requirements based on the risk, **not perception of risk**
- If we want an outcome, make that the metric
 - Only accept applications that can really be reviewed in two years both because the information is there, and the regulations are ready
- Expect the regulator to be an expert (at all levels, from both perspectives)

Industry

- Change the relationship with the regulator (and others)
- Develop more realistic development paradigms
- **Become un-ashamed advocates for the technology**

Advocacy for Nuclear Science and Technology

How you can help



American Nuclear Society

Advocacy for Nuclear Science and Technology

- Take advantage of opportunities to engage with people outside the profession about nuclear technology
- Does your passion come through?
- Do you refer to respected third parties?
- Make sure people know what nuclear science and technology is doing for them



Advocacy for Nuclear Science and Technology

- Be “known” outside the nuclear profession
- Tailor your comments to your audience
- Understand the difference between a conversation and a monologue
- Listen well and encourage others to express their points of view



How ANS is helping

- Our Past President Steve Nesbit and I have asked all the ANS Divisions to identify key technical and policy initiatives
- We also need the support of the Local and Student Sections to help us identify issues, and develop positions
- We are continuing to comment on key government policies and lend our voice to issues that need solving
- We are working to educate, the public, government officials and the media



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