Senate Energy and Utilities Committee Opponent Testimony June 2019
Connie Kline, Past Chair Sierra Club Nuclear-Free Committee

Please note - Some paragraphs were re-arranged in this submission; therefore a few end note citations are not in numerically chronological order but the reference numbers remain the same.

"Today's problems come from yesterday's `solutions.'" From MIT systems scientist Peter Senge's 1990 book The Fifth Discipline - a prescient warning for trying to solve climate change with nuclear power.

The nuclear industry claimed electricity too cheap to meter **(1)**, radioactive waste removed in five years **(2)**, and a serious accident chance of one in 1000,000 to one in a 1,000,000,000. **(3)**

Nuclear power is not a pristine panacea for climate change and doesn't deserve bailouts like HB 6. It is a catastrophically dangerous, dirty, expensive, deteriorating technology that is not **"**clean**"**, **"**indispensable**"**, **"**carbon-free**"**, or **"**renewable**";** uranium is, in fact, a finite, non-renewable resource.

Gregory Jazcko, former Nuclear Regulatory (NRC) Commissioner and Chairman from 2005 to 2012, is the latest nuclear regulator, engineer, physicist, physician etc. to sound the alarm, writing, **"**I oversaw the U.S. nuclear power industry. Now I think it should be banned. The danger from climate change no longer outweighs the risks of nuclear accidents.**" (4)**

**EXPENSIVE** - Perry and Davis Besse cost a whopping $8.7 billion and billions more in maintenance, repairs, and subsidies like those granted in 2016. **(5) (6)** Many analysts consider nuclear power the most heavily subsidized U.S. industry **(7)** with new reactor costs approaching $20 billion which is why the Summer plants in Sough Carolina were canceled in 2017. **(8)**

**UNNEEDED** - In 2018, grid operator PJM, determined that closing Perry and Davis-Besse would not destabilize the grid. **(9)** Many reactors in the U.S. and worldwide have closed without consequence. **(10)**

**NOT CARBON-FREE OR SAFE** - The nuclear power life cycle produces copious carbon and other greenhouse gases from uranium mining, milling, refining, conversion, and enrichment**;** fuel fabrication**;** transportation**;** reactor construction, maintenance, decommissioning**;** and radioactive waste management. **(15)**

Dr. Benjamin Sovacool, Ph.D, Professor of Energy Policy at the University of Sussex, and others conclude that the nuclear fuel chain emits more greenhouse gases per kilowatt hour than all renewables including biomass, hydroelectric, solar, and wind. **"**Life-cycle carbon emissions from nuclear are twice as much as solar photovoltaic and six times more than wind or energy efficiency.**" (16)**

While nuclear generated electricity is low in carbon, it has never been **"**zero emissions.**"** Reactors emit methane, a greenhouse gas, and radioactive carbon-14, with a 5700 year half-life. The human body and the environment cannot distinguish highly volatile, biologically damaging radioactive carbon-14 from non-radioactive carbon. **(14)**

Electrical and nuclear engineer Dr. Arjan Makhijani, Ph.D, author of Carbon-Free and

Nuclear Free: A Roadmap for U.S. Energy Policy, **(17)** has said, **"**Carbon is not the only, or necessarily the most dangerous, element on the periodic table.**"** Nuclear plants routinely leak and release into air, soil, and water carcinogenic, teratogenic, and mutagenic radionuclides which are chemically indistinguishable from non-radioactive, life-sustaining elements. The scientific and medical communities, including but not limited to, the U.S. National Academy of Sciences (NAS) and the European Committee on Radiation Risk have determined that there is no safe dose or threshold of radiation exposure. **(13)**

Ingested or inhaled radioactive strontium-90 and cesium-137 replace calcium and potassium respectively, irradiating bones and muscles for decades. Carcinogenic, radioactive iodine-131 is absorbed by the thyroid gland which is the reason why potassium iodide is provided to residents near reactors. Cobalt-60 is a liver, kidney, and bone carcinogen. **(18)** Specks of inhaled plutonium-239, with a half-life of 24,000 years, can cause lung cancer. **(29)** Miles of buried, inaccessible, aging, deteriorating pipes have leaked tritium, which is radioactive hydrogen, from virtually every U.S. reactor and no technology can remove it from contaminated water. **(19)**

Yet the NRC has extended all reactor licenses, including Davis-Besse's, no matter how poor the operating record, **(20)** and it routinely waives and defers inspections, standards, maintenance, repairs, and upgrades. **(21)**

**THREE DISASTERS IN 32 YEARS** - occurred at Three Mile Island (1979), Chernobyl (1986), and Fukushima (2011), and at many other reactors worldwide since the 1950s. **(22)** The U.S. has 23 Fukushima-type GE Mark I reactors at 16 sites. **(23)** The NRC and other researchers postulate a 50% chance of another catastrophic accident in approximately the next 20 years. **(24)**

To limit utility liability, Congress passed the 1957 Price Anderson Act which currently caps accident compensation at $12.6 billion **(25);** however, a 1982 NRC-commissioned study conducted by U.S. Sandia National Labs calculated a severe accident could result in 50,000 fatalities, contaminate an area the size of Pennsylvania, and cause $314 billion in property damage which is $720 billion today's dollars. **(26)** All private insurers exclude reactor accidents, and according to the NRC, state governments will cover **"**injury, sickness, disease, death, property damage, loss and living expenses for evacuees.**" (27)** Ohio are you listening?!

**WASTE** - **"**A thousand-megawatt reactor contains as much long-lived radiation as...1,000 Hiroshima-sized bombs**"** from which humans and the environment must be protected forever, **(28)** but the NRC admits that no engineered structure can last the time required to isolate these wastes and that leakage will occur. **(32)**

Early warnings to resolve radioactive waste before licensing new reactors were ignored. **(31)** There are 88,000 tons of irradiated fuel "temporarily" stored in problem-plagued spent fuel pools and dry casks at 75 environmentally unsuitable reactor sites in 33 states because no permanent repository exists. **(30)**

**CONCLUSIONS AND RECOMMENDATIONS** - In 2012, Ohio was 13th in the U.S. for wind capacity and investment; this virtually ceased due to the passage in 2014 of SB 310

which mandated the country's most restrictive wind turbine setbacks and severely impeded Ohio's 2008 renewable energy and efficiency standards. **(33)** HB 6 will finish the job. **(34)**

Conservatives are among widespread opposition to HB 6. A February 2019 Ohio Conservative Energy poll found large majorities of conservative voters prefer solar, wind,
and efficiency and **"**oppose fees to keep old nuclear plants operating.**" (11)** The conservative Buckeye Institute and the Ohio Chapter of Americans for Prosperity testified against HB 6, as **"**corporate welfare...(and) a glorified slush fund.**" (12)**

Ohio needs to strengthen renewable energy and efficiency standards, stop throwing good money after bad, close Perry and Davis Besse as scheduled, and retrain workers in renewable energy jobs. After all, a court had to order FirstEnergy to pay bonuses to the union workers who actually operate the reactors, and to guarantee money for clean up. **(35)**

**END NOTES**

**1. "Too cheap to meter..."**
Lewis Strauss, member of the the Atomic Energy Commission (AEC)1946-50 and chair 1953-58 - Speech at the 20th anniversary of the National Association of Science Writers, New York City, September 16, 1954
https://todayinsci.com/S/Strauss_Lewis/StraussLewis-Quotations.htm
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"Abundant power from atom seen" 9/17/54
https://timesmachine.nytimes.com/timesmachine/1954/09/17/83884025.pdf

**2. P. 19 - "NRC views long-term storage of wastes for more than five years as a significant safety and environmental matter..."**
U.S. Nuclear Regulatory Commission, "Guide to the U.S. NRC's 10CFR61," Office of Nuclear Materials Safety and Safeguards, August 1989
https://www.nrc.gov/reading-rm/doc-collections/nuregs/brochures/br0121/
https://www.nrc.gov/docs/ML1207/ML120720225.pdf

**3.** 1957 AEC Report - WASH-740 (aka The Brookhaven Report) "Theoretical Possibilities and Consequences of Major Accidents in Large Nuclear Power Plants"
https://everipedia.org/wiki/lang_en/WASH-740/
http://dictionary.sensagent.com/wash%20740/en-en/
"Calculation of Reactor Accident Consequences" Sandia Labs 1982
http://ccnr.org/crac.html
https://www.nirs.org/wp-content/uploads/reactorwatch/accidents/crac2.pdf

**4. Gregory Jaczko** NRC commissioner from 2005 to 2009 and chairman from 2009 to 2012, author of Confessions of a Rogue Nuclear Regulator, founder of Wind Future LLC, and professor at Georgetown University and Princeton University.
https://www.washingtonpost.com/outlook/i-oversaw-the-us-nuclear-power-industry-now-i-think-it-should-be-banned/2019/05/16/a3b8be52-71db-11e9-9eb4-0828f5389013_story.html?utm_term=.29203c0e6872
downloadable PDF
https://www.goodreads.com/book/show/40538729-confessions-of-a-rogue-nuclear-regulator

**Experts past and present who oppose nuclear power:**
Dr. Peter Bradford Ph.D, NRC Commissioner from 1977-1982 (See also Note 7)
https://www.huffpost.com/entry/former-nrc-chair-emergenc_b_4060780
https://www.cleveland.com/business/2018/06/fes_nuclear_decommissioning_fu.html
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https://www.forbes.com/sites/oshadavidson/2011/03/13/former-u-s-nuclear-official-warns-it-can-happen-here/#6ea183f558d2
https://washingtonsblog.com/2014/01/former-nrc-commissioner-trying-solve-global-warming-building-nuclear-power-plants-like-trying-solve-global-hunger-serving-everyone-caviar.html
Dale Bridenbaugh nuclear safety engineer who along with Gregory Minor, and Richard Hubbard left GE in 1976 over prophetic concerns about the GE Mark I reactor, the type at Fukushima (see also Nuclear Witness below)
https://www.cbsnews.com/news/nuclear-safety-expert-it-could-happen-here/
https://abcnews.go.com/Blotter/fukushima-mark-nuclear-reactor-design-caused-ge-scientist/story?id=13141287
https://www.nytimes.com/1976/02/03/archives/3-engineers-quit-ge-reactor-division-and-volunteer-in-antinuclear.html
Robert Pollard nuclear reactor safety engineer with the Atomic Energy Commission (AEC), predecessor of the NRC, and a licensing project manager for the NRC which he left in 1976 after deciding that the NRC "was more interested in protecting the nuclear industry than the health and safety of the public."
https://www.the-scientist.com/news/ucs-marks-20-years-as-advocate-for-the-wise-use-of-technology-61734
https://www.upi.com/Archives/1986/09/16/Critics-warn-of-O-ring-danger-at-nuclear-plants/2474527227200/
https://www.upi.com/Archives/1989/06/14/Suit-filed-against-nuclear-licensing-rule/5189613800000/
https://www.nytimes.com/1976/05/30/archives/tv-view-fair-play-or-foul-on-60-minutes-tv-view-fair-play-or-foul.html
Arnie Gunderson nuclear engineer and licensed Critical Facility Reactor Operator with more than 44 years of nuclear industry experience who became a whistleblower in 1990.
https://www.youtube.com/watch?v=3nF1Bqh55Tg
https://vermontconversation.com/tag/maggie-gunderson/
David Lochbaum a nuclear safety engineer who worked in nuclear power plants for 17 years and taught safety to inspectors at the NRC; he became a whistleblower. His expertise is in nuclear power plant design, nuclear regulatory oversight, and nuclear waste issues. He recently retired from he Union of Concerned Scientists which he joined in 1996.
https://thebulletin.org/biography/david-lochbaum/
https://allthingsnuclear.org/author/dlochbaum#.XOhHQ5l_PDA
Edwin Lyman, Ph.D in physics from Cornell University. Worked in the Processing Needs Assessment conducted by the Department of Energy's Nuclear Material Stabilization Task Group from 1997-98.
https://www.nrc.gov/public-involve/conference-symposia/ric/past/2013/docs/bios/bio1-932.html
https://inside.mines.edu/UserFiles/File/Nuclear/Edwin%20Lyman%20Seminar.pdf
https://allthingsnuclear.org/author/elyman#.XOnlS5l_PDA
Dr. John Gofman, M.D., Ph.D
https://www.latimes.com/archives/la-xpm-2007-aug-28-me-gofman28-story.html
Gofman and Dr. Arthur Tamplin, Ph.D - Poison Power
https://ratical.org/radiation/CNR/PP/PPtxt.html
Arthur R. Tamplin
https://www.legacy.com/obituaries/bakersfield/obituary.aspx?pid=86128374
Dr.Thomas Mancuso, M.D., Ph.D
https://www.nytimes.com/2004/07/07/us/tf-mancuso-who-led-radiation-study-dies-at-92.html
https://spewingforth.blogspot.com/2004/07/dr-thomas-mancuso-1912-2004.html
https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(04)16749-4/fulltext
Dr. Alice Stewart, M.D.
https://www.nytimes.com/2002/07/04/world/alice-stewart-95-linked-x-rays-to-diseases.html
Dr. Helen Caldicott, M.D. (See also Notes 28 & 29)
http://ifyoulovethisplanet.org/dl/caldicott_bio.pdf
https://www.helencaldicott.com/about/
Author of Nuclear Madness and Nuclear Power is not the Answer among other books

Dr. Rosalie Bertrell, M.D. consultant to U.S. NRC and U.S. EPA (See also Note 29)
https://www.globalresearch.ca/remembering-rosalie-bertell/31448
Author of No Immediate Danger, Chernobyl, ECRR 2010 Recommendations of the European Committee on Radiation Risk: The Health Effects of Exposure to Low Doses of Ionizing Radiation (see Note 13) among others
Roger Sowell attorney and chemcial engineer
https://sowellslawblog.blogspot.com/2016/09/a-few-excellent-reasons-to-oppose.html
Nuclear Witness Leslie J. Freeman
https://searchworks.stanford.edu/view/1017681
https://en.wikipedia.org/wiki/List_of_nuclear_whistleblowers
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**5. "First Energy customers lose chance to save billions in electricity costs"** Plain Dealer 10/17/03
http://ohiocitizen.org/campaigns/electric/2003/lose_chance.htm
http://northperry.org/community/north-perry-history.html
**"**At a cost of six billion dollars, the Perry Nuclear Power Plant is one of the most expensive ever built.**"**

**6. Millions in subsidies granted to FirstEnergy in 2016**
https://www.publicpower.org/periodical/article/ohio-regulators-modify-firstenergy-rate-proposal-scale-it-back
https://www.bricker.com/insights-resources/publications/consequences-of-first-energys-electric-security-plan-rehearing-decision

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**"**Conservative estimates suggest that the nuclear industry has received more than $85 billion in subsidies.**"** (in 2009 dollars)
https://www.taxpayer.net/energy-natural-resources/nuclear-power-subsidies/ (in 2009 dollars)
http://content.time.com/time/health/article/0,8599,1812540,00.html (in 2008 dollars)
**"**Lovins notes that the U.S. nuclear industry has received $100 billion in government subsidies over the past half-century.**"**
https://www.counterpunch.org/2016/01/01/nuclear-energy-dangerous-to-your-wallet-not-only-the-environment/
**"**...there so many different types of subsidies — but it amounts to a figure, whether we calculate in dollars, euros or pounds, in the hundreds of billions.**"** (In 2016 dollars)
https://hubpages.com/politics/The-Hidden-Costs-of-Nuclear-Energy (2018 dollars))
**"**The nuclear power industry is arguably the most heavily subsidized industry in the United States.**"**
https://www.iisd.org/gsi/commentary/gambling-nuclear-power-how-public-money-fuels-industry (2008 dollars)
**"**...studies have quantified subsidies to the nuclear-power industry over the decades, indicating aggregate subsidization at well over US $150 billion, and a subsidy intensity (government support per kWh output) normally exceeding 30% of the market value of the energy produced.**"**
Peter Bradford 2016
http://theconversation.com/compete-or-suckle-should-troubled-nuclear-reactors-be-subsidized-62069
https://www.marketwatch.com/press-release/experts-nuclear-bailout-could-cost-up-to-17-billion-a-year-and-destroy-renewables-industry-in-us-2018-06-06
https://www.ecowatch.com/nuclear-power-cost-renewables-2625524662.html
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https://www.ewg.org/news-and-analysis/2018/03/trump-administration-plans-spin-campaign-dying-nuclear-energy
https://thinkprogress.org/nuclear-power-is-so-uneconomical-even-bill-gates-cant-make-it-work-without-taxpayer-funding-faea0cdb60de/

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http://www.independent.org/news/article.asp?id=9082

**8. New reactor costs**

https://www.bizjournals.com/charlotte/news/2017/07/31/s-c-utility-votes-to-stop-building-16b-v-c-summer.html
https://www.postandcourier.com/business/georgia-s-nuclear-project-could-be-canceled-like-south-carolina/article_f8781644-d908-11e7-8116-37b0cbedd646.html

**9. PJM** - closing Perry and Davis-Besse will not destabilize the grid

https://www.euci.com/pjm-says-proposed-closing-of-firstenergy-nuclear-plants-will-not-impact-grid-reliability/
https://www.publicpower.org/periodical/article/pjm-says-firstenergy-nuclear-deactivations-wont-harm-reliability
https://www.forbes.com/sites/adammillsap/2019/04/19/state-nuclear-subsidies-not-needed/#7d7dfb18111d

**10. Closed reactors, nuclear-free states and countries**

https://www.power-eng.com/articles/slideshow/2016/08/u-s-nuclear-power-plants-already-closed-or-closing.html
http://www.radiationtruth.org/nuclear-power-free-countries/
https://www.nrc.gov/docs/ML1822/ML18226A124.pdf
see appendix C (add Oyster Creek which closed 9/17/18 after publication)
https://www.nytimes.com/2019/05/08/us/three-mile-island-shut-down.html
Pennsylvania did not pass a nuclear bailout bill in 2019. The Pilgrim reactor in Mass. is also closing in 2019.

**11. Poll** - Conservatives oppose bailouts and nuclear power, support renewables

https://www.cleveland.com/business/2019/02/conservative-ohio-voters-want-most-of-ohios-electricity-to-come-from-renewable-sources.html

**12. HB 6 - Conservatives oppose bailouts**

https://energynews.us/2019/05/06/midwest/conservatives-criticize-firstenergy-nuclear-bailout-bill-as-corporate-welfare/

**13. No safe dose/dose rate of radiation exposure**

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http://www.inaco.co.jp/isaac/shiryo/pdf/ECRR_2010_recommendations_of_the_european_committee_on_radiation_risk.pdf
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http://static1.1.sqspcdn.com/static/f/356082/26803104/1453237100603/carbon14final.pdf.html

**15. Carbon production in nuclear plant life cycle**

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**16. Carbon and nuclear fuel cycle**

Benjamin Sovacool Valuing the greenhouse gas emissions from nuclear power: A critical survey
https://www.nirs.org/wp-content/uploads/climate/background/sovacool_nuclear_ghg.pdf
Benjamin Sovacool and Christopher Cooper, Nuclear Nonsense: Why Nuclear power is no Answer to Climate Change and the World’s Post-Kyoto Energy Challenge
https://scholarship.law.wm.edu/cgi/viewcontent.cgi?referer=https://r.search.aol.com/_ylt=AwrE19xGWdFc9.wAxQFpCWVH;_ylu=X3oDMTBzdWd2cWI5BGNvbG8DYmYxBHBvcwMxMAR2dGlkAwRzZWMDc3I-/RV=2/RE=1557252550/RO=10/RU=http%3a%2f%2fscholarship.law.wm.edu%2fcgi%2fviewcontent.cgi%3farticle%3d1040%26context%3dwmelpr/RK=0/RS=3uQZ1jlhr1PnlWO4RURAX0cmSbU-&httpsredir=1&article=104

0&context=wmelpr
**"**Final report on technical data, costs and life cycle inventories of nuclear power plants.**"**
Claire Lecointe, David Lecarpentier, Vincent Maupu, Denis Le Boulch, Romain Richard
http://www.needs-project.org/RS1a/RS1a%20D14.2%20Final%20report%20on%20nuclear.pdf
**"**Life cycle and management of carbon-14 from nuclear power generation**"**
Man-Sung Yima, Francois Caron, Department of Nuclear Engineering, North Carolina State University,
https://ramp.nrc-gateway.gov/system/files/66278bfc78cd1cc9267444534e1a7b34/Progress%20in%20Nuclear%20Energy%20Article.pdf
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**17. Dr. Arjun Makhijani**

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See also - Mark Z. Jacobson, Department of Civil & Environmental Engineering, Stanford Univ. & Mark A. Deluccchi, Institute of Transportation Studies, Univ. of CA at Davis
https://web.stanford.edu/group/efmh/jacobson/Articles/I/JDEnPolicyPt1.pdf
**"**Providing all global energy with wind, water, and solar power, Part I: Technologies, energy resources, quantities and areas of infrastructure and materials**"**
"Providing all global energy with wind, water, and solar power, Part II: Reliability, system and transmission costs and policies"
https://web.stanford.edu/group/efmh/jacobson/Articles/I/DJEnPolicyPt2.pdf
Jacobson articles
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See also - Derek Abbott, a physicist and electronic engineer, and professor in the School of Electrical and Electronic Engineering at the University of Adelaide in Australia and author of Nuclear Power Game Over and other publications
http://static1.1.sqspcdn.com/static/f/356082/27266889/1475068962187/NuclearPower_GameOver_DerekAbbott.pdf?token=IEiiM7hFSxfkOm%2BpRPYvQT5iQKE%3D
https://researchers.adelaide.edu.au/profile/derek.abbott
See also - "Nuclear power, the energy balance**"** by Jan Willem Storm van Leeuwen and Philip Smith - van Leeuwen is a physical chemist and energy consultant focused on sustainability whose numerous articles and reports have appeared in various peer-reviewed scientific journals.
https://www.stormsmith.nl/aboutstudy.html
https://www.stormsmith.nl/Media/downloads/insights.pdf
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https://www.stormsmith.nl/i05.html

**18. Radionuclides**

In 2010 the NRC asked the NAS to conduct an **"**Analysis of Cancer Risks in Populations Near Nuclear Facilities: Phase I**"** which was completed in 2012. NAS was preparing to embark on Phase II of the study when the NRC abruptly canceled it.
https://www.ncbi.nlm.nih.gov/books/NBK201997/
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https://www.counterpunch.org/2015/09/22/nuclear-power-kills-the-real-reason-the-nrc-canceled-its-nuclear-site-cancer-study/
https://www.dailynews.com/2017/02/04/nuclear-officials-killed-study-on-whether-reactors-posed-cancer-risk-to-nearby-residents/
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**19. Leaks**

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https://www.ucsusa.org/sites/default/files/legacy/assets/documents/nuclear_power/nuclear-power-radioactive-releases.pdf
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**20. The NRC has never denied a reactor operating license extension**

https://www.ocregister.com/2011/07/31/feds-have-never-said-no-to-nuclear-plant-relicensing/
https://www.ap.org/press-releases/2012/part-iv-ap-impact-nrc-and-industry-rewrite-nuke-history
https://www.huffpost.com/entry/nuclear-regulatory-commission_b_1565916
https://www.counterpunch.org/2012/06/04/an-80-year-license-to-kill/
https://www2.ljworld.com/news/2011/jul/06/regulators-industry-cooperate-renew-licenses-nucle/

**21. NRC waivers, deferrals, exemptions**

https://www.nbcnews.com/politics/politics-news/nuclear-industry-pushing-fewer-inspections-plants-n983671
https://www.ap.org/press-releases/2012/aging-nukes-a-four-part-investigative-series-by-jeff-donn
https://www.propublica.org/article/nrc-waives-enforcement-of-fire-rules-at-nuclear-plants
https://www.nrdc.org/sites/default/files/nuc_12031201b.pdf
https://vtdigger.org/2011/05/16/nrc-waives-enforcement-of-fire-rules-at-nuclear-plants/
5/21/19 FENOC - Beaver Valley Power Station, Units 1 and 2; Davis-Besse Nuclear Power Station Unit 1,and Perry Nuclear Power Plant Unit 1, Request for Withholding Information from Public Disclosure Regarding Application for Order Consenting (EPID L-2019-LLM-0000).
https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML19121A479
4/10/19 FENOC - Beaver Valley Power Station, Unit 1 and 2; Davis-Besse Nuclear Power Station Unit 1; and Perry Nuclear Power Plant Unit 1 - Request for Withholding Information from Public Disclosure regarding Retrospective Premium Guarantee.
https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML19080A049
2/19/19, 3/20/19, 5/16/19 - Perry Deferrals Beyond Design Basis Flooding Hazard
https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML19035A655
https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML19080A005
https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML19093B133
3/4/2019 - NRC Response to Request for Deferral of Actions Related to Beyond-Design-Basis Flooding Hazard Reevaluations for Davis-Besse Nuclear Power Station, Unit 1
https://adamswebsearch2.nrc.gov/webSearch2/view?AccessionNumber=ML19031C930
2/27/2019 - FENOC sheds workers and regulations Document Title: Davis-Besse Nuclear Power Station, Unit No. 1 - Supplement to License Amendment Request - Proposed Changes to Technical Specifications Sections 1.1. "Definitions," 5.0., "Administrative Controls." for Permanently Defueled Condition. License-Application for Facility Operating License (Amend/Renewal) DKT 50
https://adamswebsearch2.nrc.gov/webSearch2/view?AccessionNumber=ML19058A328
2/1919/20 - License Amendment Request to avoid current regulation on core cooling system strainer debris. DTE slides. Proposing to use a risk-informed analysis of the impact of additional emergency core cooling system strainer debris that is beyond the current design basis values. Results of the analysis will provide the justification for the additional debris sources in the license amendment in accordance with



Regulatory Guide 1.174.

https://adamswebsearch2.nrc.gov/webSearch2/view?AccessionNumber=ML19045A269
9/7/2018 - Barbed wire is now grandfathered in as a security standard. FENOC Fleet - Individual FR Notice - Notice of Issuance of Exemption re: Exemption from the Definition of Physical Barrier
https://adamswebsearch2.nrc.gov/webSearch2/view?AccessionNumber=ML18178A588
8-29-2018 - Approval of Barbed Wire As Is: Davis-Besse Nuclear Power Station, Unit 1 - FirstEnergy Nuclear Operating Company (FENOC); FirstEnergy Nuclear Generation, LLC; Environmental Assessment
https://adamswebsearch2.nrc.gov/webSearch2/view?AccessionNumber=ML18130A849
8-29-2018 - Barbed Wire document: FENOC Fleet - Beaver Valley; Davis-Besse; Perry - Environment Assessment and Finding of No Significant Impact Related to Exemption Request for a Physical Barrier Requirement
https://adamswebsearch2.nrc.gov/webSearch2/view?AccessionNumber=ML18130A885
1/22/2018 - NRC has given permission to FirstEnergy to run its 4 reactors with leaking on Class 2 & 3 Piping.
https://adamswebsearch2.nrc.gov/webSearch2/view?AccessionNumber=ML18004A122
4/6/2017 - Document Title: Davis-Besse Nuclear Power Station, Unit No. 1 - Request for Withholding Information From Public Disclosure (CAC NO. MF9126).
https://adamswebsearch2.nrc.gov/webSearch2/view?AccessionNumber=ML17093A614
1/10/2017 - The NRC allowed Davis-Besse to increase liquid effluents tenfold, with a Finding Of No Significant Impacts (FONSI) approved. The NRC notice of this FONSI did not come through to the public until December 2017. Full document here: Final EA and FONSI Davis-Besse Effluent Release Controls.
https://adamswebsearch2.nrc.gov/webSearch2/view?AccessionNumber=ML16336A061
5/10/2016 - According to these documents Davis-Besse exceeded standards of radiological releases for isotopes including: Co-57, Co-60, Sr-90, Cs-134, Cs-137, K-40, Xe-65, Fe-55, Pu239/240.
https://adamswebsearch2.nrc.gov/webSearch2/view?AccessionNumber=ML16147A007
https://adamswebsearch2.nrc.gov/webSearch2/view?AccessionNumber=ML16147A006

**22. Nuclear reactor disasters**
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3606704/
https://www.cnbc.com/2011/03/16/11-Nuclear-Meltdowns-and-Disasters.html
https://www.processindustryforum.com/hot-topics/nucleardisasters

**23. Fukushima GE Mark I reactors used in U.S. and long criticized**
https://www.nytimes.com/2011/03/16/world/asia/16contain.html

**24. Probability of another nuclear plant disaster**
https://www.nytimes.com/1985/05/08/opinion/the-next-nuclear-meltdown.html
https://www.technologyreview.com/s/536886/the-chances-of-another-chernobyl-before-2050-50-say-safety-specialists/
https://www.nbcnews.com/storyline/fukushima-anniversary/u-s-nuclear-agency-hid-concerns-hailed-safety-record-fukushima-n48561
https://washingtonsblog.com/2011/04/a-u-s-nuclear-accident-could-be-a-lot-worse-than-japan.html
https://www.huffpost.com/entry/five-years-after-fukushim_b_9402962

**25. Price Anderson Act**
https://money.cnn.com/2011/03/25/news/economy/nuclear_accident_costs/index.htm
https://www.thenation.com/article/who-pays-nuclear-power/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3606704/

**26. Accident costs/consequences** (See also Note 25)
https://money.cnn.com/2011/03/25/news/economy/nuclear_accident_costs/index.htm
http://dictionary.sensagent.com/wash%20740/en-en/
Consequences of a Reactor Accident 1982
http://ccnr.org/crac.html
Impact of a Meltdown 1982
http://static1.1.sqspcdn.com/static/f/356082/10875171/1298351245463/CRAC+2+chart.pdf?token=PGuxgz5f4FZMvil8tC45ukdF8Ks%3D



http://cms.energypolicy.co.uk/243

**27. No private insurance** (See NOTE 24)

https://money.cnn.com/2011/03/25/news/economy/nuclear_accident_costs/index.htm

**28. Reactor radioactive waste**

Dr. Helen Caldicott

http://www.spaulforrest.com/2011/03/warnings-of-nuclear-plant-dangers-were.html

Dr. Rosalie Bertell

https://www.globalresearch.ca/remembering-rosalie-bertell/31448

http://www.efmr.org/Xtra/TheNRC_%20What.pdf

http://static1.1.sqspcdn.com/static/f/356082/26605366/1444852853757/BN_RoutineRadioactiveReleases_Oct2015.pdf?token=zwsUExAyfOttAa88dOgh7qJ3NkE%3D

http://nukefreetexas.org/downloads/health_risks_nuclear_power.pdf

http://nuclearfiles.org/menu/key-issues/nuclear-energy/basics/introduction.htm

Perry nuclear power plant operating license pp. 386-387 fuel specifications

https://www.nrc.gov/docs/ML0530/ML053040355.pdf

**29. Plutonium-239**

https://nuclear-news.net/2014/05/02/dr-helen-caldicott-explains-the-facts-on-radiation/

See also Note 28 Dr. Rosalie Bertell

https://www.globalresearch.ca/remembering-rosalie-bertell/31448

**30. Spent fuel pools and dry casks** (note conversion of metric tons to tons.)

https://www.gao.gov/key_issues/disposal_of_highlevel_nuclear_waste/issue_summary

**Spent Fuel Pool Problems** - Pools are not under robust containment like the reactor, itself, making accidents or attacks more likely to cause a disastrous release of radiation. The NRC admits that irradiated fuel which has been cooled in pools for decades could spontaneously combust if overheated due to partial water drainage or contact with air resulting from a loss of power, pump circulation failure, pool puncture from loading dry casks or a terrorist attack. A resulting fire could be catastrophic.

However, the NRC continues to minimize and inadequately address the vulnerability of spent fuel pools to accidents, attacks, and fires, justifying its position, in part, by assuming that populations in the 10 mile Emergency Planning Zones (EPZs) will be successfully evacuated. This assumption ignores the inadequacy of unproven evacuation plans and the fact that spent fuel can and will remain in pools long after reactor closure.

Further, the NRC can exempt utilities from maintaining EPZs within a mere 12-18 months after reactor shutdown. How can populations be evacuated if EPZs have been eliminated?

Problems are exacerbated by the increased use of high burn-up fuel which is thermally hotter, requiring cooling in spent fuel pools for a minimum of 20 years; more than twice as radioactive as lower burn-up fuel; and more susceptible to damage, cladding embrittlement, and storage instability than fuel initially used in commercial reactors. There is no way to transfer high burn-up fuel to dry cask storage.

Through incompetence, negligence, non-disclosure, and falsification, the nuclear industry ignored or hid spent fuel pool leaks of radioactive effluent (including Cobalt-60, cesium-137, and especially tritium) into soil and groundwater. (See Note 19)

http://www.beyondnuclear.org/storage/documents/LeakFirst_FixLater_BeyondNuclear_April182010_FINAL.pdf

https://www.propublica.org/article/status-of-spent-nuclear-fuel-in-question-at-crippled-japanese-power-plant

https://ratical.org/radiation/NuclearExtinction/SpentNuclearFuelPoolsInUS.pdf

https://ips-dc.org/spent_nuclear_fuel_pools_in_the_us_reducing_the_deadly_risks_of_storage/

http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=11263

https://www.freep.com/story/news/local/michigan/2018/10/19/nuclear-waste-great-lakes/1417767002/

NRC cites problems with spent fuel pools at various reactors

https://www.nrc.gov/reading-rm/doc-collections/gen-comm/info-notices/1990/in90033.html

Documented problems with spent fuel pools at various reactors

https://allthingsnuclear.org/dlochbaum/spent-fuel-damage-pool-criticality-accident

Scroll to bottom “United States”



https://www.brookings.edu/opinions/preventing-nuclear-meltdown-assessing-regulatory-failure-in-japan-and-the-united-states/

**Dry-cask storage problems** - Dry casks are much more costly than spent fuel pools. **"**A dry-cask storage facility at a plant can cost as much as $20 million to build and $7 million a year to maintain, according to the industry group Nuclear Energy Institute.**"**
https://republicans-energycommerce.house.gov/news/press-release/long-term-repository-needed-nuclear-waste-continues-pile/

Casks are made of concrete, steel, and neutron shielding materials. Thin, metal inner canisters are loaded underwater in the spent fuel pools, the water is pumped out, and the lids are welded or bolted shut. Inner canister temperatures can reach 400 degrees F due to continued radioactive decay. The canisters are transferred outdoors to concrete silos or bunkers which sit on concrete pads where they are vulnerable terrorist targets. Dry casks are certified generically for 20 years meaning public hearings are prohibited, and the casks are approved with no site-specific study and no environmental impact statement.

Problems surfaced almost immediately with dry cask use. The NRC allowed manufacturers to build casks BEFORE issuing a certificate of compliance. There have been numerous quality control and quality assurance problems with Holtec, NUHOMS, TN-40, VSC-24 casks and others. There have been well documented departures from design and technical specifications, use of potentially inferior materials, structural integrity issues, and weld failures as well as problems with the concrete pads, themselves, at, for example, the Dresden reactor in Illinois. These concrete pads and casks weighing over 100 tons have been placed on unstable, sandy, erosion-prone soils like those at the Palisades reactor on the shores of Lake Michigan.

At the Davis Besse reactor in Ohio, fully loaded NUHOMS casks were built below technical specifications with poor quality aggregate in the outer concrete shells, and welds were ground too thin. The NRC reported in 2000 that a loaded TN-32 cask at the Surry plant in Virginia developed six inch long cracks in its outer concrete shield, loose bolts, and a helium leak.

Perhaps most disturbing have been the "hydrogen ignition incidents" (explosions) with the VSC-24 casks, most notably on May 28,1996 at the Point Beach reactor in Wisconsin and in June 1999 at Palisades in Michigan.

Human error or equipment failure in moving loaded canisters could have catastrophic consequences. Dropping an empty or loaded canister inside the fuel pool building could severely damage critical safety equipment and impact the integrity of the entire pool. In some GE boiling water reactors (Fukushima-type Mark I), irradiated fuel storage pools are several stories high, making cask movement even more dangerous and potentially disastrous. A near-miss occurred on May 13, 1995 at Prairie Island in Minnesota when a loaded, 120 ton TN-40 canister became stuck and dangled precariously for 16 hours over the spent fuel pool which contained tons of irradiated fuel that had been stored for over 22 years. In August 2018, a canister at the San Onofre reactor nearly fell 18 feet as it was being moved from the spent fuel pool to a dry cask.
https://www.sandiegouniontribune.com/business/energy-green/sd-fi-songs-whistleblower-20180810-story.html

The NRC assumes that this radioactive waste can be transferred into new casks every 100 years or less, yet no dry storage cask has ever been unloaded, and no safe unloading procedure exists as evidenced by an August 1994 situation at Palisades when a VSC-24 cask was discovered to have weld flaws. The utility, Consumers Energy, "volunteered" to unload the irradiated fuel from the cask and put it back into the storage pool, but insurmountable technical difficulties prevented that from occurring. Placing 400 degree F fuel back into 100 degree F pool water would result in radioactive steam hazardous to workers, and would thermally shock the fuel threatening to further degrade it. There was only a 50 hour window to cut open the welded inner canister and unload the cask before the fuel would begin to overheat. So that fully loaded, known-defective cask and dozens more fully loaded VSC-24 casks of questionable integrity remain on the shores of Lake Michigan.

The NRC has failed to consider the very real possibility that irradiated fuel will so degrade with age that transfer operations cannot ever be accomplished.



https://www.nirs.org/wp-content/uploads/radwaste/atreactorstorage/drycaskfactsheet07152004.pdf
https://www.nrc.gov/public-involve/conference-symposia/dsfm/2015/dsfm-2015-erica-gray.pdf
https://sanonofresafety.files.wordpress.com/2011/11/drycaskstorageissues2014-09-20a.pdf

https://sanonofresafety.files.wordpress.com/2013/06/highburnupexecutivesummary2014-01-02.pdf
https://sanonofresafety.org/2014/08/21/premature-failure-of-u-s-spent-nuclear-fuel-storage-canisters/
https://www.songscommunity.com/internal_redirect/cms.ipressroom.com.s3.amazonaws.com/339/files/20182/Donna%20Gilmore%20-%20Public%20comment%20for%20CEP%20meeting%20-%2007-23-15.pdf
https://www.agreenroadjournal.com/2016/04/dry-cask-long-term-high-level-nuclear.html
http://agreenroad.blogspot.com/2013/12/spent-fuel-pool-risks-at-nuclear-power.html
Structural integrity of high burnup fuel rod under drop impact
https://www.sciencedirect.com/science/article/pii/S0029549318303005
Sandia National Lab report October 2018 Spent Fuel Transportation Casks
"Current designs for spent fuel transportation casks cannot ensure a cask's integrity during shipment, nor is there any verifiable means of maintaining continuity of knowledge (CoK) on a cask's contents."
https://www.researchgate.net/publication/328642066_SANDIA_REPORT_Developing_Design_Criteria_for_Safeguards_Seals_for_Spent_Fuel_Transportation_Casks_-_Final_Report

**31. Unheeded warnings**

From 1946-1950, David Lilienthal chaired the Atomic Energy Commission (AEC), predecessor of the present-day NRC which was created in 1974. His candid 1963 book Change, Hope and the Bomb was extremely critical of commercial nuclear power and radioactive waste:

**"**During the years since the first AEC, has the problem of disposition of these poisonous, radioactive wastes been made demonstrably manageable, either as to the danger or the cost? The answer is No!

Should not a program of large-scale atomic reactors wait at least until it is demonstrated that this waste-poison problem is decisively licked? Until such time, I believe that the future of atomic energy is in grave doubt. The risks may limit or even eliminate a nation-wide atomic-energy program.**"**

Lilienthal, David E., Change, Hope and the Bomb (Princeton, NJ: Princeton University Press, 1963), pp. 135-137.
https://ia600200.us.archive.org/18/items/changehopeandthe013184mbp/changehopeandthe013184mbp.pdf

The renowned international scientific body PUGWASH stated at its 23rd Conference in 1973:

**"**No general solution for the isolation of long-lived radioactive wastes from the biosphere, necessary for many of thousands of years, is yet in hand...`experts' still disagree on whether any proposals will suffice...It is impossible to be complacent about expansion in the use of nuclear power without having a solution in hand.**"**

Lash, Terry. R, Bryson, John E., and Cotton, Richard, Citizens' guide : the national debate on the handling of radioactive wastes from nuclear power plants (Palo Alto, CA: Natural Resources Defense Council, Inc., 1975), p. 2.
https://www.worldcat.org/title/citizens-guide-the-national-debate-on-the-handling-of-radioactive-wastes-from-nuclear-power-plants/oclc/500326701?referer=di&ht=edition
PUGWASH
https://pugwash.org/pugwash-international-conferences/
https://core.ac.uk/display/44193496

**32. Waste will outlast disposal** (See Note 2 - P. 19) - "There is no way to guarantee that any disposal facility, for any waste, will not release some amount of radioactivity...No structure or site can be guaranteed to contain radioactive waste in perpetuity. Given the fact that facilities deteriorate and human institutions may not maintain complete control, NRC chose to rely on the more realistic requirements of 100 years of institutional care..."
https://www.nrc.gov/docs/ML1207/ML120720225.pdf

**33. Killing wind power in Ohio**

https://energynews.us/2015/01/22/midwest/drops-in-ohio-clean-energy-investment-could-hurt-jobs-growth/



http://www.cleveland.com/open/index.ssf/2015/01/ohio_renewable_energy_policies.html
https://windexchange.energy.gov/states/oh

**34. Killing all renewable standards in Ohio**

https://www.cleveland.com/open/2019/05/bill-to-gut-ohios-green-energy-standards-waved-forward-by-house-panel.html

**35. FirstEnergy did not want to pay bonuses to the union workers who actually operate the reactors, and did not want to guarantee money for clean up.**

https://www.cleveland.com/business/2018/09/judge_dismisses_firstenergy_so.html

https://www.energycentral.com/news/firstenergy-solutions-revamps-bankruptcy-plan-following-court-criticisms