

ADVANCE Act Section 206: Evaluating Potential Regulatory Issues for Nuclear Facilities at Brownfield Sites

NRC

U.S. Nuclear Regulatory Commission Public Meeting January 16, 2025





Scope of Today's Meeting

- Today's meeting will discuss topics related to Section 206 of the <u>ADVANCE Act</u>, "Regulatory issues for nuclear facilities at brownfield sites."
- Per NRC's public meeting policy (<u>86 FR 14964</u>), this is an *Information Meeting* with Question and Answer.
- This meeting was noticed on the <u>NRC's Public Meeting Schedule</u> page on December 30, 2024.





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Legend All Offices NMSS NRR OCFO OCHCO OCIO OCEO OCEO OCEO RES

Task Q3 2024 Q4 2024 Q1 2025 Q2 2025 Q3 2025 Q4 2025 Q1 2026 Q2 2026 Q3 2026 Q4 2026 Q1 2027 Q2 2027 Q3 2027 Q4 2027 Section Identify international nuclear export and innova.. 101. International nuclear export a... 102. Denial of certain domestic lice... Inform external stakeholders about section 102. 103. Export license notification. Develop procedures to inform the Commission . 201. Fees for advanced nuclear rea... Establish a reduced hourly rate for advanced nu... 203. Licensing considerations relati... Submit a report to Congress on non-electric us.. 204. Enabling preparations for the ... Incorporate in the FY 2026 fee rule the exclusio... 205. Fusion energy regulation. Submit a report to Congress on licensing frame. Assess potential regulatory modifications to ac... 206. Regulatory issues for nuclear f... 206. Regulatory issues for nuclear f.. Develop and implement strategies to achieve ef.. 206. Regulatory issues for nuclear f... Submit a report to Congress on implementatio... 206. Regulatory issues for nuclear f.. Submit a report to Congress on potential regul. 207. Combined license review proc... Establish an expedited procedure for the review... 208. Regulatory requirements for ... Develop risk-informed and performance-based . 208. Regulatory requirements for ... Implement risk-informed and performance-bas... 301. Foreign ownership. Implement actions to address any identified im. 401. Report on advanced methods ... Submit a report to Congress on advanced meth.. 402. Nuclear energy traineeship Establish a nuclear energy traineeship subprogr.. 404. Development, gualification, an... Develop a memorandum of understanding with..

https://www.nrc.gov/about-nrc/governing-laws/advance-act.html#dashboard



For Upcoming and Past Meetings



ANCENRC

For NRC's public meeting information on ADVANCE Act



ADVANCE Act (Accelerating Deployment of Versatile, Advanced Nuclear for Clean Energy Act of 2024)



Public Meetings

Upcoming Meetings
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Questions, Comments, or Ideas

Contact Us about the ADVANCE Act

https://www.nrc.gov/about-nrc/governing-laws/advance-act.html#related



For Your Questions and Ideas



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Contact us with ADVANCE Act questions, comments and ideas



https://www.nrc.gov/about-nrc/governing-laws/advance-act/contactus.html





Section 206. Regulatory Issues for Nuclear Facilities at Brownfield Sites

<u>Direction</u>: Evaluate the extent to which modification of regulations, guidance, or policy is needed to enable efficient, timely, and predictable licensing reviews for, and to support oversight of, production and utilization facilities at brownfield sites.

<u>Objective</u>: Streamline licensing of NRC facilities at or near brownfield or retired fossil fuel sites by leveraging: (1) existing site infrastructure, (2) existing emergency preparedness organizations and planning; (3) availability of historical site-specific environmental data; (4) previously completed environmental reviews; (5) activities associated with potential decommissioning of facilities or decontamination and remediation; and (6) community engagement and historical experience with energy production.





Agenda, Panel 1

Time	Торіс	Speaker
1:00 – 1:10 p.m.	Welcome & Logistics	Mike King, NRC/OEDO Chris Regan, NRC/NMSS/REFS Sarah Lopas, NRC/NMSS/REFS
1:10 – 1:30 p.m.	Feasibility of Brownfield Sites for SMR Deployment – Establishing Baseline Conditions to Support Regulation & Environmental Impact Assessment	Matthew Bond, Environmental Biologist, Radioecology Section Head, Canadian Nuclear Laboratories
1:30 – 1:50 p.m.	Brownfield Redevelopment in Kentucky	Cliff Hall, Manager, Superfund Branch, Division of Waste Management, Kentucky Energy and Environment Cabinet
1:50 – 2:10 p.m.	Brownfield Redevelopment in Tennessee	Evan W. Spann, Deputy Director of Field Operations, Division of Remediation, Tennessee Department of Environmental Conservation
2:10 – 2:20 p.m.	NRC's Decommissioning Funding Assurance Requirements and Existing Radiological Contamination at Brownfield Sites	Richard Turtil, Senior Financial Analyst, NRC/NMSS/REFS
2:20 – 2:35 p.m.	Panel Discussion	NRC and Panelists





Agenda, Panel 2

Time	Торіс	Speaker
2:35 – 2:45 p.m.	BREAK	
2:45 – 2:50 p.m.	Introduction to Panel 2 – Population and Community Considerations	Christine King, Director, Gateway for Accelerated Innovation in Nuclear (GAIN), Idaho National Laboratory (INL)
2:50 – 3:10 p.m.	NRC's Population-Related Siting Requirements for Advanced Reactors	William (Bill) Reckley, Senior Project Manager, Office of Nuclear Reactor Regulation, NRC
3:10 – 3:30 p.m.	Population-Related Siting Requirements – Considerations and Recommendations	Kati Austgen, Senior Project Manager for New Nuclear, Nuclear Energy Institute
3:30 – 3:45 p.m.	Workforce, Energy & Environmental Justice	Christine King, Director, GAIN/INL
3:45 – 4:05 p.m.	Role of Local Governments in Support of New Nuclear Development	Kara Colton, Principal, KacoGroup, LLC
4:05 – 4:25 p.m.	Community Perspective	Tracy Boatner, President & CEO, East Tennessee Economic Corporation
4:25 – 4:45 p.m.	Panel Discussion	NRC and Panelists
4:45 – 5:00 p.m.	Public Comments and Questions, Close Out	Public and NRC



November 2024 Brownfield Meeting

NRC

Detailed summary of the 11/21/2024 public meeting on Section 206 is available in the NRC's Agencywide Documents Access and Management System (ADAMS) at ML24345A048.

• Includes links to all presentation slides and meeting transcript.

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Feasibility of Brownfield Sites for SMR Deployment

Establishing Baseline Conditions to Support Regulation & Environmental Impact Assessment

Matt Bond, Environmental Biologist Radioecology Section Head Canadian Nuclear Laboratories ☑ matthew.bond@cnl.ca

U.S. Nuclear Regulatory Commission Public Meeting 2025 January 16



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Energy Mix in Canada





Source: NRCan Energy Fact Book (2023)

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Adding SMRs to Canada's Energy Mix

A Call to Action: A Canadian Roadmap for Small Modular Reactors





CANADA'S SMR ACTION PLAN PROGRESS UPDATE

SMR ACTION PLAN LEADERSHIP TABLE October 2022

Canada

2022

- "SMRs could be a key player in meeting Canada's commitment to phase out the use of conventional coal-fired power plants by 2030, and as Canada strives to secure 90% nonemitting electricity supply by 2030"
 SMR Roadmap (2018)
- "The Vision: Small Modular Reactors as a source of safe, clean, affordable energy, opening opportunities for a resilient, low carbon future and capturing benefits for Canada and Canadians" - SMR Action Plan (2022)

2018

Adding SMRs to Canada's Energy Mix – The Response





New Brunswick releases energy

strategy with SMR focus

Friday, 15 December 2023

First Canadian SMR licence application Darlington New Nuclear Project submitted reaches early milestone Tuesday, 2 April 2019

Tuesday, 12 March 2024

The Canadian Nuclear Safety Commission has received its first licence application for a small modular reactor . The application from Global First Power, with support from Ontario Power Generation and Ultra Safe Nuclear Corporation, supports a proposal to deploy a Micro Modular Reactor plant at Chalk River in Ontaria



Chalk River, ON **Chalk River Laboratories**



Early-phase site preparation works at Ontario Power Generation's project have been

Darlington, ON **Darlington NPP**

CNSC Licensed Nuclear Sites

The strategy outlining how the province aims to transition to clean energy calls for the addition of 600 MWe of capacity at the Point Lepreau Nuclear Generation Station by 2035, doubling New Brunswick's current nuclear capacity



Point Lepreau, NB Point Lepreau NPP



Estevan

Monday, 3 June 2024



ARC SMR proposed for green energy hub at Canadian port Tuesday, 29 November 2022



Saskatchewan SMR to be located in

are in the Estevan area in the south-east of the province.



Estevan, SK Boundary Dam Coal-Fired PP

The Belledune Port Authority (BPA) wants to use advanced small modular reactor (SMR) technology as part of a future expansion at the port in northern New Brunswick, and says an ARC-100 providing energy for hydrogen production and other industries could be in operation by 2030-2035



Belledune, NB Port of Belledune Coal-Fired PP

Industrial Re-Use / Brownfield Sites



Adding SMRs to Canada's Energy Mix – The Response







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New Brunswick releases energy

strategy with SMR focus



Point Lepreau, NB Point Lepreau NPP

Saskatchewan SMR to be located in Estevan Monday, 3 June 2024

e SaskPower has identified two potential sites for Saskatchewan's first small modular reactor to begin detailed site analysis ahead of a final site selection in 2025. Both sites are in the Estevan area in the south-east of the province.



Estevan, SK Boundary Dam Coal-Fired PP ARC SMR proposed for green energy hub at Canadian port

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Belledune, NB Port of Belledune Coal-Fired PP

Industrial Re-Use / Brownfield Sites

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Re-Development of Brownfield Sites for SMR Siting

Advantages

- Re-development of a Brownfield may be eligible for government grants & tax credits;
- Critical infrastructure already in place (e.g., connection to the power grid);
- Likely located near town/city (i.e., proximity to amenities, work-force);

Likely more publically-acceptable to re-

 develop a Brownfield site than to develop a Greenfield site.

Disadvantages

May be more expensive than Greenfield sites due to environmental cleanup & demolition;

May be difficult to secure financing due to contamination uncertainties;

Regulatory uncertainty in terms of baseline
contaminant conditions and how this could affect site licensing.

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A Strategic Plan for the Deployment of Small Modular Reactors

Prepared by the Governments of Ontario, New Brunswick, Alberta and Saskatchewan







A Strategic Plan for the Deployment of Small Modular Reactors

Prepared by the Governments of Ontario, New Brunswick, Alberta and Saskatchewan





NORM/TENORM Contamination at Coal-Burning Power Plants





NORM/TENORM Contamination at Coal-Burning Power Plants

- **Bottom ash:** a coarse angular ash particle that is too large to be carried up into the smokestacks so it forms in the bottom of the coal furnace.
- **Fly ash:** a very fine, powdery material composed mostly of silica made from the burning of finely ground coal in a boiler.
- During combustion, radionuclides present in coal become concentrated in fly ash (TENORM).
- A number of studies have reported elevated U-238, Ra-226, Th-232, K-40, Po-210, Pb-210 in the environment around coal-fired power plants.

Finissions monitors Power plant Coal fly ash Coal fly ash Coal bottom ash Fm: Bigawi et al. (202) Construction and Building Materials, 338: 127624. https://doi.org/10.1016/j.conbuildmat.2022.127624





Canadian Nuclear | Laboratoires Nucléaires Laboratories | Canadiens https://doi.org/10.1051/radiopro/20116982s

NORM/TENORM Contamination at Coal-Burning Power Plants

- The levels/types of radioactive contaminants in coal may vary considerably from deposit to deposit. The levels of release are, in large part, dependent on site-specific factors such as plant design and coal fuel.
- Volatile radionuclides (e.g., radon) present in feed coal are lost in stack emissions as gas, while less volatile elements (e.g., Th, U, and the majority of their decay products) are almost entirely retained in the solid combustion products (i.e., bottom ash & fly ash).
- Modern coal-fired power plants can recover ~99.5% of the solid combustion wastes (including fly ash) due in large part to the installation of particulate emissions control features like electrostatic precipitators (ESP) and cyclone separators.
- However, many early-design (i.e., traditional) plants did not have these technologies and it has been estimated that ≤ 87% of fly ash was recovered in these stations.



NORM/TENORM Contamination at Coal-**Burning Power Plants**

- There is quite a bit of literature on **TENORM** contamination in the environment around coal power plants in Europe, Asia and the Middle East
- Minimal research in North America

Environ Sci Pollut Res (2015) 22:10317-10330 DOI 10.1007/s11356-014-3888-2

RESEARCH ARTICLE

Radionuclides in the soil around the largest coal-fired power plant in Serbia: radiological hazard, relationship with soil characteristics and spatial distribution

Mirjana Ćujić · Snežana Dragović · Milan Đorđević · Ranko Dragović · Boško Gajić · Šćepan Miljanić

https://doi.org/10.1007/s11356-014-3888-2

















55.0 - 56.0





TENORM Contamination - What about Canada?



Pictorial view of coal ash sample ; (a) bottom ash (b) fly ash



SEM of ash sample; (c) bottom ash (d) fly ash

From: Kumar, K. et al. (2023). Effect of Additive on Flowability and Compressibility of Fly Ash. Advances in Functional and Smart Materials. <u>https://doi.org/10.1007/978-981-19-4147-4_22</u>



TABLE 15 RADIOACTIVITY IN ASH SAMPLES COLLECTED IN POWER PLANTS IN THE UNITED STATES

Radionuclide Activity (Bq/kg)							
Sample	238 _U (234 _U)	226 _{Ra}	210 _{Pb}	210po	232 _{Th} (228 _{Th})	238 _{Ra}	40K
Fly Ash	107.3	92.5	166.5	196.1	85.1	74.0	466.2
Bottom Ash	81.4	62.9	74.0	185.0	62.9	66.6	314.5

TABLE 17 RADIOACTIVITY IN ASH FROM THE NANTICOKE GENERATING STATION

na aktor of a transformation of a	R	Radionuclide Activity (Bq/kg)			
Sample	U - Series	Th - Series	40K		
Fly Ash	92	58	204		
Bottom Ash	91	61	245		

Source: Environment Canada. 1985. Radioactivity in Coal, Ashes and Selected Wastewaters from Canadian Coal-fired Steam Electric Generating Stations. <u>https://inis.iaea.org/collection/NCLCollectionStore/_Public/20/063/20063463.pdf</u>

TENORM Contamination - What about Canada?

- MacCormack (1979) estimated radionuclide inventories escaping four Saskatchewan coal-burning power plants via fly ash.
- The plants all burned Saskatchewan lignite coal containing 2.88 to 11.02 mg/kg of U. Assuming 0.7% escape of fly ash from the ESP equipped plants, and 12.9% escape of fly ash from non-ESP equipped plants, radionuclide releases were calculated:
 - ~35 to 149 kg/yr of U released from an ESP-equipped 300 MW(e) unit at Poplar River Generating Station.
 - ~53 to 201 kg/yr of U would leave the plant from the cycloneequipped units 300 MW(e) Boundary Dam Generating Station.
 - ~33 to 123 kg/yr of U was released from the smaller 70 MW(e) Estevan Generating Station.
 - ~193 to 753 kg/yr of U was released from Units 1-5 (582 MW(e)) at the Boundary Dam Generating Station.
- All of this uranium would have been deposited to the nearby environment via fly ash fallout.





Reference: MacCormack, J., "Trace Elements in Saskatchewan Coal-Fired Power Plants", Saskatchewan Environmental Protection Service, Regina (August, 1979).

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TENORM Contamination - What about Canada?



Environmental Pollution 231 (2017) 644–653 Contents lists available at ScienceDirect

Environmental Pollution

CrossMark

journal homepage: www.elsevier.com/locate/envpol

Lake-sediment record of PAH, mercury, and fly-ash particle deposition near coal-fired power plants in Central Alberta, Canada^{*}

Benjamin D. Barst ^{a, 1}, Jason M.E. Ahad ^{b, *}, Neil L. Rose ^c, Josué J. Jautzy ^d, Paul E. Drevnick ^e, Paul R. Gammon ^f, Hamed Sanei ^g, Martine M. Savard ^b

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https://doi.org/10.1016/j.envpol.2017.08.033

ELSEVIER

AECL Federal Nuclear Science & Technology Work Plan

- AECL's Federal Nuclear Science and Technology (FNST) Work Plan performs nuclear-related science and technology (S&T) to support core federal roles, responsibilities and priorities.
- This includes the CNSC, ECCC and NRCan (among others).
- After discussions with staff from a number of federal agencies, CNL prepared & submitted a proposal to investigate the feasibility of brownfield sites for SMR deployment.
- Focus on establishing environmental baseline conditions at Brownfield sites to support regulation & Environmental Impact Assessment. Contribute to regulatory readiness.
- This proposal has been funded and the project will begin in April 2025.

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ear Commission canadienne sion de sûreté nucléaire

General Project Plan

- We plan to sample a number of former coal-fired power plant sites across the country to establish general trends in radionuclide contamination and look at variability.
- Operating history of the site? Fly ash recovery methods? Source of coal?
- Review regulations related to SMR siting & baseline characterization.
- Given that this research will be funded by the Federal Government, we do not want to complete a full site assessment/baseline characterization for SMR proponents (that is their responsibility).
- The goal is simply to understand current conditions at these sites (TENORM) – general trends – to help inform regulation and Environmental Impact Assessment.

Regulatory Context

REGDOC-1.1.1 - Site Evaluation & Site Preparation for New Reactor Facilities (V1.1)

- "The baseline data shall consider contaminants of potential concern (COPCs) associated with historical, present or proposed future use of the site. An understanding of COPCs prior to collecting environmental baseline data will direct the selection of parameters to be included in the environmental baseline data collection program."
- "Where an area on the site has received substantial contamination from previous nuclear or non-nuclear industrial activities, the baseline characterization shall consider nuclear and hazardous substance levels within relevant environmental media of interest."
- "The applicant shall assess the doses to workers and the public associated with activities to be encompassed by the licence to prepare site, or from exposures to any radioactive substances resulting from past or present nuclear activities."
- The objective of the site evaluation stage is to assess whether the site is suitable for the construction and operation of a nuclear facility.

REGDOC-2.9.1 - Environmental Protection: Environmental Principles, Assessments & Protection Measures (V1.2)

- "The applicant or licensee shall present a characterization of the baseline environment for any portion of the environment where the site characterization indicates potential for interaction."
- "The applicant or licensee shall use the facility- or activity-specific characterization and the local environmental baseline characterization to identify the potential interactions between the facility or activity and the surrounding environment. Note that these identified interactions will become the focus of further stages within the ERA."

Impact Assessment Act (IAA)

• An IA must take into account "any cumulative effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried out."

SMR Operating Envelope

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What does all this mean in terms of siting, licensing & operating SMRs at Brownfield sites?

Thank you!

Matt Bond, M.Sc. Environmental Biologist & Radioecology Section Head Canadian Nuclear Laboratories ☑ matthew.bond@cnl.ca

Brownfield Redevelopment Program, Kentucky

DEPARTMENT FOR ENVIRONMENTAL PROTECTION, DIVISION OF WASTE MANAGEMENT, SUPERFUND BRANCH

PRESENTATION TO NRC JANUARY 16, 2024

Objective and Tools

To purchase and redevelop blighted properties in the state of Kentucky without incurring Potential Responsible Party Status.

• Federal BFPP

Kentucky Brownfield Redevelopment Program

Kentucky's Revised Statutes

KRS 224.1-400 (18) similar to 42 U.S. Code Chapter 103 §9607. Liability

 Any persons possessing or controlling a hazardous substance, pollutant, or contaminant which is released into the environment...shall take actions necessary to correct the effect of the release on the environment.

Although EEC pursues the causal responsible party first, the current owner or controller is liable.

Federal – Innocent Landowners, Standards For Conducting All Appropriate Inquires

40 CFR Part 312 Effective November 1, 2006. This introduced the Bona Fide Protective Purchaser (BFPP) defense

Currently Applicable to CERCLA (Federal Sites - NPLs and Removals) – Most releases do not rise to this level.

Requires:

- Environmental Site Assessments (ESAs) ASTM E1527-21 (aka. All Appropriate Inquires)
- All Appropriate Care (prevent exposures based on assessment)
- Only Provides an Affirmative Defense (defending hindsight from regulatory agency can be problematic EAN

Kentucky – Brownfield Redevelopment Program

Kentucky's legislature adopted the BFPP defense with upgrades.

Codified in KRS 224.1-415 on July 12, 2012

• Established Conditions of Eligibility

Promulgated in 401 KAR 102 February 3, 2014

• Established Conditions for Applying and Requirements of Property Management Plans (\$2,500 Fee)

The state approves all appropriate care up front (unlike the defense under the federal law).

Known eligibility status prior to property purchase



The Kentucky Superfund 1-415 Brownfields Redevelopment Program

Program Outline & Features:

- \$2500 Fee
- Criteria is the same for an applicant as BFPP (no familiar, operational or business relationship with responsible party).
- Places great importance on valid Phase I Environmental Site Assessment. Required for all applications. Must be Fresh (180 days expiration the assessment is void)
- Eliminates uncertainty of "appropriate care" through use of the Property Management Plan (PMP).
 - PMP is designed/signed by applicant's consultant (PG/PE) so it should represent applicant's needs. DWM concurs.
 - PMP is living document, highly conformable and easily revised (Still needs PE/PG cert).
- Offers documentation:
 - Prior to purchase to facilitate lending (Notice of Eligibility).
 - After purchase (Notification of Concurrence).



The Kentucky Superfund 1-415 Brownfields Redevelopment Program

Program Outline (continued):

- Property and Person Specific (not transferrable to a future owner)
- Available to persons who already own if having BFPP Status.
- Benefits to lenders:
 - Notice of Eligibility issued prior to purchase so lender knows if buyer qualifies before loaning.
 - If given reliance and if PMP includes a "mothball" provision, lender can foreclose without generating new PMP (the Phase I must still be performed to document conditions at time of possession).
- Considerate of property transfer timelines/logistics:
 - Notice of Eligibility that has not expired will have the effect of a Notification of Concurrence upon obtaining legal title.
 - Packages will be reviewed within 30 days.



Environmental Site Assessments (ASTM E1527-21)

Phase I (Visual Site Inspection date sets the clock on expiration of the assessment not the date on the assessment.)

Phase II (Not required but characterization data may be requested to verify if management options are suitable.)

- Does not reset expiration of application
- Establishes a baseline on like use
- Reduces unneeded management
- Confirms contaminants of potential concern
- Additional characterization is almost always required with RECs that may create vapor intrusion conditions.



Property Management Plans (PMPs)

 Management or precautions to prevent exposures by reuse.

•Based on the Environmental Site Assessments.

•No required sampling unless required to demonstrate plan is working (Vapor Encroachment Condition)

olf reuse requires construction, a completion report is required.



Presumptive Remedies

Phase I may discover a REC. Instead of confirming an expected situation with additional sampling, a management plan may just restrict all reasonable exposure pathways. Typically, applicable to a non-residential use.

Examples include:

- No use (buy and hold) maintaining security
- No continued occupancy (Warehouses)
- Barriers based on expected impacts as summarized in the Phase I
 - Urban Fill -assume moderate contamination (paving, concrete, clean soil)



Voluntary Cleanup

The PMP may include voluntary cleanup.

Do not exacerbate the release.

PMP can have a section dedicated to material management.

Once the waste is generated it is the responsibility of applicant to follow appropriate regulation or policy.

No need to enter Kentucky's Voluntary Environmental Remediation Program (VERP) KRS 224.510-224.1-532.

- Application fee required
- Programmatic



Conclusion

Kentucky Offers Upfront concurrence to all appropriate care rather than the federal defense

Most Releases/Contamination are not subject to CERCLA

BFPP may offer protection in other states. Kentucky had adopted the federal defense prior to the Brownfield Redevelopment Program. Other states may offer something similar.



Contact Information

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Brownfields Voluntary Oversight and Assistance Program Update

January 2025

Brownfields are abandoned or underused industrial and commercial properties where redevelopment may be complicated by real or perceived environmental contamination.

- Abandoned and former gas stations
- Former dry cleaners
- Old industrial facilities
- Former coal yards
- Former junk yards
- Legacy contamination of unknown origin





Laws which may apply to Brownfields





- Federal: Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and SARA (1986).
 - 42 U.S.C. § 9601 et seq.
 - Code of Federal Regulations
- State: Hazardous Waste Management Act of 1983
 - T.C.A. § 68-212-224 (Brownfields Projects Voluntary Cleanup Oversight and Assistance Program)
 - T.C.A. § 68-212-225 (Notice of Land Use Restrictions)
- Tennessee Compilation of Rules & Regulations



Brownfield Voluntary Agreement

- The Commissioner has the discretion and is authorized to establish an apportionment of liability consistent with T.C.A. § 68-212-207(b) in a voluntary agreement or consent order;
 - Liability protections are automatically extended to "successor parties"; meaning the benefits of the Brownfield Voluntary Agreement follow the property, not the property owner.
- Avoiding potential environmental enforcement actions that could impose penalties and costly cleanups;
- Reducing the likelihood that contamination from the property will result in unacceptable risk;
- To establish a legal basis for enforcement of institutional controls to limit future liability at a site resulting from it progressing to uses with increased risk,
- Receiving tax benefits for cleaning up and reusing the property;



"Liable Party"

"Liable party" means:

- (A) The **owner or operator** of an inactive hazardous substance site;
- (B) Any person who at the time of disposal was the **owner or operator** of an inactive hazardous substance site;
- (C) Any **generator** of hazardous substance who at the time of disposal caused such substance to be disposed of at an inactive hazardous substance site; or
- (D) Any **transporter** of hazardous substance which is disposed of at an inactive hazardous substance site who, at the time of disposal, selected the site of disposal of such substance;



Liable Party Exceptions

- (i) As used in this subdivision (a)(4), **"owner or operator"** does not include a person who establishes, by a preponderance of the evidence, that:
 - ...acquired the title to the hazardous substance site after the disposal or placement of the hazardous substance...
 - ...did not know and had no reason to know that any hazardous substance which is the subject of the release or threatened release was disposed of on, in or at the site...
 - …exercised due care with respect to the hazardous substance concerned
 … in light of all relevant facts and circumstances…
- (ii) ... the person must have undertaken, at the time of acquisition, all appropriate inquiry into the previous ownership and uses of the property consistent with good commercial or customary practice in an effort to minimize liability.



VOAP Application (online)

- Voluntary Party certifications in application:
 - 1) Other than being an owner or operator of the Site, it is not a "liable party" of the Site, as defined by Tennessee Code Annotated section 68-212-202(a)(4)(B–E);
 - Certification that the applicant did not generate, transport, or release the contamination at the subject property
 - 2) Activities will not aggravate or contribute to existing contamination on the Site or pose significant human health or environmental risks;
 - 3) A summary description of all known existing environmental investigations, studies, reports, or documents concerning the site's environmental condition with the application; and
 - 3) it is financially viable to meet the obligations of a Brownfield Voluntary Agreement (BVA).



Purpose of the BVA

- TCA 68-212-202 (a) (1) "Brownfield project" means the screening, investigation, monitoring, control and/or remediation of any abandoned, idled, under-utilized, or other property whose re-use, growth, enhancement or redevelopment is complicated by *real or perceived* adverse environmental conditions.
- "Perceived" environmental conditions that may exist at a brownfield site must be identified and quantified to be addressed under a BVA.





All Appropriate Inquiry (40 CFR § 312.20)





- The responsibility is on the prospective purchaser to perform "All Appropriate Inquiry" consistent with the current ASTM standard.
 - AAI is the process of evaluating a property's environmental conditions and assessing potential liability for any contamination.
- Understand environmental risks and costs of owning, operating, or redeveloping the property,
- Obtaining a Phase I Environmental Site Assessment compliant with ASTM Standard E 1527-21 (or it's most recent version) at least 6 months prior to purchase.



All Appropriate Inquiry (40 CFR § 312)

• § 312.11 References.

- (a) The procedures of ASTM International Standard E1527–21 entitled "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process."
- "all appropriate inquiry" included in Tennessee Code Annotated section 68-212-202(a)(4)(F)(ii).
- Every REC identified in AAI and for which liability protection is requested should be both identified/investigated and addressed though an Agreed Action.
- AAI necessary to avoid being a responsible party for clean-up:
 - Bona Fide Prospective Purchaser
 - Innocent Landowner
 - Contiguous Property Owners





Model BVA

- Section D All Appropriate Inquiry
 - Identify RECs
 - Provides credit for investigation but differentiates what is an actual "matter identified and addressed".
- Section E Matters Identified and Addressed
 - Each "matter identified and addressed" should include three elements: media, location, and the contaminants and their concentrations in comparison to initial regulatory screening levels and risk-based action levels.
 - Clearly defines how matters are to be addressed.
 - TDEC's expectation for voluntary parties is that matters identified and addressed are mitigated to ensure no unacceptable risk to human health and the environment, including any ongoing monitoring at brownfields.



BVA template update

- Section I Continuing Obligations
 - Continuing obligations are legal requirements designed to protect public health and the environment for contamination or a remedy that remains on a property.
 - Continuing obligations still apply after a property is sold with successor parties responsible for complying.
 - Vapor Intrusion Mitigation System Operation and Maintenance any modification or change in operation to the system would require the review and approval per the Notice of Land Use Restrictions.
 - Site/Soil Management Plan



Notice of Land Use Restrictions

- Mirrors BVA template to include three elements: media, location, and the contaminants and their concentrations.
 - use restrictions (e.g., prohibiting residential land use due to presence of hazardous substances in soil above Residential RSLs),
 - activity controls (e.g., to prevent exposure to contaminated ground water by prohibiting extraction or use of ground water), and
 - operation and maintenance (O&M) controls used to ensure safe reuse of the impacted Property (e.g., caps and/or covers, vapor mitigation intrusion barriers, or other systems).
- Written Notice of the Presence of Contamination
- Notice of Limitations in Future Conveyances
- Compliance Reporting
- Adds Successor notification



Levels of Liability Protection

- No Additional Action
 - Letter from DoR acknowledging that no additional action is required
 - TDEC oversight without a voluntary agreement or consent order
 - No statutory protections
- No Further Action Letter
 - Used only for BVA
 - Entitled to all statutory defenses
- Letter of Completion
 - Used for Consent Order
 - Entitled to all statutory defenses





Tennessee Brownfields Redevelopment Toolbox





Remediation/Mitigation Strategies



- Incorporate targeted cleanup and/or caps/covers for on-site management into redevelopment plan
- Develop/Implement Soil Management Plan for future development
- Limit future use of the property via Notice of Land Use Restrictions
- Use of pre-emptive mitigation especially when dealing with volatile chemicals





ADVANCE Act Section 206

NRC's Decommissioning Funding Assurance Requirements and Existing Radiological Contamination at Brownfield Sites

January 16, 2025

Richard H. Turtil, U.S. NRC Senior Financial Analyst Financial Assessment Branch



- Current <u>Financial Qualification</u> and Nuclear <u>Decommissioning Trust Fund</u> Requirements Overview
 - Applicant is Financially Qualified
 - Requirements at 10 CFR 50.33
 - Possesses or has Reasonable Assurance of Obtaining Funding for –
 - Construction
 - Operations
 - Decommissioning



- Current Nuclear Decommissioning Funding Assurance Requirements Overview
 - Applicant to provide Certification of Financial Assurance for Decommissioning
 - Requirements at 10 CFR 50.75
 - Use of a Minimum Formula Amount provided in 50.75 or
 - Based on a cost estimate for decommissioning the facility



Brownfield Site Considerations

Nuclear Facilities at Brownfield Sites are Envisioned to Rely on <u>Site-Specific Cost Estimates</u> for Decommissioning

In addition to meeting Financial Qualification requirements for construction and operations, applicant to provide evidence that:

- Applicant is Financially Qualified to address contamination issues at the site
- > Applicant's plans consider radiological contamination at the site from pre-brownfield activities, if any.

Brownfield Site Considerations



In support of a Site-Specific Cost Estimate for Decommissioning, anticipated need for:

- Thorough Site Description and Characterization Prior to Licensing;
- Thorough and Transparent Understanding of:
 - > Assumption of Liability at Contaminated Site, including:
 - > Liability for prior radiological contamination, if present,
 - > Liability for post-operations radiological contamination.
 - > Agreements, Terms of Lease or Sale Transaction that Articulate:
 - Reference to Current Site Characterization/Contamination
 - Identifies Which Entity Assumes Site Liability Upon Transaction.



Thank You! Questions?

Richard Turtil

Senior Financial Analyst U.S. NRC, NMSS, REFS



NRC's Population-Related Siting Requirements for Advanced Reactors

William Reckley, Senior Project Manager Advanced Reactor Policy Branch Division of Advanced Reactors and Non-Power Production and Utilization Facilities (DANU) Office of Nuclear Reactor Regulation



Commercial Power Reactor Siting - A Long and Interesting History

- Potential radiological releases (source term)
 - TID-14844, "Calculation of Distance Factors for Power and Test Reactor Sites," (1962)
 - RG 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors"
 - SECY-16-0012, "Accident Source Terms and Siting for Small Modular Reactors and Non-Light Water Reactors"
- Policy Considerations
 - NUREG-0478, "Metropolitan Siting A Historical Perspective," (1978)
 - NUREG -0625, "Report of the Siting Policy Task Force," (1979)
 - Accident Consequences
 - Societal Risk
 - Defense in Depth
 - Final Rule Reactor Site Criteria Including Seismic and Earthquake Engineering Criteria for Nuclear Power Plants (61 FR 65157; December 11, 1996)
 - Defense in Depth
- Environmental Considerations
- Revision 4 to Regulatory Guide 4.7
 - SECY-20-0045, "Population Related Siting Considerations for Advanced Reactors"
 - ORNL/TM-2019/1197, "Advanced Reactor Siting Policy Considerations"
 - OR-SAGE (Oak Ridge Siting Analysis for power Generation Expansion)
- Accelerating Deployment of Versatile, Advanced Nuclear for Clean Energy Act of 2024 (ADVANCE Act)



Overview – Consideration of Radiological Consequences in NRC Activities (Offsite Areas/Zones)



ARCAP – Advanced Reactor Content of Applications Program (DANU-ISG-2022-01; Regulatory Guide (RG) 1.253) RG 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors" RG 4.7, "General Site Suitability for Nuclear Power Stations"

RG 1.242, "Performance-Based Emergency Preparedness for Small Modular Reactors, Non-Light-Water Reactors, and Non-Power Production or Utilization Facilities"



Overview - Traditional Approach for 10 CFR Part 100, "Reactor Site Criteria"





Traditional Approach (20 miles)

10 CFR 100.21(h)

Reactor sites should be located away from very densely populated centers. Areas of low population density are, generally, preferred. However, in determining the acceptability of a particular site located away from a very densely populated center but not in an area of low density, consideration will be given to safety, environmental, economic, or other factors, which may result in the site being found acceptable³.

10 CFR 100.3 (Definitions) Population center distance means the distance from the reactor to the nearest boundary of a densely populated center containing more than about 25,000 residents.

Regulatory Guide 4.7, "General Site Suitability Criteria for Nuclear Power Stations"

Preferably, a reactor should be located so that, at the time of initial site approval and for about 5 years thereafter, **the population density**, including weighted transient population, **averaged over any radial distance out to 20 miles** (cumulative population at a distance divided by the area at that distance), **is at most 500 persons per square mile**. A reactor should not be located at a site where the population density is well in excess of this value.



Recent Revisions to Population Density Considerations

- SECY-20-0045, "Population-Related Siting Considerations for Advanced Reactors," dated May 8, 2020
- Staff Requirements Memorandum (SRM)-SECY-20-0045, "Staff Requirements – SECY-20-0045 – Population-Related Siting Criteria for Advanced Reactors," dated July 13,2022 (ML22194A885)
- Revision 4 to RG 4.7 issued February 2024

Regulatory Guide 4.7, "General Site Suitability Criteria for Nuclear Power Stations," Rev. 4 APPENDIX A, Alternative Approaches to Address Population-Related Siting Considerations

An applicant can demonstrate compliance with 10 CFR 100.21(h) by siting a nuclear reactor in a location where the **population density does not exceed 500 persons per square mile out to a distance equal to twice the distance at which a hypothetical individual could receive a calculated TEDE of 1 rem over a period of 30 days from the release of radionuclides following postulated accidents.**

An advanced reactor with estimated doses below 1 rem at the site boundary over the 30 days following the assumed postulated accident could be sited within towns with populations of no more than approximately 25,000 residents.


Recent and Ongoing Activities

- Revision 4, Regulatory Guide 4.7, "General Site Suitability Criteria for Nuclear Power Stations," February 2024
- Proposed Rule Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors (Part 53), (89 FR 86918, October 31, 2024)
- Microreactor Activities
 - SECY-20-0093, "Policy and Licensing Considerations Related to Micro-Reactors"
 - SECY-24-0008, "Micro-Reactor Licensing and Deployment Considerations: Fuel Loading and Operational Testing at a Factory"
 - White Paper "Nth-of-a-Kind Micro-Reactor Licensing and Deployment Considerations" (September 2024)
- Accelerating Deployment of Versatile, Advanced Nuclear for Clean Energy Act of 2024 (ADVANCE Act)
 - § 206 Regulatory issues for nuclear facilities at brownfield sites
 - § 208 Regulatory requirements for micro-reactors



Discussion





Option 3 – Case 1

BACKUP SLIDE (SECY-20-0045)

Case 1:

Event Sequences with Offsite Doses > 25 rem over course of event Event Sequences with Offsite Doses > 1 rem over the month following event





Option 3 – Case 2

BACKUP SLIDE (SECY-20-0045)

Case 2:

<u>No</u> Event Sequences with Offsite Doses > 25 rem over course of event Event Sequences with Offsite Doses > 1 rem over the month following event





Option 3 – Case 3

BACKUP SLIDE (SECY-20-0045)

Case 3:

<u>No</u> Event Sequences with Offsite Doses > 25 rem over course of event (LPZ at site boundary) <u>No</u> Event Sequences with Offsite Doses > 1 rem over the month following event



Population center distance means the distance from the reactor to the nearest boundary of a densely populated center containing more than about 25,000 residents

ADVANCE Act Section 206 Brownfield Sites NRC Public Meeting

January 16, 2025

Kati Austgen Senior PM, New Nuclear





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NEI Perspective: RG 4.7 Rev. 4 Outcome



- Rev. 4 issued in Feb. 2024 did clarify some flexibility in considering population-related siting, specifically Population Density Distance (PDD) for advanced reactor designs.
- The revision did not adequately:
 - 1. Put the population-density siting consideration in context with other siting elements and defense-in-depth considerations
 - 2. Compare the level of protection afforded as proposed by NRC for advanced reactors to that currently applied to existing LWRs
 - 3. Identify whether NRC's guidance would result in undue burden (i.e., excessive restrictions on siting) for advanced reactors

Recap NEI Input and Feedback



- In public comments (<u>ML23326A031</u>) on DG-4034, which would become RG 4.7, Rev. 4, we provided NEI White Paper: Advanced Reactor Population-Related Siting Considerations to inform the three preceding points, concluding:
 - In context: PDD minimizes societal impacts following an accident involving significant quantities of fission products released to the environment
 - Level of protection: 2x the distance of 1 rem in 30 days is more than a factor of five times more conservative than what the NRC currently finds acceptable for large LWRs
 - Undue burden: imposes excessive restrictions on the ability to site advanced reactors

Disposition of NEI Recommendations



- NEI White Paper: Advanced Reactor Population-Related Siting Considerations (ML23326A031) proposed:
 - A PDD of 5 rem in 30 days would align with the current NRC accepted level of protection for large LWRs calculated using best estimate methods at 20 miles. NRC Staff disagreed with comparison. (ML23324A007)
 - The RG 4.7 Rev. 4 Appendix alternative PDD at 2x the distance of 1 rem in 30 days provides excessive baseline margin to previous large LWR licensing experience and should limit the need for extensive uncertainty analysis. NRC Staff agreed on flexibility in uncertainty assessments with no further change to RG.
 - Best estimate analysis approaches are more than adequate for defining the PDD. NRC Staff agreed without further clarification to RG.

Population-Related Siting More Broadly



- 10 CFR 100.21(b), (h) and 100.3, and RG 4.7, may challenge the business case for widespread advanced reactor deployment as they are overly restrictive compared to the accepted level of protection provided by requirements for existing large light water reactors.
- Opportunities
 - Provide regulatory history & bases for alternative approaches
 - Modify corresponding 10 CFR Part 100 requirements
 - Appropriately enable Population Density Distances
 commensurate with characteristics of advanced reactors

NEI developing bases for alternative pop.-related siting criteria

Recall Various Siting Criteria / Limitations

- Power reactor siting has typically involved assessment of a variety of distances, most of which are depicted in Fig. 1
- Each provides functional and defense-in-depth (DiD) purposes
- Siting criteria protect from societal impacts & provides DiD to minimize societal impacts should containment fail*
- *as we understand it; based on TID 14844 (1962)





NÊI

Preview/Draft Possibilities Going Forward



- For sites where the EPZ coincides with the site boundary, the EAB, LPZ, PDD & PCD could all be set to the site boundary
- Alternate PDD dose criterion could be developed to be more representative of the currently accepted level of protection for large LWR licensing, and/or definition of PCD changed from 25,000 people
- Clarity is needed on the modeling assumptions, which heavily influence dose criterion calculations, including consideration with respect to the realistic exposure risk to the public that would be acceptable to the NRC
- Others?

Big Picture Demand

 Applications for >300 GWe new nuclear by 2050









Key Findings Relevant to Brownfields



- US tripling nuclear energy by 2050 = many sites needed
 - Brownfield sites are already impacted and site reuse may be environmentally preferable to additional land disturbance
- NRC already looking closely at Environmental Requirements for Siting and Safety Siting Requirements
 - Opportunity to fully consider whether population-related siting criteria serve an independent purpose and whether the analysis/justification necessary to site near populations is already provided by other requirements
- Environmental Justice & Energy Justice
 - Opportunity to clarify and streamline consideration of communities that host retiring coal facilities

Why It Matters



DOE found >300 existing & retired coal plants are suitable to host advanced nuclear

- A NPP replacing a CPP would
 - ✓ employ more people & create additional long-term jobs in host communities
 - ✓ increase total income in host 5 | 200,000+ | 43 | 10070 | 4 Note: metropolitan statistical area (MSA). Data source: (U.S. EIA 2023b) communities
 - ✓ increase revenue for host communities, power plant operators, & local suppliers

BUT, ~80% are in communities >25,000 people

Table 2-1. Coal power plant community tier characteristics.

CPP Community Tier Characteristics					
Tier Number	Population Range	Count of Counties	% of Counties Located in MSAs	Avg. # CPP Generating Units	Avg. CPP Nameplate Capacity
1	< 20,000	46	19%	2.2	489
2	20,000-39,999	44	20%	2.1	452
3	40,000-89,999	40	50%	2.9	400
4	90,000-199,999	45	82%	2.8	390
5	200,000+	43	100%	2.2	422

Credit: DOE's April 2024, Stakeholder Guidebook for Coal-to-Nuclear Conversions, distribution of U.S. CPPs bound by the size of the community populations where they are located

Population-Related Desired Outcomes



- NRC population-related siting criteria requirements and guidance are updated to meet ADVANCE Act direction, including increased use of risk-informed and performance-based approaches; with additional stakeholder engagement
- If population-related criteria serve a unique purpose, then clarify whether unique requirements are necessary or whether credit for other requirements (and analyses performed) can be justified.
- Population Center Distance and Population Density Distance are updated to reflect the characteristics of advanced reactors, especially micro-reactors.

1996 Reactor Site Criteria Final Rule [61 FR 65175]: "next-generation reactors are expected to have risk characteristics sufficiently low that the safety of the public is reasonably assured by the reactor and plant design and operation itself, resulting in a very low likelihood of occurrence of a severe accident."

Other Brownfield Sites Desired Outcomes



- NRC revise guidance (and regulations, as needed) to acknowledge brownfield sites are already impacted and site reuse may be environmentally preferable to additional land disturbance
 - Brownfield site review should not be more resource intensive than greenfield
 - Existing information for brownfield sites may be equivalent to what NRC needs
- NRC activities to respond to ADVANCE Act direction align with the opportunities identified in SECY 24-0046, Implementation of the Fiscal Responsibility Act of 2023
 - Staff recommends rulemaking to allow increased use of EAs, applicant preparation of draft EA/EIS, more narrowly-focused need statement and alternatives analyses
- Clear NRC summary position/guidance on what makes a brownfield site viable for nuclear

QUESTIONS?

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NRC Advance Act: Section 206 Workforce, Energy and Environmental Justice

Christine King – Director of Gateway for Accelerated Innovation in Nuclear (GAIN)

January 16, 2025 Virtual Meeting











Coronado Generating Station

Primary Objective:

Assess the feasibility of transitioning from coal to nuclear; Learnings can be applied to other coal units within commuting distance from CGS.

Partnered with Salt River Project and St Johns Mayor's Office Plant is in same county as Navajo Nation

Ghent Generating Station

Primary Objective:

Assess feasibility of nuclear energy at Ghent Generating Station (GGS) from a siting and technology perspective.

Partnered with PPL to assess siting and technology feasibility for producing electricity and process heat for nearby industrial users.

Colstrip Power Plant Primary Objective:

Assess nuclear and non-nuclear repowering timelines and site feasibility.

Partnered with Northwestern Energy to build on lessons learned from CGS/GGS, and assess various potential options and siting options for Colstrip.







157 Retired Sites, 237 Operating Sites Screened

Peeking into the details

- Started with 349 Retired Sites
 - Remove sites not owned/operated by utility or independent power producer
 - Remove units retired before 2012
- 229 Retired Sites remaining
 - Quick screen multiple factors including population
 - 157 were analyzed in 2022 report
 - 57 of 72 sites screened out in this step screened out on population
 - 500 ppsm at 4 miles

If you would like the analysis for your coal stations, please use this link to request: https://inlfedramp.gov1.gualtrics.com/jfe/form/SV 81EfQuLFZLHSrki



Required Nuclear Buildout – 200 GW by 2050

- Annual industrial capacity additions:

 - ∠ Ramping to 13 GW per year from 2035 2050 to achieve 200GW by 2050
 - Requires an additional 275,000 workers; currently 100,000 workers



Coal Transitions

Christine King – Director of Gateway for Accelerated Innovation in Nuclear (GAIN) Christine.king@inl.gov

April 2024

Jason Hansen, INL Alisa Trunzo, DOE Emily Nichols, INL Will Jenson, INL



COAL-TO-NUCLEAR TRANSITIONS:

AN INFORMATION GUIDE



Office of
 NUCLEAR ENERGY Image Credit: Terrathower, Rendering of the Netritam¹¹



What does nuclear power conversion offer a community?

- Nuclear can bring lasting jobs to a plant for 40-80 years
- There are both direct jobs created as well as indirect and induced jobs
- Many other renewable technologies only bring construction jobs



ESTIMATED EMPLOYMENT BY GENERATION

Figure 6: Number of jobs to support operations at typical coal plant and typical nuclear plant of comparable generation size



Nuclear has a multiplier of ~1.5

For every \$100 of electricity produced, \$50 of economic activity occurs in suppliers and support industries

Source: DOE April 2024: COAL-TO-NUCLEAR TRANSITIONS: AN INFORMATION GUIDE

Overlap in Job Types and Education Levels



- Comparing occupation codes shows the similarity in roles from each power plant type.
- 45 percent of the added nuclear jobs share identical occupation codes with the coal plant,
- 72 percent of the added share similar occupation codes.
- This implies that many occupations at the CPP have the educational background to work at the NPP.
- NOTE: Analysis does not account for nuclear, industry-specific training.



Figure 9. Total jobs by educational requirement across all coal and nuclear plant jobs in the United States for 500 MWe power plants

POWER PLANT TOTAL EMPLOYMENT BY EDUCATIONAL TYPE



Interest in Redeveloping Coal

ENERGY

The U.S. wants to triple nuclear power by 2050. America's coal communities could provide a pathway

PUBLISHED FRI, SEP 27 2024-12:47 PM EDT | UPDATED FRI, SEP 27 2024-3:24 PM EDT



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EDITORIAL: Why Colorado should follow Microsoft's lead

The Gazette editorial board Sep 26, 2024



Can Nuclear Power and Coal Plant Communities Bail Each Other Out?

JOSHUA CHERTOK | JULY 12, 2023

SHARE ON **f** in 🖂

- <u>https://www.cnbc.com/2024/09/27/americas-coal-communities-could-help-the-us-triple-nuclear-power.html?mkt_tok=NzY2LVdCTC04NzcAAAGV7JwhmyQZMvM6M2cN9rF0UBD17h7oFWRXoteJhxnyIU9FgR_oqjWjrWYU5BP-PcayZwfq8XgE4UvjvsiMTd3gUNmwsX8qHBNTIMGyeWiZ</u>
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Stakeholder Guidebook for Coal-to-Nuclear Conversions (2024) https://fuelcycleoptions.inl.gov/SiteAssets/SitePages/Home/C2N_Guidebook_2024.pdf

