# Nuclear-Powered Data Centers:

## Investor's Concise Guide to Managing Regulatory Approval

*ISL, Inc*

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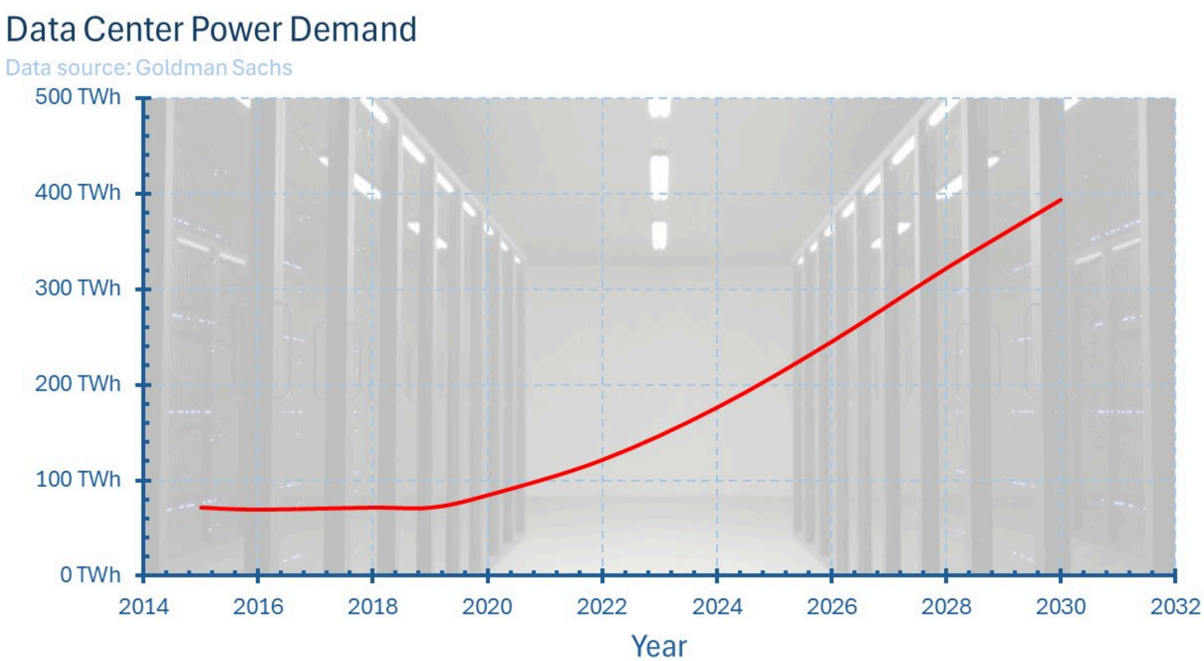
4,196 words … about 12 minutes

## The Big Picture: Artificial Intelligence (AI) Poised to Increase Data Center Power Demand—But There's a Solution



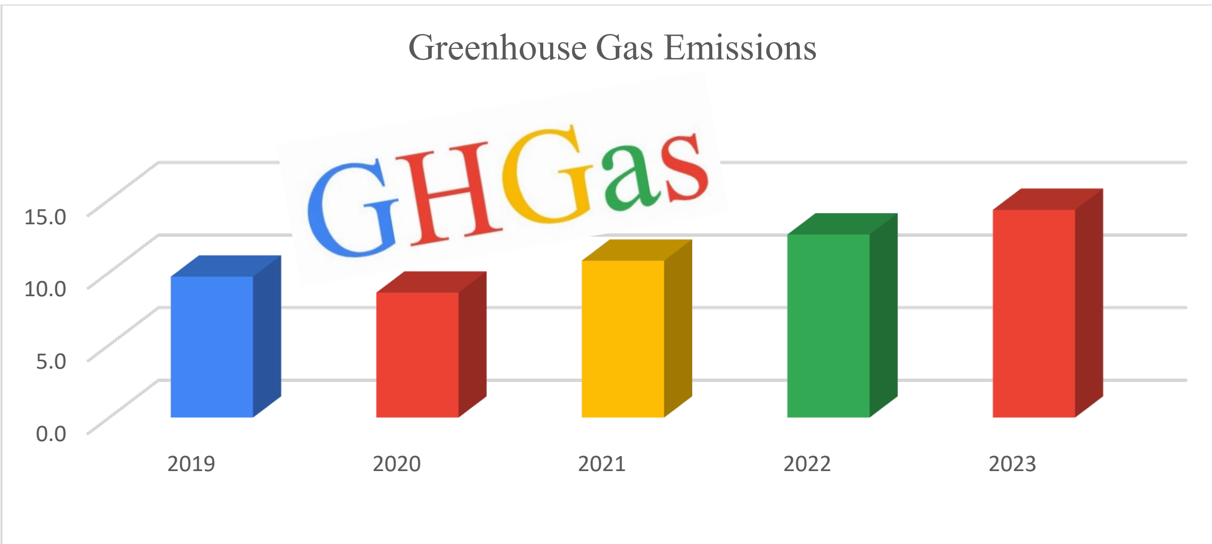

- ~~Math~~ **Arithmetic Don't Lie:** Artificial intelligence (AI), online commerce, crypto, and cloud-based computing drive demand for greater data-center capacity. Data center power consumption could range anywhere from a few kilowatts (kW) to over 100 megawatts (MW). Or enough electricity to power a few households to a city the size of Bend, Oregon.[1]

- **Long-term data center power demand is expected to grow dramatically, more than doubling from 21 gigawatts (GW) in 2023 to greater than 50 GW by 2030**.[2] Data centers, in fact, use 10 to 40 times more energy per square foot than standard office buildings and account for nearly 2% of all U.S. energy demand.[3]

- The continued development of AI is likely to drive that number higher. Some analysts predict that AI alone will drive a 160% demand increase.[4]

- **Equally challenging**, data centers classified as Tier 4 or Tier 5 require two independent power sources, a rarity in today's deregulated power market. Tier 4 facilities are used by enterprises with mission-critical requirements. The expected uptime is 99.995%, which corresponds to 26.3 minutes of downtime per year. Tier 5 is used by organizations demanding the highest level of reliability and efficiency exceeding the Tier 4 gold standard and mandate the use of renewable energy. Both Tier 4 and 5 require full redundancy end to end (power plant to facility).

**And there's more**: With increased energy demand comes increased greenhouse gas emissions (GHG).



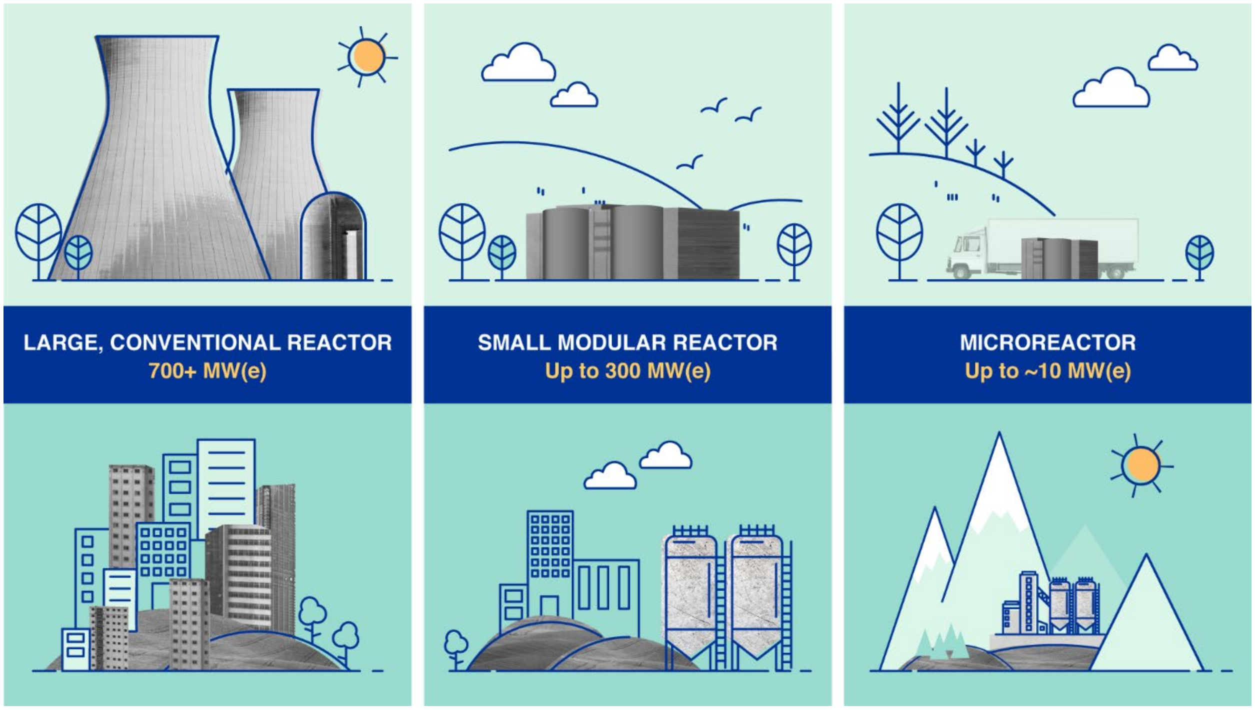

Source: Google 2024 Environmental Report[5]

- **Google reported that its GHG emissions increased** 48% over its 2019 baseline and 13% year-over-year between 2022 and 2023 due to increased electricity demand from its data centers and rapid growth in AI.[6]
- **Microsoft likewise disclosed a 29% increase** in GHG emissions due to data center operations since 2020.[7]
- **Data centers currently emit about 1% of the world's energy-related GHGs**, the International Energy Agency (IEA) reports, and those centers fail to make adequate use or reuse of waste heat.[8]

**The U.S. Environmental Protection Agency has responded lightly so far**, enacting no specifically targeted regulatory measures favoring, instead, changes to its Energy Star program specifications for data center equipment and ratings and certifications for high-efficiency centers.[9] Responding to, rather than anticipating, regulatory action, however, is a long-recognized plan to fail in managing costs, schedule, and optimization of operations.

# 1 Big Thing: Nuclear power solves data center demand challenges.




Source: IAEA[10]

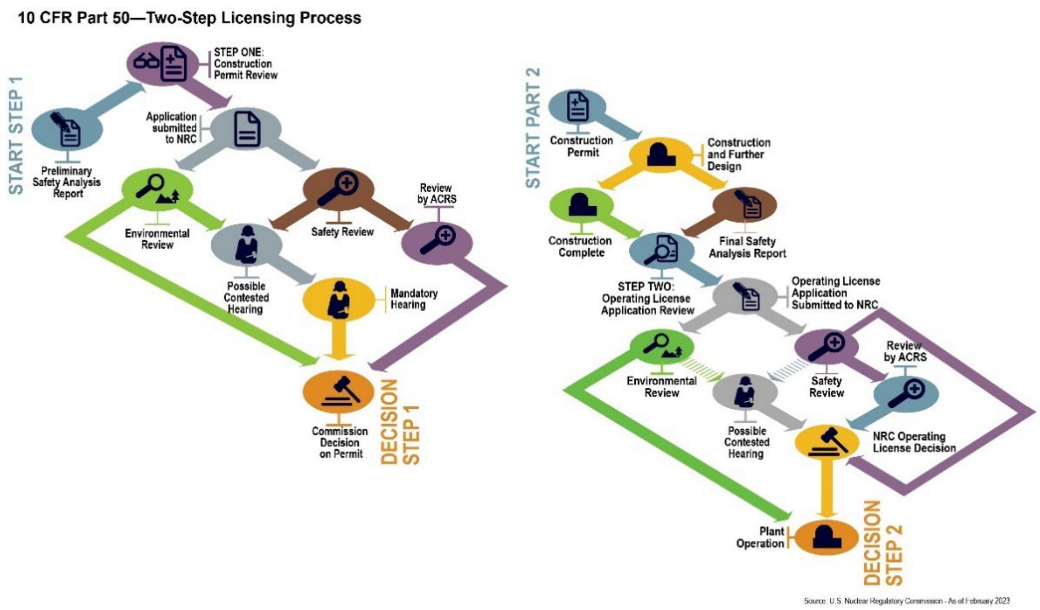
- **Nuclear power provides clean, stable, and sustainable and GHG-free energy to data centers**,[11] which small modular reactors (SMRs) and microreactors render even more attractive because they are less expensive to purchase and install, built in factory settings rather than stick-built onsite, and can be scaled with additional units to respond to evolving needs.[12] They can provide a steady, GHG-free power supply 24 hours per day, 7 days a week, with downtime for refueling occurring every 18 – 36 months or longer depending on the design.
    - **Go deeper**: Even before the wide deployment of SMRs and microreactors, several project developers have eyed large, MW reactors as attractive sites and power supplies, including NE Edge, which seeks to develop a data center at Millstone Nuclear Power Plant in Waterford, CT, and Amazon, which has purchased a $650M data center from Talen Energy on the site of Susquehanna Steam Electric Station in Luzerne County, PA.[13] And Constellation Energy is making a bid to restart Unit 1 at the Three Mile Island Nuclear Generation Station near Harrisburg, PA, after having been shut down for five years, to power a Microsoft data center,.[14]
    - **Feel the reactor burn, fossil**: Co-located with a data center, SMRs, microreactors, or large MW reactors can serve as one of the two independent power sources required to classify data centers as Tier 4 or Tier 5. Other solutions, such as backup diesel or natural gas generators, fail to satisfy the rigorous Tier classification requirements … and neither source decreases GHG emissions.

# Inside the Strategy: The Multi Million Dollar Regulatory Question.

- **The U.S. Nuclear Regulatory Commission (NRC) is responsible for domestic nuclear reactor licensing, including siting, construction, operation, and decommissioning**.

- **Select licensing strategy from process A, B, or C**: NRC licenses reactors using one of three approaches, any one of which an applicant (owner or operator) may select depending on the regulatory strategy they wish to deploy, which involves questions of phasing licenses, integrating licenses, or risk-informing licenses.

    - **Licensing's atomic level**: Each of the three NRC approaches are (or will be) codified in Title 10 of the *Code of Federal Regulations* (10 C.F.R.) at Parts 50, 52, and 53.




    - **The Part 50 Two-Step licensing process responds well to iterative funding, changing market conditions, and the reactor's as-built conditions**. A Construction Permit and Operating License are issued in two separate, in-series proceedings, during which the Operating Permit is not guaranteed. The in-series licensing steps created uncertainty, which, in turn, resulted in the adoption of the next licensing strategy.[15]

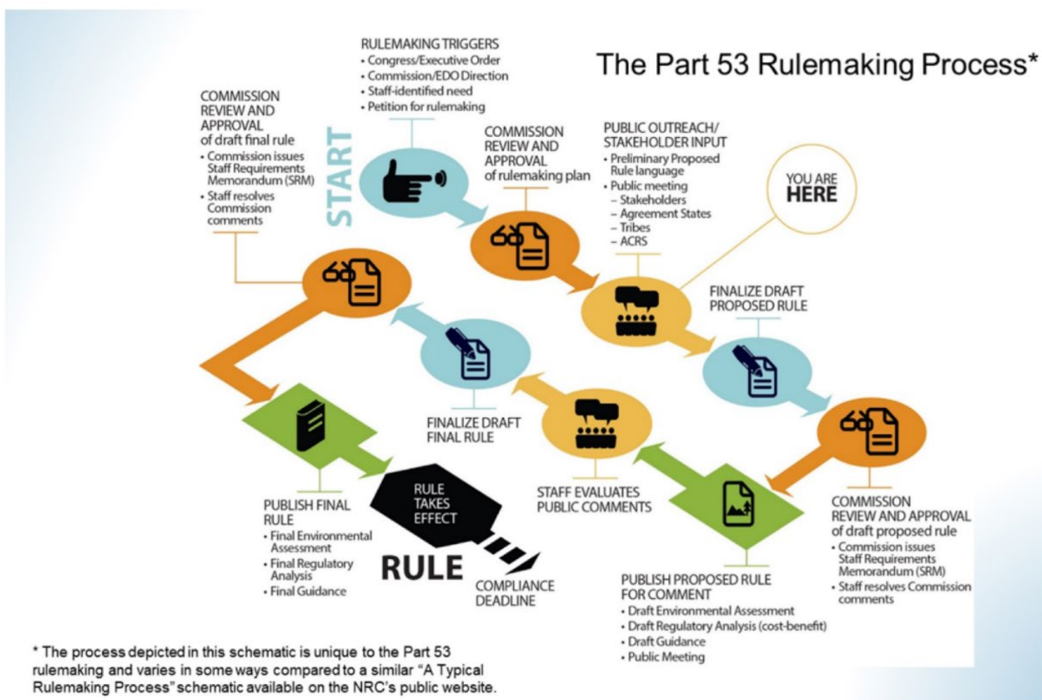
New Reactor Licensing Process


- **Part 52 combines the siting, construction, operation, and decommissioning aspects of licensing in one licensing action—the Combined License (COL).** It requires an applicant to use reactor technology that has previously received a Design Certification or Standard Design Approval, a prior NRC safety review (under the same Part) of the reactor's design and operating parameters.[16] This process favors mature technology and designs (whereas Part 50 can accommodate a less mature technology or design) but has a more predictable and streamlined outcome. The process, on the other hand, places a greater burden on the reactor vendor to have an approved design, but, once the reactor design is approved, an applicant must seek only approval to use it at a particular site. The Part 50 process, by contrast, requires that both the design and the site be approved each time the design is deployed.

- **Leveraging approved Early Site Permits (ESPs):** Part 52 also provides for an ESP process under which an applicant may obtain a permit—but no COL or Construction Permit—for one or more proposed sites for a nuclear power facility. That is, the ESP process permits the site but not the specific nuclear plant design, which would be licensed under a separate proceeding. An ESP is valid for 10- to 20- years (and can be renewed), and allows a permittee to "bank" a site or sites for future nuclear power generation use. NRC has approved six ESPs in Clinton, IL (Clinton); Port Gibson, MS (Grand Gulf); Mineral, VA (North Anna); Waynesboro, GA (Vogtle); Hancocks Bridge and Salem, NJ (PSE&G site); and Oak Ridge, TN (Clinch River). This prior site permitting can shorten the overall regulatory timeline for the deployment of a nuclear power solution.

- **But the challenge with Part 52—and Part 50—is the same: Both are prescriptive standards designed for older gen technology,** which may not effectively accommodate a large number of simultaneous, intensively reviewed license applications.[17] This prescriptive approach is a challenge because the guidance for light water reactors (LWRs) and older gen technology does not align with advanced non-LWR technologies. This misalignment challenge between the Part 50 and Part 52 regulatory approaches and advanced non-LWR technologies has been mitigated by NRC issuance of regulatory guidance for advanced non-LWR technologies. Also, SMR, microreactor, and Advanced Reactor technologies now benefit from 70-years of operating experience and technological development that advances the state-of-the-art beyond those earlier designs.[18]

- **Forthcoming Part 53 seeks to ameliorate the challenges with the existing licensing models.** Recent legislation mandates that NRC adopt a new rulemaking by 2027 that adopts a new licensing paradigm that is responsive to modern technology, such as SMRs and microreactors, and that adopts a performance based licensing approach. NRC has not yet adopted any of these new rules, but the ongoing rulemaking process is considering a wide swath of issues, which ISL is monitoring.[19] NRC staff proposed an internal draft rule in March 2023 that the NRC Commissioners voted a year later to return to staff with significant comments for revision, providing some insights on the rulemaking's direction.[20]




- **Pump the brakes if that Part 53 process is appealing**. Reactor design vendors are interested in using the forthcoming Part 53 rule, including for Advanced Reactors, but no one anticipates that Part 53 will be promulgated in time for the first round of applications.

## Investor objectives in a regulatory strategy.

- **Identify and manage regulatory risk.**
  - Evaluate design maturity and map that maturity to the licensing process. Consider aligning the technology development process with promulgation of the forthcoming Part 53. Give special attention to the capacity for the existing Parts 50 and 52 to address new or novel technology.

- **Consider efficiency.**
  - The Part 52 COL licensing process is generally considered an enhancement on the Part 50 two-step licensing process. Neither process, however, is known as a model of efficiency or as capable of managing a large number of simultaneous applications, which might occur if the new designs take off.[21]
  - Despite what some may perceive as drawbacks with Part 50, it is a well-exercised and understood process. It also has the virtue of allowing plant construction to begin earlier in the licensing process (after issuance of a Construction Permit or Limited Work Authorization). Further, NRC has issued regulatory guidance for advanced non-LWR applicants applying for permits, licenses, certifications and approvals under Part 50 (and 52) regulations. RG 1.233[22], which endorsed NEI 18-04[23], is guidance using a technology-inclusive, risk-informed and performance-based methodology that informs the licensing basis and content of applications for non-LWRs. RG 1.253[24] is guidance for a technology-inclusive content of application methodology to inform the licensing basis and content of applications for advanced non-LWR applicants. Many applicants and pre-applicants are implementing or have committed to using these new guidance documents as the basis, in part, for their Part 50 (and Part 52) applications.
  - Part 53 could help, but what if it isn't available? The Part 52 COL process has the virtue of allowing a reactor design vendor to obtain a design certification or standard design approval in advance of any owner-operator license application. That design certification means that the design is "pre-licensed;" subsequent regulatory actions thus generally focus on siting and operational matters. Advanced technology, however, is a challenge to that process because it is not generally based on the LWR technology that serves as its basis.[25] So, back to waiting for Part 53.

- **Understand how hazards analysis will be performed.**
  - Hazards analysis is the analysis of risks and accident scenarios against which a reactor must protect human health and the environment. Current NRC regulations call for evaluating certain deterministic accident events that could damage the reactor core and lead to unacceptable radiological releases. The regulatory strategy should disposition in advance whether those sorts of accident and hazard analysis scenarios are relevant, and, if so, how they will be addressed. The strategy should

also consider how atypical scenarios will be addressed, such as locating a SMR or microreactor in more populous areas. And the million-dollar question: Will a full probabilistic risk assessment (PRA) be required or will another risk-informed approach be acceptable?

- Consider, too, the litigation risk if NRC agrees to a less robust approach, even if it is technically adequate and appropriate in a given instance. Opponents—and even competitors—can use the regulatory process and litigation to increase schedule and cost. Sometimes a more conservative approach, even if more expensive and time-consuming, may be appropriate.

- Finally, the lessons learned from the Fukushima event teach that man-made and natural hazards may warrant more extensive consideration. These lessons learned combine, too, with recent changes in weather patterns, all of which add up to including within the scope of a hazard analysis risks that heretofore were considered too remote. Perhaps, for example, a once in 500-year event is worthy of hazard analysis. And even if you don't think so, perhaps your opponents or competitors do.

- **Understand the environmental review process.**

  - The National Environmental Policy Act (NEPA)[26]mandates that federal agencies prepare an environmental impact statement (EIS) for every action significantly affecting the quality of the human environment. Issuing a license or permit, such as an NRC COL, may be a significant impact; however, an agency may also use the environmental assessment (EA) process or a categorical exclusion (Cat-X) to perform a less searching analysis of actions that fail to trigger a determination of significance. Feel like you're going down another rabbit hole? You are, Alice. The high-level takeaway is that the environmental review process is parallel to the licensing process and equally robust. Your overall regulatory strategy must include both elements, as well as being well integrated into financing and debt-servicing strategies.

## About ISL & Authors

ISL is an expert in the design, modeling and simulation, digital engineering, validation of nuclear power systems, and the development and execution of sophisticated regulatory strategies and license application preparation and processing. Visit our website for more information https://www.islinc.com/contact-us.

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# End Notes

[1] U.S. Census Bureau, Fastest-Growing Cities Are Still in the West and South (May 26, 2022) (available at https://www.census.gov/newsroom/press-releases/2022/fastest-growing-cities-population-estimates.html#:~:text=Six%20cities%20crossed%20the%20100%2C000,Tuscaloosa%2C%20Alabama%20(100%2C618).) (accessed September 3, 2024).

We used the standard rule-of-thumb that 1 MW will power 1,000 households.

Data centers are projected to require the following energy demands:

- Small: < 5 kW – < 400 kW
- Medium: 1 megawatt (MW) – 10 MW
- Large: 10 MW – > 100 MW.

[2] McKinsey & Company, Global Energy Perspective 2023: Power Outlook (January 16, 2024) (available at https://www.mckinsey.com/industries/oil-and-gas/our-insights/global-energy-perspective-2023-power-outlook) (accessed September 3, 2024).

[3] U.S. EIA, Commercial Electricity Demand Grew Fastest in States with Rapid Computing Facility Growth (June 28, 2024) (available at https://www.eia.gov/todayinenergy/detail.php?id=62409) (Accessed September 3, 2024).

[4] Goldman Sachs, AI Is Poised to Drive 160% Increase in Data Center Power Demand (May 14, 2024) (available at https://www.goldmansachs.com/insights/articles/AI-poised-to-drive-160-increase-in-power-demand) (accessed September 3, 2024).

Google, Environmental Report 2024 (available at https://sustainability.google/reports/google-2024-environmental-report/) (accessed September 4, 2024)

[6] S&P Global, Google Says Datacenters, AI Cause Its Carbon Emissions to Rise Sharply (July 9, 2024) (available at https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/electric-power/070924-google-says-datacenters-ai-cause-its-carbon-emissions-to-rise-sharply#:~:text=The%20US%20Energy%20Information%20Administration,in%20a%20May%20sustainability%20report.) (accessed September 3, 2024).

[7] *Id*.

[8] International Energy Agency (IEA), Data Centres and Data Transmission Networks (available at https://www.iea.org/energy-system/buildings/data-centres-and-data-transmission-networks) (accessed September 3, 2024).

[9] U.S. Environmental Protection Agency (EPA), ENERGY STAR Expands Efforts to Improve Energy Efficiency of U.S. Data Centers (August 16, 2021) (available at

  

https://www.epa.gov/newsreleases/energy-star-expands-efforts-improve-energy-efficiency-us-data-centers) (accessed September 3, 2024); Federal News Network, EPA Aims to Help Ensure Sustainability in the Data Center (April 27, 2022) (available at https://federalnewsnetwork.com/federal-insights/2022/04/epa-aims-to-help-ensure-sustainability-in-the-data-center/) (accessed September 3, 2024).

[10] International Atomic Energy Agency, What Are Small Modular Reactors (SMRs)? (September 13, 2023) (available at https://www.iaea.org/newscenter/news/what-are-small-modular-reactors-smrs) (accessed September 4, 2024).

[11] The positive environmental attributes of nuclear power are well known by now and they include, in sum, the following:

- Zero GHG emissions and low carbon footprint: Nuclear power produces electricity without emitting greenhouse gases during operation, helping data centers reduce their carbon footprint.

- Stable and reliable power supply: Nuclear power provides a consistent and reliable power supply, crucial for the uninterrupted operation of data centers, ensuring high availability and performance.

- Efficiency and scalability: SMRs and microreactors are smaller and portable, allowing for deployment in a variety of locations, including areas where traditional reactors might be impractical. SMRs, moreover, are scalable and can be used in tandem to match the growing energy needs of expanding data centers.

- Enhanced safety features: Modern SMRs incorporate advanced safety features and are designed to operate safely with minimal risk, addressing concerns related to other forms of nuclear energy.

- Long-term sustainability: SMRs are designed to use nuclear fuel more efficiently, which can contribute to long-term energy sustainability.

[12] Current SMR designs embrace traditional light water reactor (LWR) technology, often variants on that used in the current fleet of large, Megawatt (MW) plants, but use the Rankine cycle to generate up to 300 Megawatts Electric Power ($MW_e$) (as compared to about 1,200 $MW_e$ for the current fleet of large reactors). SMR designs include many design enhancements that allow easier fabrication in factory—rather than field—conditions and that promote enhanced safety through new fuel types (such as pebble bed) and alternate cooling methods. These smaller SMRs are cost-effective to manufacture, given the factory fabrication conditions, and are delivered nearly complete to the site, easing installation costs. They are to the nuclear industry what prefabricated housing is to the residential construction industry.

A nuclear microreactor is like an SMR but even smaller, cheaper, and more transportable. Current microreactor designs generate 1 – 25 $MW_e$ and are entirely transportable, often small enough to fit in several sea freight containers. They also employ accident-resistant fuel designs (which future generations of SMRs will likewise employ) and connect to existing infrastructure with fast and simple on-site set up. They are to the nuclear industry what a mobile home is to the housing industry, but without Cousin Eddie emptying his sump into your storm sewer.

[13] The Amazon deal is particularly intriguing because it includes not only the facility purchase but also a fixed-price supply contract in 120 MW increments, a one-time option to cap at 480 MW, and two options to extend the contract by 10-years, which are tied to a license renewal.

Erica Miller, "Proposed data center would get power from Millstone nuclear plant," CTMirror.org (January 19, 2024) (available at https://ctmirror.org/2024/01/19/millstone-power-plant-ct-data-center-nuclear/) (accessed September 4, 2024); American Nuclear Society, "Amazon buys nuclear powered data center from Talen," ANS Nuclear Newswire (March 7, 2024) (available at https://www.ans.org/news/article-5842/amazon-buys-nuclearpowered-data-center-from-talen/) (accessed September 4, 2024).

[14] Constellation Energy, "Constellation to Launch Crane Clean Energy Center, Restoring Jobs and Carbon-Free Power to The Grid," (September 20, 2024) (available at https://www.constellationenergy.com/newsroom/2024/Constellation-to-Launch-Crane-Clean-Energy-Center-Restoring-Jobs-and-Carbon-Free-Power-to-The-Grid.html) (accessed September 22, 2024).

[15] Siting, construction, and construction's environmental impacts are considered in one phase—the Construction Permit—and operations, operations' environmental impacts, and decommissioning in a second phase—the Operating License—for Two-Step Licensing.

[16] The Part 52 process also includes a submission and evaluation of special criteria for inspections, tests, analyses and acceptance criteria (ITAACs) that provide reasonable assurance for the owner operator and NRC that the plant has been constructed and will be operated in accord with the COL.

[17] Both Parts, for example, prescribe protection against and analysis of core melt scenarios, which is a proper concern for MW capacity light-water reactors (LWR). But how does that same prescriptive standard apply to molten salt reactors where the core is already "melted" under normal operating conditions? Does it prohibit molten salt technology at the outset or merely require NRC to come up with additional regulatory guides that provide standards and analytical techniques for them?

Glad you asked. The regulatory guide, or "Reg Guide," is another layer of interpretive guidance below the level of a regulation that informs NRC judgment and interpretation of its regulations. Reg Guides are, essentially, documented interpretations of how the NRC will exercise its discretion to apply and interpret its rules in specific circumstances.

As for molten salt reactors and analysis under the Parts 50 and 52 regimes, NRC has issued regulatory guidance on how to analyze them. For the reasons discussed next, however, that guidance is likely to be inadequate for microreactors and Advanced Reactors. Many of the leading SMR designs are LWR-based, but future designs will take advantage of Advanced Reactor and microreactor technology.

  

The LWR, too, are subject to voluminous Reg Guides. The Parts also contain appendices providing additional requirements and incorporate by reference certain consensus standards, such as the American Society of Mechanical Engineers (ASME) standard NQA-1-2022, Quality Assurance Requirements for Nuclear Facility Applications (2022). All these sources of regulatory instruction must thus be factored into a robust analysis of adopting a licensing approach.

[18] Indeed, unlike those older reactor designs, many of these newer designs do not use water as a coolant or moderator, some are not pressurized, some are buried in the ground rather than housed in large containment structures, and many therefore do not require extensive primary and redundant backup and emergency systems and components to pump cooling water. These new designs, instead, rely on passive safety features—or inherently safe designs—such as gravity, natural heat circulation, and containment in the earth.

[19] The 2019 Nuclear Energy Innovation and Modernization Act (NEIMA), 42 U.S.C. §§ 2214, 2214 note, 2215, 2215 note, 2133 note, 2134, 2134 note, mandates that NRC promulgate new licensing rules equally applicable to all reactors, including LWRs and Advanced Reactors. NEIMA directs NRC to adopt a licensing process that is:

- Technology-inclusive—the rules will be agnostic to moderator, coolant, and siting but that set safety, security, and inspection standards for all reactor types;

- Risk-informed—focus license review and subsequent inspections on structures, systems, and components (SSCs) that present the greatest risk to human health and the environment; and

- Performance-based—the standards identify the objective to be met rather than, as now, the specific means of achieving a defined end state. Passage of the July 2024 ADVANCE Act builds on NEIMA's direction and instructs the Commission to adopt rules to license and regulate microreactors.

The ADVANCE Act (Accelerating Deployment of Versatile, Advanced Nuclear for Clean Energy), Pub. L. No. 118-67, __ Stat. __ (July 9, 2024), is consistent with NEIMA's schedule and sets a three-year schedule—also by 2027—in which NRC is to adopt a rulemaking applicable to microreactors. The ADVANCE Act will require NRC to address such microreactor challenges as:

- Unique characteristics, such as size, design simplicity, and type, configuration, and (smaller) quantity source term;

- Licensing considerations concerning population-density criteria, mobile-deployment licensing, environmental reviews, and risk analysis methods (for example, should a microreactor require a full-blown probabilistic risk assessment (PRA) or might the potentially decreased risk to human health and the environment it presents warrant a less robust but adequately informative approach?);

- Regulatory requirements relating to staffing and operations, safeguards and security, emergency preparedness, decommissioning-funding-assurance methods, oversight and inspections, and transportation of fueled microreactors;

- Policy issues, such as factory fabricated microreactors, factory-fabricated microreactor deployment model, factory fuel loading and factory operational testing (may be addressed under forthcoming Part 53 rulemaking), manufacturing licenses (likely to be issued under Part 52) (factory-fabricated modules (high standardization)).

NRC has begun work on drafting options for Part 53 and settled on a title ("Risk-Informed, Technology-Inclusive Regulatory Framework for Commercial Nuclear Plants"); the ADVANCE Act is likely to affect the scope of NRC's prior pronouncements on the forthcoming Part 53. No draft has been issued. NRC, Rulemaking Plan on Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors, SECY-20-0032 (April 13, 2020) (available at https://www.nrc.gov/docs/ML1934/ML19340A056.pdf) (accessed September 9, 2024); NRC, Agency Activities in Response to a Portion of the Nuclear Energy Innovation and Modernization Act (available at https://www.nrc.gov/waste/decommissioning/neima-section-108.html) (accessed September 9, 2024) (website monitoring NRC NEIMA activities); General Service Administration (GSA), eRulemaking website for 10 CFR Part 53: Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors (available at https://www.regulations.gov/docket/NRC-2019-0062/document) (accessed September 9, 2024) (GSA website providing rulemaking docket); NRC, Micro-Reactor Licensing and Deployment Considerations: Fuel Loading and Operational Testing at a Factory, SECY-24-0008 (January 24, 2024) (available at https://www.nrc.gov/docs/ML2320/ML23207A252.html) (accessed September 9, 2024); NRC, ADVANCE Act (Accelerating Deployment of Versatile, Advanced Nuclear for Clean Energy Act of 2024) (available at https://www.nrc.gov/about-nrc/governing-laws/advance-act.html) (accessed September 9, 2024) (NRC website recounting ADVANCE Act actions).

[20] NRC, Proposed Rule: Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors (RIN 3150-AK31), SECY-23-0021 (March 1, 2023) (available at https://www.nrc.gov/docs/ML2116/ML21162A093.html) (accessed September 17, 2024).

[21] *See, e.g.*, United States Government Accountability Office (GAO), Nuclear Power: NRC Needs to Take Additional Actions to Prepare to License Advanced Reactors (July 2023) (available at https://www.gao.gov/assets/gao-23-105997.pdf) (accessed September 23, 2024); Stephen G. Burns, Looking Backward, Moving Forward: Licensing New Reactors in the United States, pub. By Organisation for Economic Co-operation and Development—Nuclear Energy Agency (July 8, 2008) Stephen G. Burns is a former Chairman of the NRC) (available at https://www.oecd-nea.org/law/nlbfr/documents/007_029_ArticleBurnsStephen.pdf) (accessed September 23, 2024); Idaho National Laboratory, Recommendations to Improve the Nuclear Regulatory Commission Reactor Licensing and Approval Process (April 2023) (available at https://inldigitallibrary.inl.gov/sites/sti/sti/Sort_65730.pdf) (accessed September 23, 2024); Nuclear Innovation Alliance, Enabling High Volume Licensing of Advanced Nuclear Energy (January 2024) (available at https://nuclearinnovationalliance.org/sites/default/files/2024-01/Enabling%20High%20Volume%20Licensing%20of%20Advanced%20Nuclear%20Energy%20-%20NIA.pdf) (accessed September 23, 2024); Center on Global Energy Policy, Improving the Efficiency of NRC Power Reactor Licensing: The 1957 Mandatory Hearing Reconsidered (November 2023) (available at https://www.energypolicy.columbia.edu/wp-content/uploads/2023/11/NRCLicensing-CGEP_Report_112123.pdf) (accessed September 23,

2024); Sidley, "U.S. Nuclear Regulatory Commission Progresses Efforts to License Advanced Reactors" (available at https://environmentalenergybrief.sidley.com/2024/04/18/u-s-nuclear-regulatory-commission-progresses-efforts-to-license-advanced-reactors/) (April 18, 2024). *See also* Ted Nordhaus and Adam Stein, 'NRC Staff Whiffs On Nuclear Licensing Modernization" (available at https://thebreakthrough.org/blog/nrc-staff-whiffs-on-nuclear-licensing-modernization) (accessed September 23, 2024); ClearPath, "A Simpler, Dedicated Pathway for Advanced Nuclear Reactor Licensing" (available at https://clearpath.org/our-take/a-simpler-dedicated-pathway-for-advanced-nuclear-reactor-licensing/) (accessed September 23, 2024).

[22] NRC RG 1.233, "Guidance for a Technology-Inclusive, Risk-Informed and Performance-Based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-LWRs."

[23] NEI 18-04, "Risk-Informed Performance-Based Technology-Inclusive Guidance for Non-Light Water Reactor Licensing Basis Development," Revision 1, August 2019. (ADAMS Accession No. ML19241A472).

[24] NRC RG 1.253, "Guidance for a Technology-Inclusive, Content-of-Application Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certification, and Approvals for Non-Light Water Reactors."

[25] NRC, admittedly, has adopted some guidance on processing license applications based on Advanced Technology.

[26] 42 U.S.C. §§ 4321-4347.

  