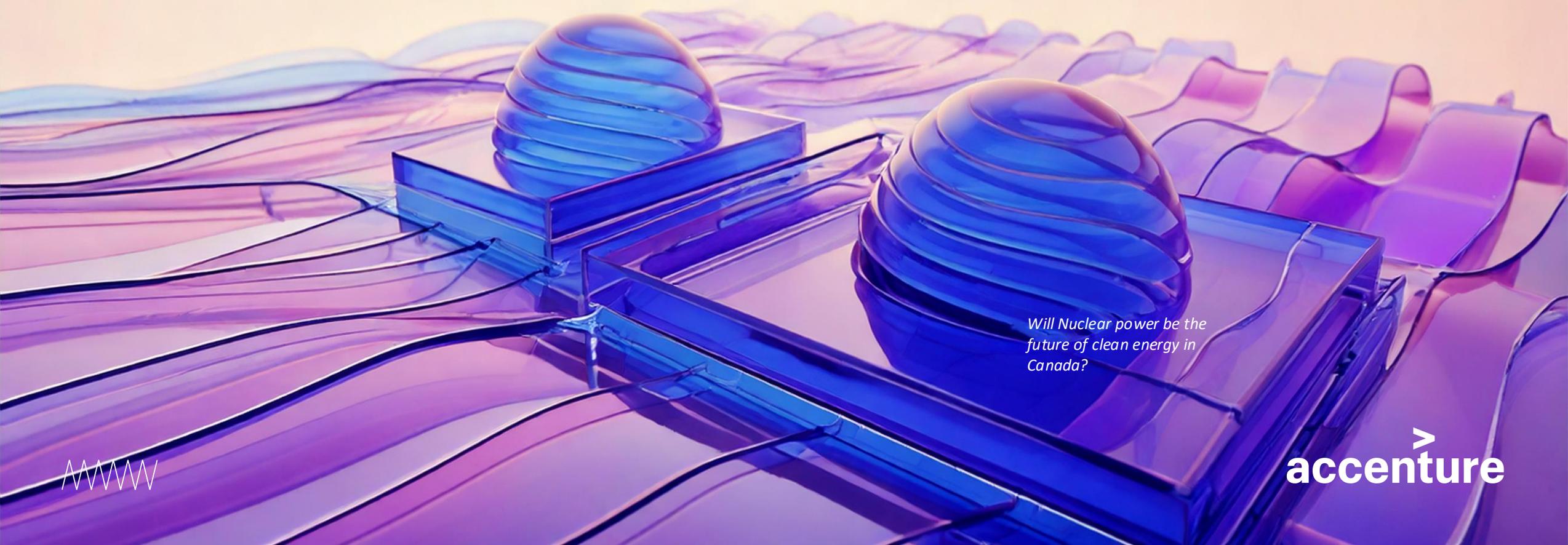




Nuclear
Futures

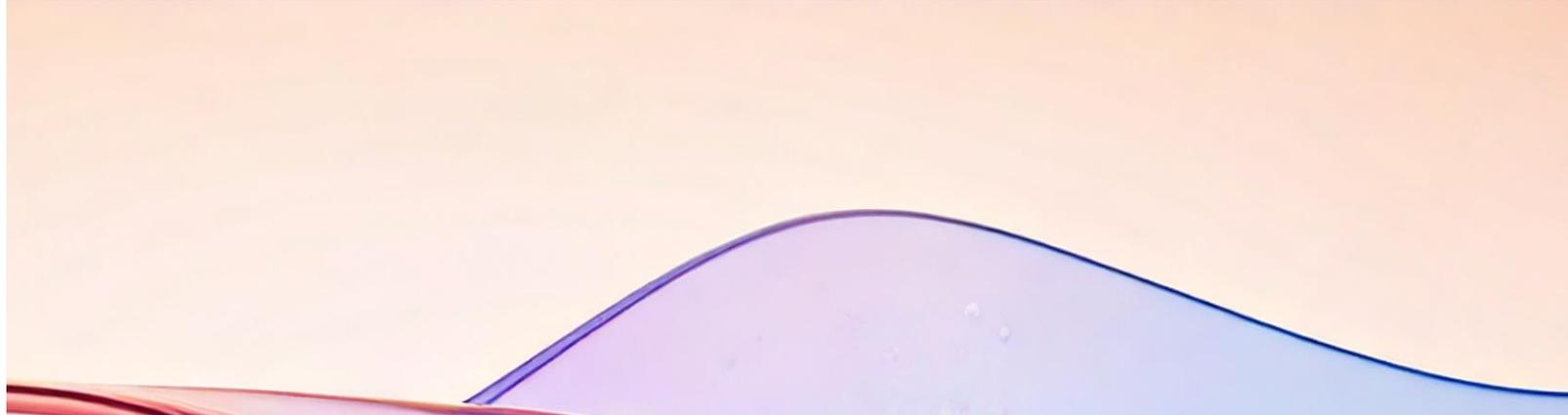
2050 



*Will Nuclear power be the
future of clean energy in
Canada?*



 **accenture**



Land Acknowledgement

We acknowledge the Indigenous Peoples who have stewarded the lands, waters, and skies of Turtle Island since time immemorial. Canada is shaped by a complex history of Treaties—Traditional, Modern, and Peace and Friendship Treaties. Many of these agreements were signed under duress, in contexts of violence and misunderstanding.

Understanding this history is essential as we discuss the future of nuclear energy in Canada—a sector deeply connected to the land and its resources. Let this acknowledgment serve as a call to action for meaningful reconciliation and collaboration with Indigenous communities in shaping Canada’s energy future.





Leadership Foreword



Recently, my discussions with Canada's foremost business and policy leaders have often revolved around the challenge of fostering economic stability and sustainability for future generations. In every discussion, whether centred around artificial intelligence, automation, or industrial innovation, one common denominator stands out: *energy*. And among the various energy sources, clean, reliable nuclear power is emerging as a cornerstone of our future.

Having dedicated my career to the intersection of technology, innovation, and strategic leadership, I am convinced that Canada stands at a pivotal juncture. We possess the expertise, the talent, and the global influence to become a leader in nuclear energy. However, this potential is not without challenges. Aging infrastructure, supply chain inefficiencies, and a looming workforce shortage threaten to impede our progress. The question before us is not whether nuclear energy will play a role in our future, but whether Canada will lead the charge.

This comprehensive report delves into the transformative forces reshaping the nuclear energy landscape and outlines the tactical steps

Canadian leaders must take to stay ahead. Through a strategic foresight approach, we have identified ten emerging trends that are redefining the industry. These trends range from Big Tech's significant investments in nuclear to power advanced AI infrastructure, to Indigenous communities securing equity stakes in energy projects, and even the potential of nuclear propulsion for deep-space exploration.

We have also mapped out four possible future scenarios—Incremental Growth, Transformation, Stagnation, and Collapse. Regardless of the path we take, this report highlights key no-regrets strategies that will ensure the nuclear industry remains competitive and resilient in an uncertain future.

At Accenture, I am honoured to lead a team of thousands of innovators and strategists dedicated to helping Canada's largest private and public sector organizations navigate the most pressing generational challenges. Whether in energy, technology, or workforce transformation, our mission is to harness the power of human ingenuity and cutting-edge technology to drive meaningful change.

The nuclear industry is now facing a similar challenge. Leaders need to act decisively, embracing innovation and collaboration to ensure nuclear energy's place in a sustainable, tech-driven future. This isn't just about maintaining the status quo; it's about reinventing ourselves. We need to rethink how we approach energy, how we integrate new technologies, and how we build a workforce that is ready for the challenges ahead.

The decisions we make today will shape the next 25 years of energy and beyond. Will Canada rise to this challenge?

David Morgenstern
President, Accenture Canada





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Nuclear Futures 2050

Executive Summary

Nuclear power is one of the few technologies capable of delivering massive amounts of clean, 24/7 energy anywhere. It has the potential to drive energy independence, slash emissions, and fuel a green industrial revolution.

Yet Canada's nuclear sector is at a crossroads—facing a need for much higher throughput despite aging infrastructure and a looming workforce crisis. Will we lead the next energy revolution or fall behind?

This report explores the forces shaping nuclear's future and the strategies nuclear leaders will need to thrive no matter what the future holds.

Methodology

This report combines industry research and expert insights in a proven strategic foresight framework. This isn't an academic or technical

paper—it's a forward-looking analysis grounded in strategic foresight. Rather than just documenting the present, we use future-focused methodologies to anticipate change, explore possibilities, and identify actionable steps that industry leaders can take today to shape the path ahead. It will take sector-wide collaboration – as well as strong public and government support - to shape the most desirable future.

The Six Macro Forces

We've identified six key forces shaping nuclear energy's future: *global stability, climate urgency, energy security, economic pressure, AI & quantum technology, and public trust.*

Governments are reconsidering nuclear to cut carbon, but high costs and slow deployment raise concerns. Energy independence is critical, and while public trust is growing, it remains fragile. AI and advanced safeguards will determine whether nuclear remains both viable and secure as the world changes.

The Ten Trends

Through deep research, expert interviews, and collaborative sessions, we've identified ten key trends shaping nuclear energy's future:

1. **Hyperscaler Power Brokers:** Big Tech is betting on nuclear, investing in reactors to power data centers and AI infrastructure.
2. **Regulation Crossroads:** Regulators race to streamline approvals while upholding high safety standards.
3. **The Half-Life of Talent:** A looming workforce crisis is forcing innovation in training, technology, and recruitment.
4. **Isotope Gold Rush:** The demand for rare medical isotopes from nuclear plants is surging.
5. **Nuclear Influencing:** Social media influencers and grassroots campaigns are making nuclear energy cool again.
6. **Nuclear Liftoff:** Space agencies are exploring nuclear propulsion for deep-space missions, fueling the next space age.
7. **Partnerships for Prosperity:** Indigenous communities are financially backing nuclear projects and securing equity stakes.
8. **Polar Power:** As the Arctic opens up, nuclear is poised to serve both communities and commerce.
9. **Rad Bots:** The next generation of AI-powered robots are redefining the future of nuclear operations.
10. **Canadian Made:** Canada is powering global nuclear growth through technology, talent, and strategic financing.





2050

Four Future Scenarios

The future of nuclear energy is uncertain. To support long-term planning, we've modelled four distinct scenarios—each representing a different, yet equally plausible, future for the industry. These are not meant to be read as a timeline or progression, but as alternative contexts that nuclear leaders must be prepared for.



Incremental Growth

The industry continues its current trajectory, making steady, sustained progress on ambitious targets.

By 2050, nuclear energy is embedded in the global energy mix, growing alongside renewables. Canada plays a key role, exporting SMRs and reactor expertise while powering heavy industry and remote communities. Automation and AI streamline operations, and nuclear is widely seen as clean, safe, and essential. Workforce and cost challenges persist, and net-zero remains an ambitious challenge.

Questions for nuclear leaders:

1. **What** role should my company play in securing Canada's nuclear supply chain amid economic uncertainties?
2. **How** can we address workforce shortages and build a resilient talent pipeline for long-term industry growth?



or Transformation

Breakthrough innovations and bold investments unlock nuclear's full potential, revolutionizing energy.

By 2050, nuclear energy is the backbone of global decarbonization—powering net-zero, transforming healthcare, and enabling new economic frontiers. Canada leads with a full-spectrum strategy, fueling advanced manufacturing, northern "Nuclear Cities," and lunar outposts. With Indigenous-led innovation, medical breakthroughs, and AI-powered infrastructure, Canada stands at the forefront of a clean and resilient future.

Questions for nuclear leaders:

1. **How** might we expand into sectors like medicine, mining, and technology to maximize nuclear's impact?
2. **What** investments in SMRs, fusion, and next-gen reactors will keep us at the forefront of global nuclear innovation?



or Stagnation

Strained systems, talent gaps, and uneven innovation keep nuclear in a holding pattern.

After years of systemic strain, nuclear energy is entering a slow recovery. Canada favours cautious progress—refurbishing plants, advancing Indigenous equity partnerships, and modernizing regulation. Innovation remains uneven, and workforce gaps persist. As global ambitions reawaken, the industry must move faster to meet the moment.

Questions for nuclear leaders:

1. **Are we** too limited in our technology choices, or are we striking the right balance between innovation and reliability?
2. **What** strategic partnerships, governmental, Indigenous, or global, will help my company scale?



or Collapse

A failing industry sees plants decommissioned, investments abandoned, and nuclear power marginalized.

By 2050, nuclear power is a relic of the past. Systemic strain, high costs, and lost public trust leads to its steady decline. Indigenous communities, promised economic participation for years, walk away after repeated failures to deliver. A cyberattack in the 2030s seals its fate. Now, abandoned reactors dot the landscape—rusting relics of an industry that failed to evolve in a rapidly changing world.

Questions for nuclear leaders:

1. **How** might we streamline approvals while investing in next-generation reactors?
2. **How** do we ensure public trust and financial backing to sustain nuclear's long-term viability?





2050

No-Regrets Moves

There are many paths forward, but the next move doesn't have to be overwhelming. These no-regrets strategies create an important foundation for the resilience of your existing operating fleet and for future new builds.

Resilience & Growth

01

Fortify Canada's Supply Chain

A strong, reliable supply chain is needed to expand nuclear energy and cement Canada's role as a global leader in nuclear innovation.

02

Diversify Nuclear Funding Models

Attracting new investors and long-term funding will reduce financial risks and accelerate deployment.

03

Expand Nuclear Strengths

Expanding domestic generation capacity, refurbishing existing plants, and exporting expertise globally will drive nuclear growth and international leadership.

Technology & Talent

04

Strengthen the Talent Pipeline

Investing in talent attraction, development, and retention—including training, diversity, and career growth initiatives— is essential for local and global relevance.

05

Modernize Technology

From AI-assisted decision-making to modular construction, emerging technologies can boost efficiency, cut costs, and drive scalability.

06

Innovate Beyond Grid Power

Embracing new markets, industrial applications, and nuclear cogeneration will allow the industry to remain resilient in changing economic conditions.

Public Support & Policy

07

Boost Public Support of Nuclear

Continue building momentum and sustaining public support by engaging influencers, communities, and policymakers.

08

Partner for Regulatory Agility

An agile regulatory framework can support emerging technologies while maintaining top-tier safety and environmental standards.

09

Advance Waste Solutions

Lead the way by developing innovative long-term disposal solutions as part of sustainable waste management planning.





2050

Nuclear Futures

Preparing for an Uncertain Future

Preparing for an Uncertain Future

This report is grounded in industry research, expert insights, and a strategic foresight methodology used by leading organizations worldwide. Through environmental scanning, visioning, and action planning, we've identified key shifts and opportunities that will shape the future of the nuclear industry, globally and here in Canada.

The future isn't set in stone—it's shaped by the decisions made today. Canada's nuclear sector has the chance to lead, innovate, and drive a new energy era. But without bold action, we risk stagnation or decline.

The Time for Action is Now

Canada has a narrow window to maintain its position as a leader on the global nuclear stage. The future of the industry depends on the actions taken today. Business leaders, policymakers, and innovators must act now to make strategic, no-regrets moves that secure a resilient, competitive future. The choices made today will determine whether Canada builds a legacy of energy resilience—or risks being overtaken.

[Read the full report for deeper insights and ways forward >>](#)



Executive
Summary

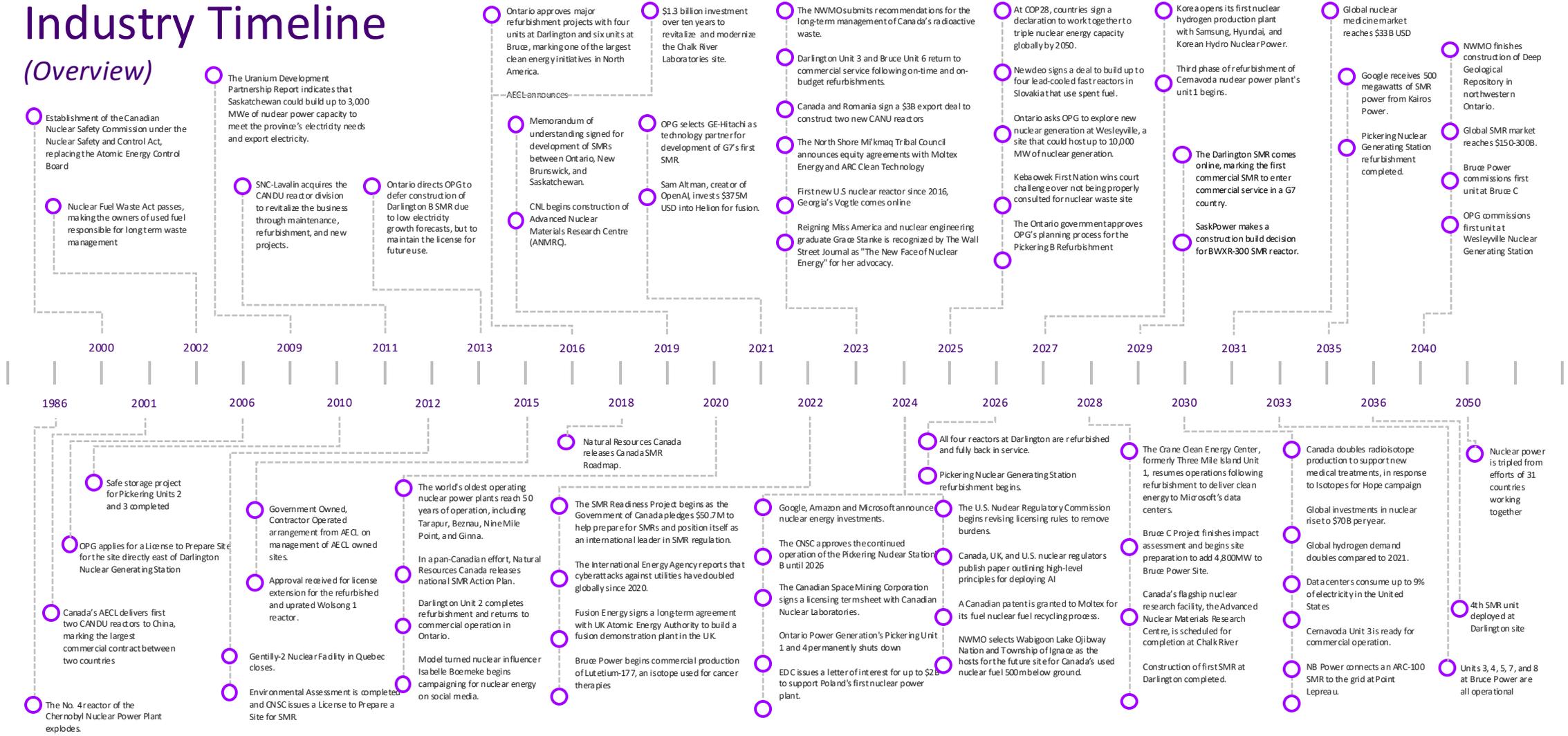




2050

Nuclear Futures

Industry Timeline (Overview)



Executive Summary





Introduction





Setting the Stage

Nuclear 2050:

The High-Stakes Race for Canada's Energy Future

In the summers of 2023 and 2024, as wildfires turned Canada's skies apocalyptic red and extreme heat strained the power grid to the brink, a hard truth became undeniable—our energy system is not built for the future hurtling toward us.

Countries that invest in reliable, carbon-free baseload power will weather the coming storms of energy demand and climate change.

Those that don't will face blackouts, economic turmoil, and a dwindling ability to compete on the world stage.

Nuclear power should be Canada's saving grace. It's one of the only technologies capable of providing massive amounts of clean, 24/7 energy anywhere. It could anchor energy independence, slash emissions, and fuel a green industrial revolution.

As we approach the mid-21st century, the question is: will Canada seize the opportunity, or will it watch from the sidelines as others lead the next energy revolution?





The Six Macro Forces

The Macro Forces Shaping Nuclear Power's Future

Why Pay Attention to These

The Macro Forces are undercurrents. They set the stage for industry dynamics, influencing everything from policy decisions to investment flows. Understanding them helps us better interpret market trends, anticipate challenges, and consider what enduring success needs to look like.



01

The Global Security Puzzle

Nuclear power's biggest challenge globally? Making sure it stays in the right hands. Canada's nuclear program and exports are designed to promote peaceful uses of nuclear energy with strict safeguards in place to prevent proliferation. However, careful supply chain management is crucial. International oversight agencies like the IAEA play a key role in maintaining global cooperation¹.

02

The Climate Push

The race to cut carbon emissions is heating up, and nuclear power is a serious contender. Electrification is driving demand for stable, low-carbon power, and in response, Canada is aiming for 90% of its electricity to come from renewable and non-emitting sources by 2030². Unlike wind and solar, nuclear delivers around-the-clock energy without depending on the weather.

03

Energy Security in Uncertain Times

Recent geopolitical contexts have made one thing clear: energy independence matters. As nations seek reliable, clean energy solutions, demand for Canadian nuclear expertise is rising. Canada is meeting the call with cost-effective, scalable solutions that can be exported worldwide³. Yet, even as a leader, Canada still relies on U.S. power to fill gaps⁴.

04

The Cost Factor

Energy affordability remains a top issue for Canadians⁵. But let's be honest—nuclear power is expensive upfront. Traditional reactors take years (sometimes decades) to build, and the costs can be staggering. But new technologies like Small Modular Reactors (SMRs) promise more flexibility and affordability⁶. If nuclear is going to compete with renewables and natural gas, government incentives will be crucial.

05

AI Bounds & Quantum Leaps

As outlined in Accenture's Technology Vision 2025⁷, AI's rate of diffusion is bringing new opportunity to reshape nuclear's core operations and even business models. Meanwhile, quantum computing is set to enhance reactor safety⁸, efficiency, and energy optimization in the coming decades⁹. With hyperscalers investing heavily in AI and quantum, nuclear must adapt¹⁰.

06

Overcoming the Fear Factor

While over half of Canadians surveyed today support nuclear energy, support for wind and solar is still higher¹¹. Accidents like Chernobyl and Fukushima still loom large in the public mind. Half the people surveyed across twenty countries still worry about radiation and potential for disaster¹². Fully tipping the scales will take more than statistics—it will require transparency, education, and engagement.





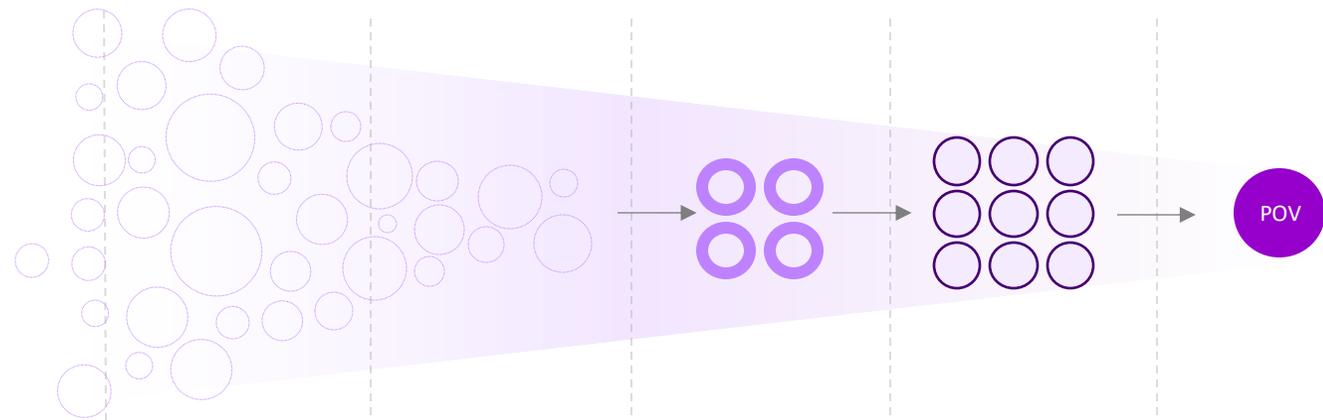
2050

Methodology

Shaping tomorrow's nuclear landscape

Accenture Canada's Nuclear Industry Practice working alongside Accenture Canada's Innovation Practice looked across the nuclear industry with a Canadian perspective involving subject matter experts, designers, innovators and futurists to understand the industry shifts and identify opportunities for our clients to stay ahead of the curve.

This report is grounded in industry research and expert insights, applying a proven strategic foresight methodology that is used by leading companies and governments worldwide to inform strategy, identify blind spots, and de-risk decisions. Together through a three-step approach of **Environment Scanning**, **Visioning** and **Acting**, we identified signals of change, analyzed what's happening and considered the possibilities of where the industry is heading, culminating in a set of no-regrets moves.



← Environmental Scan → Visioning → Acting →

Scope

Work with industry experts to ground in what's happening today and determine the jumping off point for research to collect signals of change.

Scope	Signals	Trends	Scenarios	Strategy	Report
	<p>Collect signals of change from; consulting industry experts and deep secondary research.</p> <p>256 signals of change collected</p> <p>31 industry experts consulted</p> <p>1 timeline from 2000 - 2050</p>	<p>Identify the patterns of change from the signals to create a set of trends. Prioritize and test trends with industry experts.</p> <p>10 primary trends identified</p> <p>8 secondary trends identified</p>	<p>Explore how these signals and trends will shape the nuclear industry in worlds of Incremental Growth, Transformation, Stagnation and Collapse.</p> <p>4 future scenarios created</p> <p>8 future artifacts created based on the scenarios</p>	<p>Work with industry experts to examine scenarios and identify actions needed today to move towards a desirable future for the nuclear industry in 2050.</p> <p>9 No regrets moves identified (in Resilience & Growth, Technology & Talent, and Public Support & Policy)</p>	<p>Bring together all pieces of work in an industry POV.</p>





Environment Scanning

Charting Nuclear's Path





Exploring the Past, Present, and Future



A timeline of events in the nuclear industry from 2000 - 2050

Overview:

The **industry timeline** showcases the main events that have happened, the events happening now, and the events to watch out for in the future. This is built from industry research, experts and headlines. Future dates come from reputable models and roadmap planning from industry stakeholders. While future events are not known, there are signposts to watch out for.

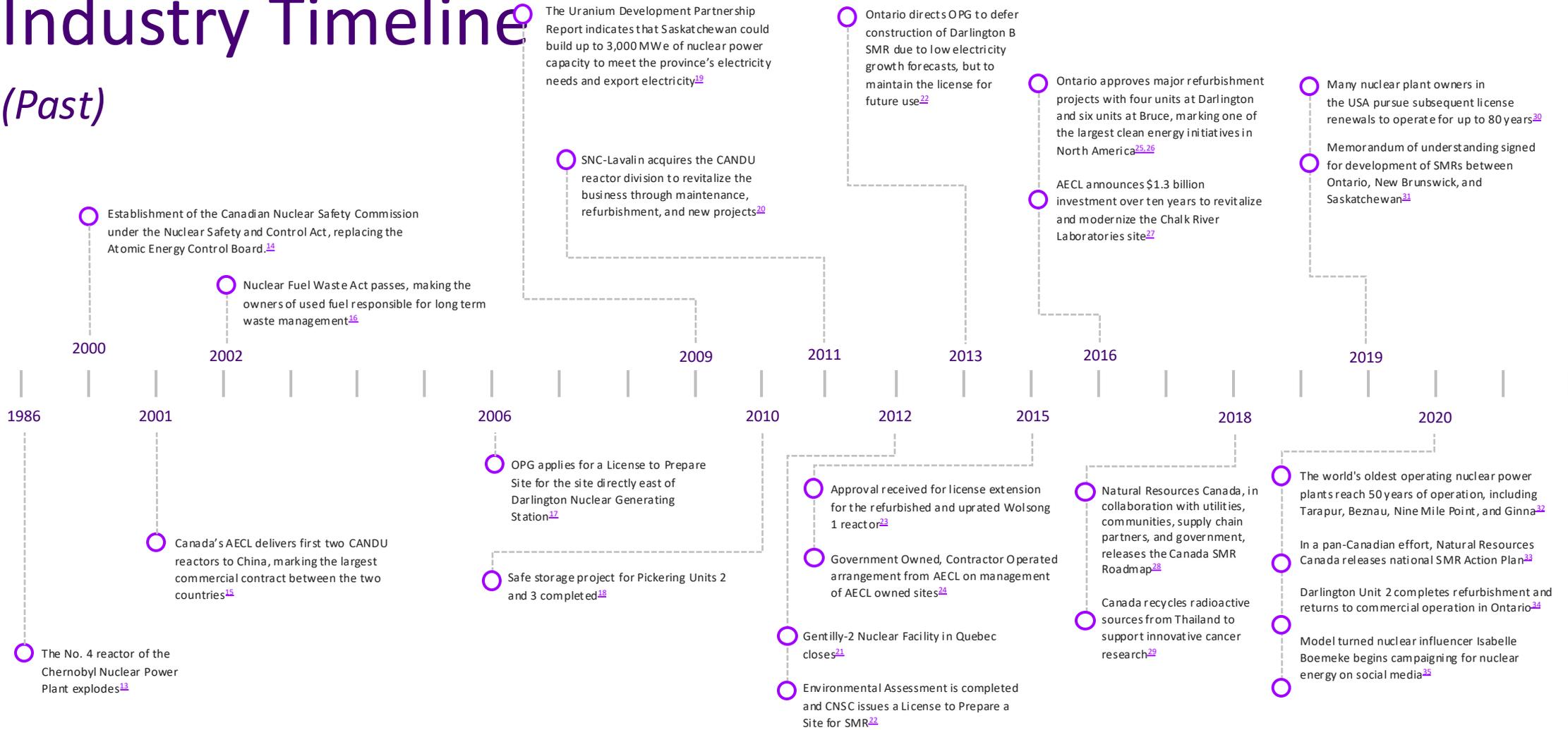




2050

Nuclear Futures

Industry Timeline (Past)



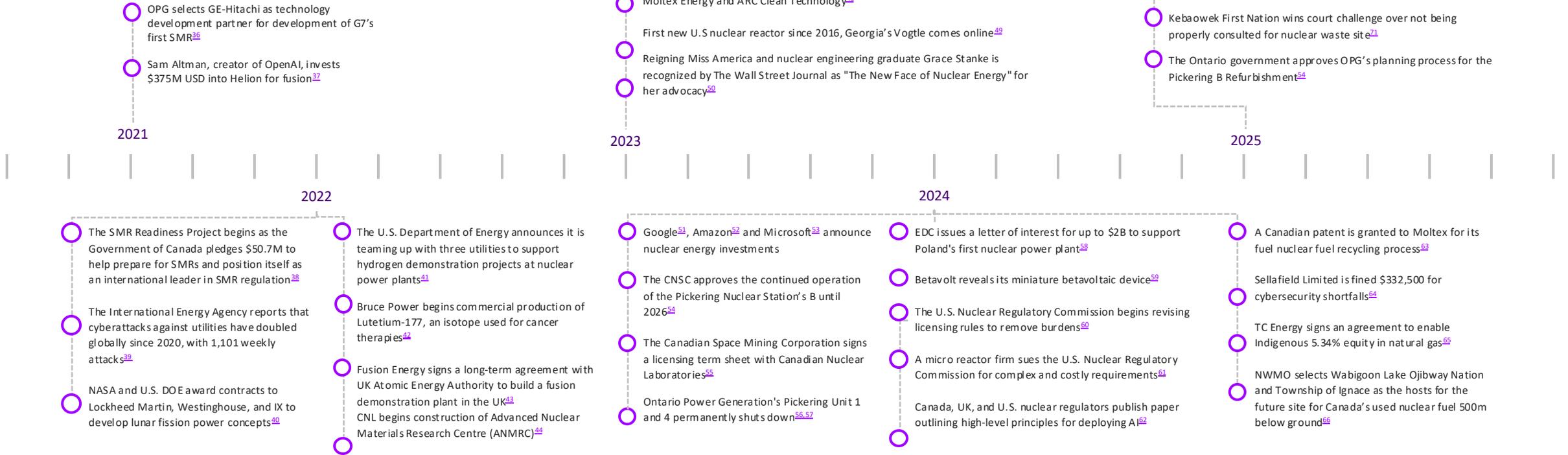
Environment
Scanning





2050

Industry Timeline (Present)





2050

Nuclear Futures

Industry Timeline (Future)

- All four reactors at Darlington are refurbished and fully back in service²²
- Pickering Nuclear Generating Station refurbishment begins⁵⁴

- Utilities need to produce an extra 26% in energy to keep up with demand⁷⁵
- The Crane Clean Energy Center, formerly Three Mile Island Unit 1, resumes operations following refurbishment to deliver clean energy to Microsoft's data centers⁵³

- Bruce C Project finishes impact assessment and begins site preparation to add 4,800MW to Bruce Power Site⁷⁶
- Canada's flagship nuclear research facility, the Advanced Nuclear Materials Research Centre, is scheduled for completion at Chalk River⁷⁷
- Construction of first SMR at Darlington completed²⁸

- Canada doubles radioisotope production to support new medical treatments with added production of Yttrium-90, Molybdenum-99, and Lutetium-177, plus first large-scale production of Actinium-225 and Iodine-125⁸¹
- Global investments in nuclear rise to \$70B per year⁸²
- Global hydrogen demand doubles compared to 2021⁸³
- Data centers consume up to 9% of electricity in the United States⁸⁴
- Cernavoda Unit 3 is ready for commercial operation⁸⁵
- NB Power connects an ARC-100 SMR to the grid at Point Lepreau⁸⁶

- Units 3, 4, 5, 7, and 8 at Bruce Power are all operational⁸⁸
- 4th SMR unit deployed at Darlington site²⁸
- Nuclear power is tripled from efforts of 31 countries working together²



2027

- Korea opens its first nuclear hydrogen production plant with Samsung, Hyundai, and Korean Hydro Nuclear Power⁷³
- Third phase of refurbishment of Cernavoda nuclear power plant's unit 1 begins⁴⁴

2029

- The Darlington SMR comes online, marking the first commercial SMR to enter commercial service in a G7 country²⁹
- SaskPower makes a construction build decision for BWXR-300 SMR reactor⁸⁰

2031

- Global nuclear medicine market reaches \$33B USD⁸⁷

2033

2035

- Google receives 500 megawatts of SMR power from Kairos Power⁵¹
- Pickering Nuclear Generating Station refurbishment completed⁵⁴

2036

2040

- NWMO finishes construction of Deep Geological Repository in northwestern Ontario²⁴
- Global SMR market reaches \$150-300B⁸²
- Bruce Power commissions first unit at Bruce C⁷⁶
- OPG commissions first unit at Wesleyville Nuclear Generating Station²⁰

2050





The Ten Trends Shaping Tomorrow



What's changing today

Overview:

Trends are emerging patterns of change that help organizations anticipate risks and opportunities. Spanning social, technological, economic, environmental, political, and value-driven shifts, they offer a holistic view of the future. Grounded in deep research, expert insights, and collaboration, the following trends highlight key developments shaping the nuclear industry.

- 1. Hyperscaler Power Brokers**
Big Tech is betting on nuclear, investing in reactors to power data centers and AI infrastructure.
- 2. Regulation Crossroads**
Regulators race to streamline approvals while upholding high safety standards.
- 3. The Half-Life of Talent**
A looming workforce crisis is forcing innovation in training, technology, and recruitment.
- 4. Isotope Gold Rush**
The demand for rare medical isotopes from nuclear plants is surging.
- 5. Nuclear Influencing**
Social media influencers and grassroots campaigns are making nuclear energy cool again.
- 6. Nuclear Liftoff**
Space agencies are exploring nuclear propulsion for deep-space missions, fueling the next space age.
- 7. Partnerships for Prosperity**
Indigenous communities are financially backing nuclear projects and securing equity stakes.
- 8. Polar Power**
As the Arctic opens up, nuclear is poised to serve both communities and commerce.
- 9. Rad Bots**
The next generation of AI-powered robots are redefining the future of nuclear operations.
- 10. Canadian Made**
Canada is powering global nuclear growth through technology, talent, and strategic financing.





Social / Technological / **Economic** / Environmental / Political / Value

2050



Nuclear Futures

STRONG

Strength

Hyperscaler Power Brokers

Big Tech is betting on nuclear, investing in reactors to power data centers and AI infrastructure.

trend



Trends
Report





Trend: Hyperscaler Power Brokers

Nuclear Futures

What's happening

As demand from AI and cloud computing surges, tech giants are turning to nuclear energy—both large and small reactors—to secure stable, carbon free power.

The rise of computationally intensive AI applications has made energy security a boardroom priority for hyperscalers⁸⁹.

In response, strategic partnerships between tech firms and nuclear providers are accelerating. These partnerships span the spectrum of nuclear technologies, including refurbished large-scale reactors, uprates of existing plants, and early investments in small modular reactors (SMRs).

Recent deals highlight this growing interest. Google has entered an agreement to purchase nuclear energy from multiple SMRs developed by Kairos Power⁵¹. Meanwhile, Amazon has purchased stakes in X-Energy⁵² and Microsoft is partnering with Constellation Energy to restart the Three Mile Island plant⁵³—each aiming to integrate nuclear energy into their AI and cloud infrastructure.

These commitments reflect a strategic bet on a diversified nuclear strategy —seeking low-carbon, high-reliability power wherever it can be most readily deployed. For nuclear operators, long-term agreements with hyperscalers provide revenue certainty—unlocking the confidence and capital needed to invest in large-scale, long-life assets.

Nuclear providers are already adapting in kind. Companies across North America are pivoting their strategies to support high-load applications in data centers, cementing nuclear's role in the digital economy^{90,91}.



2050



“Hyperscalers need reliable, clean power that’s available 24/7. Only nuclear power provides that without compromise.”

Terry Maxey
Global Power Generation Lead,
Accenture



Trend 1





Signals



01

Increasing Energy Demand from AI Market Boom

The AI market is continuing to grow at breakneck speed. It is projected to grow at a CAGR of 36.6% from 2024 to 2030⁸². Its energy-intensive nature is translating to increasing electricity demand. The Electric Power Research Institute (EPRI) estimates that data centers could consume up to 9% of electricity in the United States by 2030, more than double 2024 consumption figures⁸⁴.

02

Hyperscalers Are Striking Novel Nuclear Deals

Since 2023, there have been 21 publicly announced agreements to power data centers with nuclear energy⁸². In 2024, Amazon purchased a stake in nuclear reactor developer X-Energy with a view of commercially deploying SMRs by 2039⁵⁴. A month prior, Microsoft entered a 20-year power purchasing agreement with Constellation Energy to restart Unit 1 of the Three Mile Island plant⁵⁵.

03

Nuclear Companies Are Gearing Up for Data Centers

Nuclear plant operators are responding to growing demand from big tech. In 2024, 45% of NEI members—representing 95 U.S. reactors—reported interest in powering data centers, from load applications to license renewals⁹⁰. In Canada, Ontario’s grid operator projected that by 2050, data centers will drive 13% of total electricity demand, with at least 16 new facilities expected by 2035⁹¹.





Social / Technological / Economic / Environmental / **Political** / Value

2050

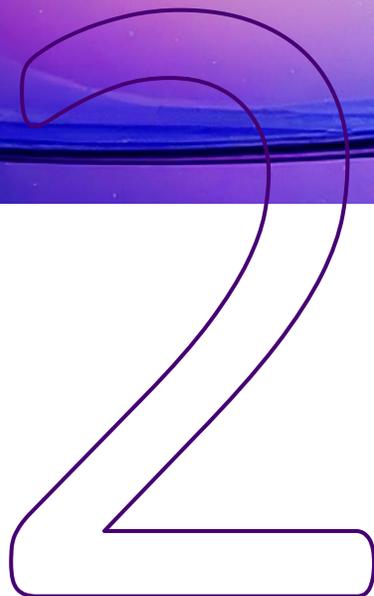


Nuclear Futures

MEDIUM

Strength

trend



Regulation Crossroads

Regulators race to streamline approvals while upholding high safety standards.

Trends
Report





What's happening

As the world accelerates toward stable, low-carbon energy solutions, the nuclear industry is at an inflection point: how can regulatory processes evolve to support rapid, efficient deployment while maintaining the highest safety standards?

For decades, nuclear energy has been governed by a framework designed for certainty and security. Now, as demand for nuclear power grows, regulators are working to revisit these processes to enable a much higher throughput.

One area of focus is harmonizing regulations across jurisdictions to support scalability. Canada, the U.S., and the U.K. have established innovation-focused regulatory departments, collaborating to align standards and facilitate efficient reactor deployment⁹³. This coordination is especially important as reactor vendors look to standardize designs across multiple markets.

Regulators are also setting out principles for the use of modern tools such as AI, digital

design, and 3D modeling⁹⁴, which hold the promise of enhancing reactor safety and construction efficiency. Canada has joined international efforts to consider how to integrate these technologies into a regulatory framework⁹⁵, ensuring oversight keeps pace with innovation.

Debates around licensing Small Modular Reactors (SMRs) versus large reactors continue. In Canada, both follow the same process, but some argue that SMRs' lower risk profile warrants a more tailored approach⁹⁶. Another challenge is the Impact Assessment process, where the final project approval rests with the Minister of the Environment, introducing political uncertainty.

As nuclear expansion gains momentum, Canada's regulators are engaging with industry and international partners to refine processes, increase throughput, and provide greater policy certainty. These efforts will shape the country's ability to deploy nuclear energy at scale while maintaining rigorous safety oversight.



“The nuclear regulator in Canada stands at a crossroads, where the delicate balance between advancing energy innovation and safeguarding public safety demands not only vigilance but visionary leadership.”

-Michael Krause,
Client Account Leader, Nuclear
Accenture Canada





Signals



01

AI Regulation in the Nuclear Sector May Be Slow to Come

While AI regulations are advancing across industries, frameworks its use within the nuclear industry have not kept pace. In 2024, the US, UK and Canada nuclear regulators released a trilateral paper showing a wide range of AI standards and guidelines and highlighting opportunities to address safety and security, given AI's rapid evolution⁶². They note that AI-specific nuclear standards are unlikely to emerge for years.

02

Legal Dispute Over SMR Regulation in USA

In December 2024, U.S. microreactor firm Last Energy, along with the states of Texas and Utah, sued the Nuclear Regulatory Commission, arguing that its complex and costly licensing requirements significantly hinder SMR construction, deployment, and broader innovation in the nuclear energy sector⁶¹.

03

Governments Streamlining Approval Processes

In April of 2024, Canada announced plans to fast-track nuclear projects, while Ontario explored eliminating overlap between provincial and federal assessments⁹⁷. Meanwhile, the UK moved to simplify nuclear planning as part of its goal to boost capacity from 5.9 GW to 24 GW by 2050⁹⁸.





Strength **STRONG**



trend

The Half-Life Of Talent

A looming workforce crisis is forcing innovation in training, technology, and recruitment.





Trend: The Half-Life of Talent

Nuclear Futures

What's happening

As demand for nuclear energy ramps up, the industry faces an impending labour shortage which will need addressing.

While concerns about an aging workforce have circulated for decades, limited growth and the ability to retain retirees kept the issue at bay. But with a wave of planned new builds and plant life extensions, the industry now faces a real and pressing talent challenge.

The International Energy Agency (IEA) projects that nuclear capacity must double by mid-century to meet net-zero goals⁹⁹. But while expansion plans are accelerating, the workforce is contracting.

In Canada and the US, nearly half of nuclear professionals will retire within the next decade^{100,101}. In Canada alone, over 30% of the workforce is over 50¹⁰⁰. Unlike past decades, the road ahead requires a surge in recruitment, training, and retention—both at speed and at scale.

To bridge this gap, governments and industry leaders are rolling out workforce initiatives. Canada has expanded skilled trade programs and clean energy networking events¹⁰², while the UK is investing in technical training and apprenticeships to build a strong talent pipeline¹⁰³.

But attracting young professionals isn't just about job opportunities—it's about changing how nuclear work is perceived. Today's workforce seeks tech-driven, collaborative, and purpose-driven careers¹⁰⁴. AI-powered training, VR simulations, and digital-first career pathways are modernizing nuclear education.

Yet, nuclear competes with tech and finance, where fast career progression and remote work are the norm. If the industry is to thrive, it must reshape workplace culture, ensuring it remains innovative, attractive, and future-focused.

The demand is rising. The workforce is shrinking. The clock is ticking.



2050



“The nuclear industry must value its workforce, foster interest, develop skills, and cultivate innovation. A steady talent pipeline is essential for renewal.”

-Ash Anderson,
Senior Talent Strategist, Accenture



Trend 3





Signals



01

Money Matters Less to Incoming Labour Force

Several studies indicate that Gen Z and Millennials prioritize flexibility, purpose-driven work, and technology-enabled roles¹⁰⁵. Accenture Life Trends 2025 found that when it comes to work, people value work/life balance most highly, with salary and job security a close second¹⁰⁶. The shift to valuing work/life balance could indicate that money is weakening as a motivator to work harder.

02

Preference for Cutting-Edge Technology

Technology jobs in the U.S. are projected to grow twice as fast as the overall U.S workforce over the next ten years¹⁰⁷. Gen Z, a significant portion of the younger workforce, are looking to tech jobs. TechRepublic reports that 80% of Gen Zers want to work with cutting-edge technology and the younger the generation, the more likely they are to have used and expect to integrate Gen AI¹⁰⁸.

03

Nuclear Skills Programs Are Targeting High School Students

Programs that prepare students for nuclear skills are offered even before college. The Nuclear Innovation Institute offers a 17-week Energy Co-op for high school students, combining skill development with real-world learning¹⁰⁹. Meanwhile, the Ontario Government has invested \$5.4 million in three mobile tech classrooms, engaging nearly half a million students in skilled trades over three years¹⁰².





Social / Technological / **Economic** / Environmental / Political / Value

2050



Nuclear Futures

STRONG

Strength

trend



4

Isotope Gold Rush

The demand for rare medical isotopes from nuclear plants is surging.

Trends
Report





Trend: Isotope Gold Rush

Nuclear Futures

What's happening

As global demand for radioactive elements rises, investment and innovation are reshaping nuclear medicine—positioning isotopes as a cornerstone of 21st-century healthcare.

The global market for nuclear medicine is projected to reach \$33 billion by 2031, driven by the need for more precise, targeted treatments⁸⁷. Isotopes like Lutetium-177 and Actinium-225 are revolutionizing cancer care, delivering radiation directly to tumors while minimizing damage to healthy tissue^{110,111}. However, supply remains a critical challenge.

For decades, research reactors have been the primary source of medical isotopes, but aging infrastructure and periodic supply disruptions have exposed the vulnerabilities of this system.

In response, global initiatives such as the IAEA's Rays of Hope and Canada's Isotopes for Hope are working to expand access and accelerate production⁸¹. Countries like Canada, the U.S., and those in Europe are investing in new reactors, particle accelerators, and alternative isotope production methods to secure supply chains.

As governments, industry leaders, and research institutions rally behind medical isotope expansion, nuclear medicine is emerging as a vital force in global healthcare—offering new hope for millions of patients while strengthening the resilience of modern healthcare systems.



2050



“Nuclear isotopes represent an opportunity for the nuclear industry to demonstrate its importance not only to energy independence but cutting-edge medical treatment.”

-Ken Yau
Utilities Industry Executive,
Accenture



Trend 4





Signals



01

Rare Isotope Production is Strong in Canadian Nuclear Industry

More than 70 percent of the world’s supply of Cobalt-60 is produced at Canadian nuclear power plants¹¹². Canadian Nuclear Laboratories is producing Actinium-225, a rare isotope for cancer treatment clinical trials¹¹⁰. Bruce Power’s has since 2022 produced Lutetium-177 to meet global clinical trial demand¹¹³. Meanwhile, Ontario Power Generation aims to deploy North America’s first commercial power reactor for harvesting Molybdenum-99 at its Darlington site¹¹³.

02

Campaigns Increase for Isotope-Powered Cancer Treatment

The International Atomic Energy Association (IAEA) launched Rays of Hope in 2022, a global cancer initiative aimed at expanding radiotherapy access, particularly in low-income nations¹¹¹. Meanwhile, the Canadian Nuclear Isotope Council (CNIC) introduced Isotopes for Hope, a program designed to develop solutions that will double Canada’s isotope production by 2030, ensuring a more stable and resilient supply for critical treatments globally⁸¹.

03

Coalitions and Capital Fuel Canadian Isotope Growth

Public, private, and academic players are investing heavily to expand isotope production. Regional alliances like the Central and Eastern Ontario Isotope Alliance (2024) and the Southwestern Ontario Isotope Coalition (2023) are raising awareness and advancing national production efforts^{114,115}. Meanwhile, Canadian firm Kinectrics Inc. has invested over \$22 million to boost enriched medical isotope production for cancer treatments¹¹⁶.





Social / Technological / Economic / Environmental / Political / Value

2050



Nuclear Futures

Strength

WEAK

trend



5

Nuclear Influencing

Social media influencers and grassroots campaigns are making nuclear energy cool again.

Trends Report





Trend: Nuclear Influencing

Nuclear Futures

What's happening

Today, a new generation of influencers is reshaping public perception, making nuclear not just acceptable—but cool.

For decades, nuclear energy has suffered from a PR problem. Pop culture, from The Simpsons' three-eyed fish to Chernobyl's haunting memory, cemented fears of radiation, danger, and radioactive waste. But today, a new wave of advocates is reframing the narrative—casting nuclear as innovative, climate-friendly, and worth getting excited about.

Social media figures like Isabelle Boemeke (Isotope) and former Miss America Grace Stanke have taken to TikTok, Instagram, and YouTube, educating millions on how modern nuclear energy is safe, clean, and essential for a carbon-free future^{35,117}. Unlike traditional industry experts, these influencers connect with younger audiences through humor, aesthetics, and accessibility. The result? A shift in public opinion. Polls now show growing support for nuclear energy, especially among younger generations who are increasingly concerned about climate change¹¹.

But influencers alone aren't enough. Grassroots campaigns like Generation Atomic, Stand Up for Nuclear and Come Clean have amplified this movement, taking pro-nuclear messaging to the streets, engaging communities, and lobbying policymakers^{118,119,120}.

As these campaigns gain momentum, the political landscape follows. In the U.S., once anti-nuclear states are reconsidering plant closures, while in Europe, governments are reinvesting in reactors. In Canada, discussions about reintroducing nuclear power are emerging in British Columbia, while Nova Scotia is lifting its ban on uranium mining and exploration^{121,122}.

To secure nuclear's place in the clean energy future, political popularity must be seeded by trusted voices. Whether it's a scientist-turned-TikTok-star or a viral campaign pushing for plant extensions, influencers are proving that nuclear energy isn't just a necessity—it's a movement. And for the first time in decades, it has public support to back it up.



2050



“When influencers speak up for nuclear energy, they inspire the next generation of nuclear workers and build trust with the general public.”

– Alex Bettencourt,
Managing Director, Accenture



Trend 5





Signals



01

Rise of Nuclear Influencers

Influencers like Brazilian model Isabelle Boemeke (“Isodope”) and former Miss America Grace Stanke are reshaping nuclear’s image online^{35,50}. With futuristic, science-driven content, they’ve brought nuclear energy into the mainstream for younger audiences—amassing millions of views and sparking new conversations.

02

#SaveDiabloCanyon

The #SaveDiabloCanyon grassroots campaign rallied public support to keep California’s last nuclear power plant operational¹²³. Driven by environmentalists, scientists, and tech leaders, the movement gained lots of ground. It successfully influenced state policymakers to extend Diablo Canyon’s lifespan, reversing its planned shutdown.

03

Generation Atomic Involvement at Climate Conferences

Pro-nuclear advocacy group Generation Atomic has, for eight consecutive years, appeared at the UN Climate Conference to campaign for the advancement of nuclear energy in climate action¹¹⁸. At COP29, they distributed bananas to highlight that radiation exposure from a common fruit is comparable to living near a functioning nuclear power plant.





Social / **Technological** / Economic / Environmental / Political / Value

Strength **WEAK**

2050



Nuclear Futures

Nuclear Liftoff

trend



Space agencies are exploring nuclear propulsion for deep-space missions, fueling the next space age.



Trends
Report





Trend: Nuclear Liftoff

Nuclear Futures

What's happening

As space agencies and private companies accelerate plans for lunar and interplanetary exploration, nuclear energy is emerging as a leading candidate to power humanity's next giant leap.

The world's major spacefaring nations are rekindling their ambitions for space exploration, with a particular focus towards the Moon¹²⁴. Since the start of the last decade, multiple nations have ramped up their missions to Earth's celestial neighbour. In January of 2024, Japan became the fifth country to land on Moon¹²⁵. The United States, China and Russia have all committed to establishing a sustained presence beyond Earth's orbit.

Meanwhile, the continued success of commercial space companies is accelerating the viability of deep-space missions. Reduced launch costs—driven by industry leaders like SpaceX and Blue Origin—are paving the way for sustained human exploration beyond low Earth orbit, making long-duration missions to the Moon and Mars increasingly feasible.

As these efforts intensify, governments and private enterprises are beginning to pursue nuclear-based energy solutions for space. Nuclear manufacturers are receiving funding from space agencies and partnering with other heavy industry firms to develop research of new and novel applications. These range from powering the shuttles of the future, supplying power on future bases or even providing the energy required to extract extraterrestrial resources^{129,130}.

Nuclear could play a significant role in establishing a sustainable future presence beyond our planet as nations and enterprises compete. While large-scale deployment remains distant, ongoing advancements suggest a growing area of opportunity that nuclear companies would be wise to monitor.



2050



"Humanity's next giant leap into the cosmos will be powered by the atom. As nations reignite their lunar and interplanetary ambitions, nuclear energy is emerging as a beacon of sustainability."

-Jennifer Wong,
National Power Generation Leader,
Accenture



Trend 6





Signals



01

Renewed Interest in Lunar Missions

NASA plans to reestablish a human presence on the Moon for the first time since the Apollo 17 mission in 1972 with its Artemis II mission, scheduled to launch in 2026¹²⁶. China is continuing its own missions and recently professed its aims to put the first Chinese person on the moon before 2030¹²⁷. It is also partnering with Russia to build a lunar station as part of the International Lunar Research Station (ILRS) project¹²⁸.

02

Increased Funding to Nuclear Companies for Space Applications

In June 2022, NASA and the U.S. Department of Energy awarded contracts to Lockheed Martin, Westinghouse, X-Energy and Intuitive Machines to develop lunar fission power concepts¹²⁹. BWXT and Rolls-Royce are also advancing space nuclear technologies¹³⁰. In November 2024, the Canadian Space Mining Corporation signed a Memorandum of Understanding with Canadian Nuclear Laboratories to explore commercializing their SLOWPOKE-2 reactor⁵⁵.

03

Space Mining Companies Receive Funding

In February 2025, private startup Karman+ secured \$20 million USD in seed funding to advance asteroid mining technologies, with a demonstration mission planned for 2027⁶⁷. A few months prior, Californian company AstroForge raised \$40 million USD in its Series A, signaling growing investor interest in space-based resource extraction and off-world industries¹³¹.





Social / Technological / Economic / Environmental / Political / Value

2050



Nuclear Futures

STRONG

Strength

Partnerships for Prosperity

Indigenous communities are financially backing nuclear projects and securing equity stakes.

trend



Trends Report





Trend: Partnerships for Prosperity

Nuclear Futures

What's happening

Indigenous companies and communities coast-to-coast have been investing in nuclear reactors through equity stakes and loan guarantees¹³². These investments are intended to support the development of nuclear energy while also providing economic opportunities for Indigenous communities.

For decades, Indigenous consultation on nuclear projects followed a familiar script—developers sought community buy-in, offered impact assessments, and made promises of environmental stewardship. But too often, these consultations amounted to little more than a bureaucratic hurdle, with limited long-term benefits for Indigenous nations.

Now, a new model is emerging—one that moves beyond consultation to real equity ownership¹³³. For example, Bruce Power and the Saugeen Ojibway Nation signed an equity agreement for medical isotope production—demonstrating how Indigenous ownership can align commercial success with community benefit¹³⁴.

Revenue generated from these projects can fund infrastructure, education, and self-governance initiatives, reducing reliance on government programs.

Indigenous-owned companies are also becoming active investors in nuclear energy projects, not just stakeholders on the sidelines¹³⁵. This shift represents more than just a financial opportunity; it's a step toward true economic uplift for Indigenous professionals.

Indigenous nations, business-owners, and leaders who have a seat at the table in decision-making will ultimately be co-creators of the energy projects that impact their lands. In contrast to the old consultation model, equity investment offers real power—both political and financial.



2050



“We must envision a future where Indigenous partnerships play not only a role, but a substantial role in developing and sustaining the next generation of our skilled nuclear workforce.”

– Bojan Bogdanovic
Nuclear Energy Leader, Accenture



Trend 7





Signals



01

Canadian Government Facilitating more Indigenous ownership deals

At least 135 major energy and related projects in Canada have moved forward with some form of indigenous ownership, according to an April 2024 report from law firm Fasken¹³⁶. During the same month, the Canadian national government launched a CAD\$5 billion loan guarantee program to facilitate Indigenous ownership deals¹⁰⁹.

02

Historic equity agreements signed between First Nation Community and nuclear companies

In September of 2023, the North Shore Mi'kmaq Tribal Council (NSMTC) announced equity agreements with Moltex Energy Canada and ARC Clean Technology Canada to participate in the development of advanced nuclear technology in New Brunswick and beyond⁶². Two years prior, Bruce Power and the Saugeen Ojibway Nation signed an equity agreement for medical isotope production¹³⁴.

03

TC Energy announces Canada's largest Indigenous equity ownership agreement

In July 2024, TC Energy announced an agreement enabling Indigenous communities to acquire a 5.34% equity interest in its Canadian natural gas pipeline network, marking Canada's largest Indigenous equity partnership in energy infrastructure and a significant step toward Indigenous economic participation⁶⁴.





Social / Technological / Economic / **Environmental** / Political / Value

2050

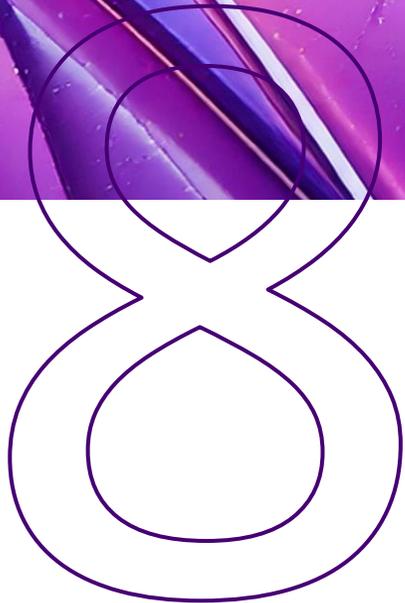


Nuclear Futures

MEDIUM

Strength

trend



Polar Power

As the Arctic opens up, nuclear is poised to serve both communities and commerce.

Trends Report





Trend: Polar Power

Nuclear Futures

What's happening

As the Arctic opens up, a significant opportunity for modular reactors to serve both remote communities and commerce is emerging.

Climate change is accelerating the Arctic's thaw, reshaping global trade routes and drawing new economic activity into once-inaccessible regions.

While seasonal ice coverage remains unpredictable, Arctic crossings have steadily increased over the past decade¹³⁷. This shift is already driving investment in Arctic infrastructure with the U.S. constructing its first deep-water Arctic port in Nome, Alaska¹³⁸. In Canada, a formerly shelved deep-water port project is restarting at Grays Bay in Nunavut¹³⁹. Both reflect a growing recognition that the Arctic is no longer just a frozen expanse—it is a developing frontier.

While Russia already uses nuclear-powered icebreakers for year-round Arctic access¹⁴⁰, nuclear energy is set to play a larger in future northern expansion.

The potential extends to remote communities across Canada facing similar challenges. Work continues on modular reactor technologies to offer a long-awaited alternative to diesel-dependent remote communities, promising cleaner, more autonomous energy solutions.

Governments are showing interest. In 2023, a Yukon Government study found SMRs feasible, highlighting zero emissions, minimal land use, and lower energy costs as potential benefits¹⁴¹.

These two shifts are converging in ways that could redefine northern infrastructure. As human and industrial activity expands in the region, the demand for stable, off-grid power—and the opportunities it creates—is set to grow.



2050



“The future of nuclear is global. We must remain responsive to new communities and geographies that will be focal points in the world of tomorrow.”

-Maciej Hryniewicki,
Utilities Data & AI Leader, Accenture



Trend 8





Signals



01

Feasibility Study Backs SMRs for Yukon Communities

In August of 2023, the Yukon Government published a feasibility on using SMRs to provide continuous power to its communities. The study focused on the role and benefits SMRs could provide to the Yukon grid, off-grid mine sites, and microgrid communities. The report cited various benefits and found no major barriers to their eventual deployment¹⁴¹.

02

Marked Increase in Arctic Shipping Activities

The number of unique ships entering the Arctic Polar Code area increased by 37% from 2013 to 2024, adding approximately 500 vessels, according to a report by the Arctic Council¹³⁷. Fishing vessels accounted for 39% of the total traffic, marking the highest increase, with growth also observed in cruise and cargo ships¹³⁷.

03

Continued Development of Micro Modular Reactors for Remote Areas

Westinghouse continues to develop its eVinci MMR, completing front-end engineering and experiment design to test a prototype at Idaho National Laboratory in September of 2024¹⁴². That same month, the US Department of Defense announced it had broken ground on transportable nuclear reactors for remote locations as part of its Project Pele¹⁴³.





Social / **Technological** / Economic / Environmental / Political / Value

2050



Nuclear Futures

STRONG

Strength

trend



99

Rad Bots

The next generation of AI-powered robots are redefining the future of nuclear operations.

Trends
Report





Trend: Rad Bots

Nuclear Futures

What's happening

The march of progress in generative AI is increasingly intertwined with advances in robotics. Humanoid robots are reaching new levels of dexterity and intelligence, potentially reshaping their role in nuclear plant settings.

Our Accenture Tech Vision 2025 report highlights how breakthroughs in large language models (LLMs), visual language models (VLMs), and Robotics Foundation Models are transforming automation⁷. Machines now possess real-world autonomy to interact with people, follow complex instructions, and take safe, accurate actions.

The nuclear energy industry is no stranger to robotics. For decades, hazardous environments have required remote-controlled manipulators, drones, and climbing robots for inspection, maintenance, or decommissioning tasks¹⁴⁴.

Among the most prominent recruits is Spot, the quadruped robot developed by Boston Dynamics. Routinely deployed at sites like Chernobyl, Fukushima, and Sellafield, Spot supports tasks like equipment inspection,

waste sorting, and environmental monitoring¹⁴⁵. Its capabilities continue to evolve rapidly, with recent deployments hinting at new possibilities for remote operation and site navigation¹⁴⁶.

Yet the implications of this robotic revolution go far beyond traditional applications. Across the broader industrial landscape, AI and digital twins are accelerating robot deployment and refining human-robot collaboration—highlighting how simulation-based training could shape future nuclear integration¹⁴⁷.

Leading this next wave is Shanghai Electric, which launched China's first training facility for heterogeneous humanoid systems. It recently deployed its first humanoid robot for nuclear operations and aims to expand their roles across nuclear sites, potentially including refurbishments and new builds¹⁴⁸.

As AI-driven robotics evolve, they may not only complement human expertise but redefine the very nature of nuclear operations—paving the way for a future where automation and intelligence drive the industry's next frontier.

2050



“Over the past two years, breakthroughs in computing power and generative AI have reshaped our vision of what’s possible. We’re on the verge of a profound transformation in how we plan and execute work through industrial and process automation.”

- Majid Afana
VP Sales and Business Development,
Nuclear
Eclipse Automation,
part of Accenture



Trend 9





Signals



01

First Humanoid Deployment for Nuclear Operations

Shanghai Electric has partnered with nine research enterprises to establish China's first heterogeneous humanoid robot training facility, the Humanoid Robot Kylin Training Ground. In December of 2024, Shanghai Electric's Nuclear Power Group successfully deployed its first humanoid robot for nuclear operations, targeting tasks in extreme and hazardous conditions to improve safety and efficiency¹⁴⁸.

02

Virtual Models to Train Robots at Scale at Schaeffler AG

Manufacturing firm Schaeffler AG has developed a proof-of-concept demonstrating how AI-powered simulations can be used to test robot fleets, including general-purpose humanoid robots. With support from NVIDIA, Accenture, and Microsoft, they've created digital twins of factory environments to explore human-robot collaboration, advancing virtual models to teach specific tasks to robots successfully¹⁴⁷.

03

Robotics Milestone Achieved with Spot the Dog at Sellafield

Spot, the quadruped robot dog has been successfully deployed in hazardous environments such as Chernobyl, Fukushima, and Sellafield, where it recently achieved a major milestone¹⁴⁵. In March of 2025, AtkinsRéalis announced that it had successfully operated Spot remotely from a different location at the Sellafield site—a first in the industry¹⁴⁶.





Social / Technological / **Economic** / Environmental / Political / Value

2050



Nuclear Futures

Strength

MEDIUM

trend



Canadian Made

Canada is powering global nuclear growth through technology, talent, and strategic financing.

Trends
Report





Trend: Canadian Made

Nuclear Futures

What's happening

Just as other countries promote their nuclear industries globally, Canada is steadily expanding its presence on the international stage.

With a strong legacy in nuclear technology and a globally respected workforce, Canada is increasingly exporting both its expertise and reactor designs to meet rising global energy demand.

In recent years, Canadian companies and institutions have taken on more visible roles in major international projects, with reactor technology planned for deployment across Europe and homegrown expertise supporting the design, construction, and upkeep of new and refurbished plants^{149,150}.

To sustain this momentum, public and private actors are working together to open doors abroad. Recent partnerships are setting the stage for coordinated promotion of Canadian nuclear services—strengthening commercial ties and positioning the country's workforce and innovations as global leaders¹⁵¹.

Canada is also making inroads in new regions, including a memorandum of understanding with Jamaica to support nuclear readiness¹⁵², and a new working group in Singapore aimed at helping Southeast Asian nations pursue civilian nuclear energy¹⁵³.

Financial instruments remain a critical part of the equation. Through strategic lending tools, Canada is creating pathways for its suppliers to contribute to major international builds, with embedded conditions that prioritize Canadian technology^{154,57}.

These arrangements don't just support exports—they cultivate lasting partnerships built on operational support, safety collaboration, and technical knowledge exchange.

The result is a multi-faceted export strategy. Canada is establishing long-term roles in global nuclear ecosystems—supporting energy transitions abroad while reinforcing its own domestic capabilities, industrial base, and geopolitical relevance.

2050



“By exporting our nuclear technology, supply chain strength, and world-class expertise, we can support other countries in decarbonizing their energy systems and accelerating their transition to a greener future.”

-Martine Lapointe
Canadian Power & Utilities Lead,
Accenture



Trend 10





Signals



01

Canada Continues International Reactor Technology Expansion

Canada continues to grow its global nuclear footprint through major reactor technology exports. In 2022, Poland selected Westinghouse Electric to build its first nuclear power plant on the Baltic Sea coast¹⁴⁹. In parallel, Romania is advancing plans to build two new CANDU reactors at the Cernavodă site, extending Canada’s legacy of CANDU exports¹⁵⁰.

02

Workforce Partnership Signed to Grow Nuclear Footprint

In December of 2024, an agreement between Canadian Nuclear Laboratories (CNL) and the Canadian Commercial Corporation (CCC) formalized efforts to expand globally, building on Canada’s workforce experience in international construction and refurbishment projects, and promoting technologies and nuclear solutions^{151, 155}.

03

Export Deals Advance Canada’s Nuclear Role Abroad

In 2023, Export Development Canada (EDC) signed a \$3 billion export deal with Romania to build two new CANDU reactors at Cernavodă, strengthening energy security and reducing reliance on Russian imports¹⁵⁴. A year later, EDC issued a Letter of Interest for up to CAD 2 billion to support Poland’s first nuclear plant, enabling Canadian supplier involvement⁵⁷.





Further Trends to Watch





Further Trends to Watch

11

Waste Not, Want Not

Turning spent nuclear fuel into a sustainable resource

While countries such as France and Russia have closed-fuel cycle loops, nuclear fuel recycling is gaining traction in North America. In the US, Oklo is developing a next-generation reactor that runs on reprocessed spent fuel¹⁵⁶. Canadian firm Moltex Energy is pioneering a novel Waste to Stable Salt (WATSS) process¹⁵⁷.

12

Guarding the Grid

As nuclear energy expands, the threat of cyberattacks grow

The shift to digital systems in nuclear plants exposes the critical energy grid to rising cyber threats¹⁵⁸. Cyberattacks on utilities have doubled since 2020, and some operators like Sellafield have been fined for cyber vulnerabilities^{39,63}. Securing nuclear energy means being proactive against bad actors.

13

Race to Fusion

Transformative change is edging closer with private and public R&D investments

Investments in fusion are on the rise. Net energy gains at Lawrence Livermore’s National Ignition Facility mark a turning point, while companies like Helion are forging historic power purchase agreements^{159,37}. UK, France, and Spain are dedicating over 10% of their national energy R&D budgets to fusion¹⁶⁰.

14

The Great Rebuild

Recommissioning old nuclear plants offers a faster path to clean energy

Restarting decommissioned reactors is gaining traction as a cost-effective, timely alternative to new builds. Projects like Three Mile Island (U.S.) aim to modernize old plants with advanced safety upgrades—helping meet soaring energy demand while reinforcing grid stability and emissions targets⁵³.





Further Trends to Watch

15

Nuclear in Your Pocket

Betavoltaics could enable ultra-compact, long-lasting nuclear power

Breakthroughs in betavoltaic batteries are making long-lasting nuclear energy a reality. Researchers are developing tiny, isotope-powered devices for medical implants, space tech, and off-grid applications—advancing miniaturized nuclear power that could soon outlast batteries^{59,161}.

16

Surveilling Deep Waste

AI and real-time monitoring turn DGRs into actively managed systems

New technologies are reshaping nuclear waste storage. AI, sensors, and real-time monitoring are transforming Deep Geological Repositories (DGRs) into intelligent, actively managed systems¹⁶². As nations like Finland advance DGR projects, they ensure long-term safety, adaptability, and environmental accountability for future generations¹⁶³.

17

Freshwater Fission

Nuclear is poised for a larger role in desalination

With freshwater shortages worsening, nations like Jordan and Namibia are turning to nuclear-powered desalination for long-term water security^{164,165}. Meanwhile, in Texas, an experimental molten salt reactor is testing nuclear’s potential to simultaneously generate power and potable water—signaling a broader shift toward nuclear in water infrastructure¹⁶⁶.

18

Atomic Hydrogen

Nuclear-powered hydrogen is emerging as a clean energy game-changer

As global hydrogen demand surges, nuclear is stepping up with high-temperature reactors and electrolysis to produce clean, emissions-free hydrogen⁸³. Nations like the U.S. and South Korea are investing in pilot projects, while new policies and subsidies are showing promise for nuclear’s role in scaling a reliable, low-carbon hydrogen economy^{41,73}.





Visioning
**Stepping
Into 2050**





The Nuclear Horizon: Expert Views on 2050



A collection of expert perspectives on what the industry may look like in 2050 given what is probable, plausible and possible.

Overview:

We consulted with industry experts and asked them to think about what nuclear energy may look like in 2050. Their answers were mapped using the Futures Cone method, based on what they think is least likely to occur to most likely to occur given where the industry stands today. In this you will see what experts think are the probable futures (most likely), plausible futures (somewhat likely), and possible futures (least likely).



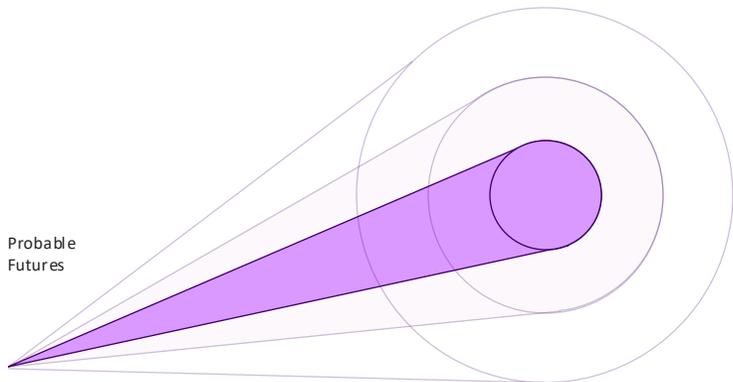


Probable Futures



What are Probable Futures?

These are the most likely outcomes out experts see happening based on current trends, industry momentum and policy direction.



Probable Futures

In the future*,

-  **Need for Data Governance & Cybersecurity:** Increasing reliance on digital technology will increase the need for stronger data governance and cybersecurity.
-  **Increase Collaboration with Indigenous Communities:** The nuclear sector will deepen its engagement with Indigenous communities.
-  **Surge in Energy Demand:** Rising energy demand will boost political and investor support for nuclear power.
-  **Push for Net-Zero & Decarbonization:** The push toward net-zero emissions will accelerate as 2050 approaches, driving further regulatory changes.
-  **Refurbishment, Decommissioning Grow & Supply Chain Shifts:** Growing demand for nuclear energy will spur a wave of refurbishment and decommissioning mega-projects and reshape supply chains through key strategic partnerships.
-  **Need for Workforce and Shift in Work Styles:** The nuclear industry will face growing demand for skilled workers, while new generations bring evolving norms and work styles.
-  **Rise of Medical Isotopes Demand:** Demand for medical isotopes will continue to rise globally.



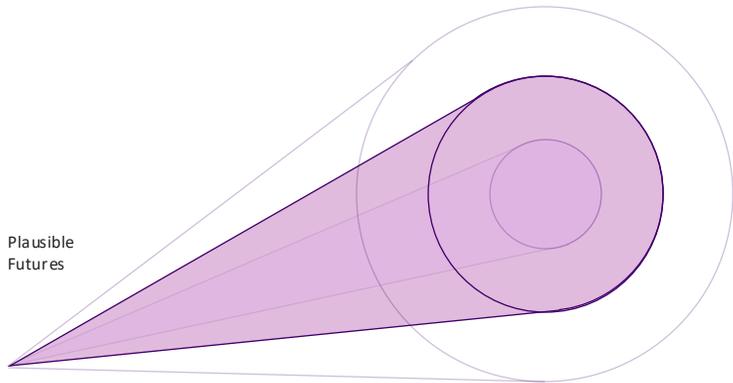


Plausible Futures



What are Plausible Futures?

These are outcomes that could realistically occur but depend on factors like shifts in tech, costs or policy that will influence the industry's direction.



Plausible Futures

In the future*,

-  **Decline in SMRs:** Larger nuclear plants may displace SMRs due to economic efficiencies of larger scale.
-  **Rise of Reusing Nuclear Waste:** The reuse and repurposing of spent fuel and nuclear waste will increase, driven by sustainability goals and building social licence.
-  **Financial Risk Slows Innovation:** Aversion to financial risk will constrain development and innovation within the industry.
-  **Shift to Technical Skills:** Younger generations will place a greater emphasis on acquiring technical skills for the nuclear sector.
-  **Self-Sufficient Supply Chain:** The Canadian nuclear supply chain will grow more self-sufficient to mitigate geopolitical risks.
-  **Increase in Modular Power Plant Construction:** Power plant construction will become more modular and repeatable to reduce costs and improve efficiency.
-  **Evolving Reactor Designs:** Reactor designs will evolve to be more scalable, improving flexibility and efficiency.
-  **AI, Automation & Technology Integration:** AI, automation, and robotics will increasingly shape plant operations, maintenance, and workforce roles. However, the nuclear industry may lag in adopting new technologies compared to other sectors, which will also impact manufacturing and procurement processes.
-  **Reduction of Industry Players:** Industry consolidation will reduce the number of nuclear players, increasing market concentration.
-  **Design for Efficiency & Cost:** New nuclear plants will be designed for greater efficiency and cost reduction.
-  **Improving Public Perception of Nuclear:** Wider adoption of nuclear energy will improve public perception.



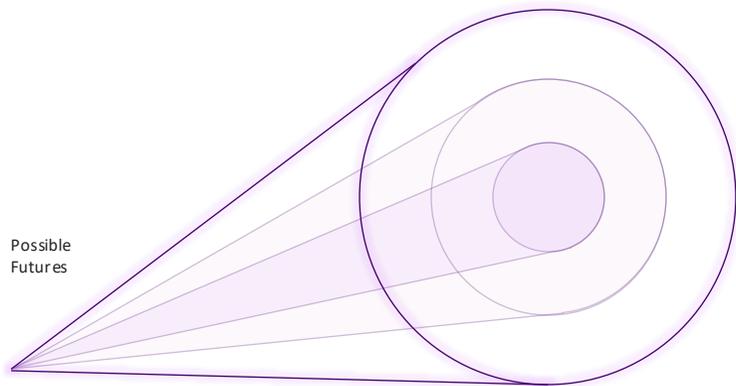


Possible Futures



What are Possible Futures?

These outcomes may feel harder to reach, and may require significant innovation, policy changes or industry changes to achieve.



In the future*,

-  **Rapid Deployment of SMRs:** Small modular reactors (SMRs) are standardized for rapid deployment, along with innovation in design.
-  **Breakthrough in Fusion:** Advances in fusion R&D could lead to commercialized fusion reactors.
-  **Nuclear-Powered Space Travel:** Nuclear energy could play a key role in advancing space exploration.
-  **Global Collaboration & Regulation:** Growing nuclear demand may drive greater international cooperation and regulatory harmonization.
-  **Autonomous Nuclear Operations:** Nuclear operations could become more automated and autonomous.
-  **Workforce Constraints:** Declining populations and large-scale projects may limit industry growth due to workforce shortages.
-  **New Market Entrants:** Industry expansion may attract unexpected new players.
-  **Carbon Pricing & Nuclear Investment:** A new carbon price could accelerate nuclear investment.
-  **Shifts in Ownership Models:** Traditional owner-operator models may undergo significant transformation.





Nuclear 2050: Four Scenarios



Using today's signals, trends and expert insights to explore potential scenarios of what the nuclear industry may look like in 2050.

Overview:

A collection of four future scenarios that describe what the world of nuclear may look like in 2050. Following a **Four Futures** approach which describes potential directions of the future: incremental growth, transformation, stagnation and collapse. Each scenario is built from signals, trends, and expert insights and is accompanied by an overview.





2050

Four Future Scenarios

The future of nuclear energy is uncertain. To support long-term planning, we've modelled four distinct scenarios—each representing a different, yet equally plausible, future for the industry. These are not meant to be read as a timeline or progression, but as alternative contexts that nuclear leaders must be prepared for.



Incremental Growth

The industry continues its current trajectory, making steady, sustained progress on ambitious targets.

By 2050, nuclear energy is embedded in the global energy mix, growing alongside renewables. Canada plays a key role, exporting SMRs and reactor expertise while powering heavy industry and remote communities. Automation and AI streamline operations, and nuclear is widely seen as clean, safe, and essential. Workforce and cost challenges persist, and net-zero remains an ambitious challenge.



Or

Transformation

Breakthrough innovations and bold investments unlock nuclear's full potential, revolutionizing energy.

By 2050, nuclear energy is the backbone of global decarbonization—powering net-zero, transforming healthcare, and enabling new economic frontiers. Canada leads with a full-spectrum strategy, fueling advanced manufacturing, northern "Nuclear Cities," and lunar outposts. With Indigenous-led innovation, medical breakthroughs, and AI-powered infrastructure, Canada stands at the forefront of a clean and resilient future.



Or

Stagnation

Strained systems, talent gaps, and uneven innovation keep nuclear in a holding pattern.

After years of systemic strain, nuclear energy is entering a slow recovery. Canada favours cautious progress—refurbishing plants, advancing Indigenous equity partnerships, and modernizing regulation. Innovation remains uneven, and workforce gaps persist. As global ambitions reawaken, the industry must move faster to meet the moment.



Or

Collapse

A failing industry sees plants decommissioned, investments abandoned, and nuclear power marginalized.

By 2050, nuclear power is a relic of the past. Systemic strain, high costs, and lost public trust leads to its steady decline. Indigenous communities, promised economic participation for years, walk away after repeated failures to deliver. A cyberattack in the 2030s seals its fate. Now, abandoned reactors dot the landscape—rusting relics of an industry that failed to evolve in a rapidly changing world.





Imagine a world in 2050
where there is...





Incremental Growth

The industry continues its current trajectory, making steady, sustained progress on ambitious targets.

Scenario

1





Incremental Growth

Steady Steps:

Canada's Growing Leadership in a Nuclear World

By 2050, fossil fuels are in decline, no longer the dominant force they once were. Stricter climate policies, shifting market forces, and advancements in clean energy technology have accelerated their retreat.

In their place, nuclear and renewables have risen as the twin pillars of the global energy system. Even nations once hesitant about nuclear have embraced it as part of a diversified clean energy mix. The global market has settled into a steady equilibrium, where nuclear and renewables compete and complement each other, reshaping energy infrastructure across continents.

Public perception has transformed. Decades of advocacy, education, and high-profile endorsements have rewritten its narrative. Nuclear energy isn't hidden behind infrastructure—it's woven into daily life. Augmented reality billboards, street panels, and lampposts dynamically respond to touch and movement, flashing "100% powered by clean energy." Influencers, activists, and climate-conscious corporations have made nuclear integration a badge of responsibility. Businesses failing to adapt face consumer boycotts and investor divestment. The cultural shift is undeniable in most provinces: nuclear isn't just accepted; it's expected.

Amid this energy revolution, proposals for new plants in the western part of Canada are in early stages of planning and are under pressure to catch up with the economic boom. The nation's expertise in reactor technology, uranium supply chains, and advanced infrastructure continues to be globally needed. A proven track record of successful builds—both at home and abroad—has reinforced Canada's credibility as a nuclear partner. As the industry expands, a dominant reactor platform has emerged, ensuring efficiency, streamlined production, and global compatibility. Canada leverages its expertise to integrate this next-generation technology into its domestic infrastructure while remaining a preferred partner for nations newly transitioning to nuclear power.

Meanwhile, a domestically perfected Small Modular Reactor (SMR) design is reshaping industries at home, providing dedicated power and industrial heat for high-energy operations—

the national strategy. First Nations partnerships in funding and ownership have redefined the energy landscape, ensuring nuclear's expansion is rooted in long-term stewardship of the land. Remote northern communities, once isolated from modern grids, now generate and distribute their own clean power.

The nuclear workforce has adapted, but not without challenges. Skilled labor shortages persist, prompting an industry-wide embrace of automation, AI, and robotics. "Green-collar" workers rely on AI-assisted devices for real-time diagnostics, optimization strategies, and emergency response cues. Early quantum computing projects hint at breakthroughs in efficiency, but these remain on the horizon rather than in the mainstream.

Despite nuclear's rise, the energy mix remains just that—a mix. Renewables, strengthened by next-generation storage and decentralized grids, have expanded rapidly, yet nuclear remains essential for baseload power, ensuring stability when intermittent sources fall short. Canada continues to balance competing energy priorities, with nuclear securing its place—not as the dominant force, but as a reliable backbone of the low-carbon future.

Now, in 2050, nuclear is synonymous with stability, progress, and sustainability.

Scenario 1

from hyperscaler data centers to next-generation manufacturing, steel, and cement production hubs.





Steady Steps: Canada's Growing Leadership in a Nuclear World

How did we get here?

The 2020s were marked by nations scrambling for stable, affordable and low-carbon baseload power. Global demand skyrocketed, fueled in part by the continued rush towards electrification and the expansion of AI.

Coming into the 2030s, nuclear, once the underdog, emerged as a critical pillar of the global energy transition alongside renewables.

By 2027, signs of shifting public perception were gaining momentum. The 'Green Reactor' movement reframed nuclear as the backbone of a clean energy future. That same year, Canada secured agreements with three small nations to build CANDU reactors.

By 2029, many governments fast-tracked policy reforms, cutting regulatory red tape and slashing the cost of new builds. With modular reactors rolling off assembly lines, worldwide deployment accelerated.

In 2031, a significant milestone was reached in the medical isotope industry when Microsoft announced it was venturing into the field, by acquiring a stake in a Canadian production facility.

By 2038, fossil fuel markets faced their steepest annual decline on record, signaling a paradigm shift in the energy sector.

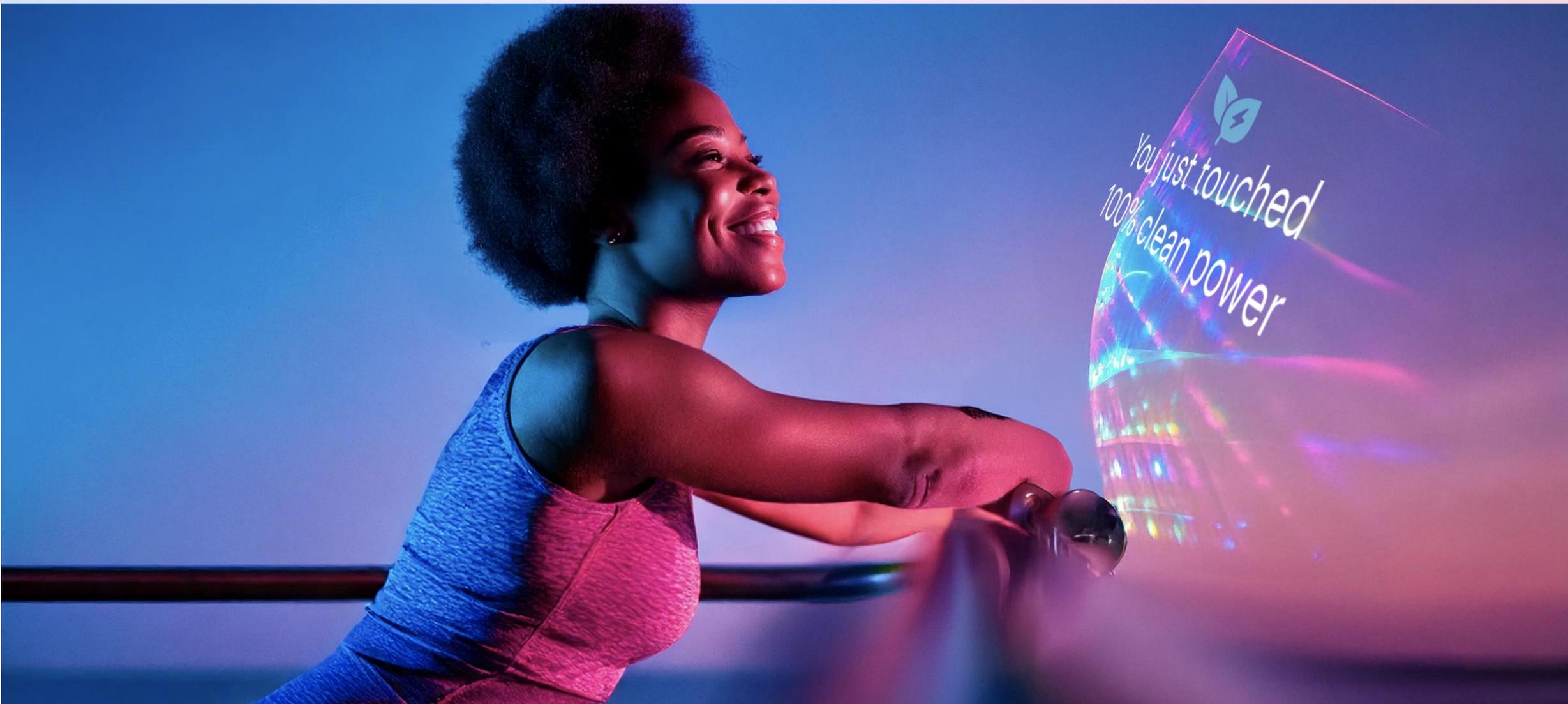
By 2042, nearly a hundred countries had integrated nuclear into its energy mix. Canada, with its deep expertise in reactor technology, positioned itself as a global leader—exporting power, parts, and skilled labour to energy-hungry nations. Our country's nuclear workforce, however, struggled to keep up with demand, prompting wide-scale adoption of automation, AI, and robotics for productivity gains.

Yet, by 2050, one fact was undeniable: nuclear wasn't just back—it was here to stay.

Signals

- **2020:** Influencer campaign to make nuclear energy trendy among young people³⁵
- **2023:** Canada and Romania sign a \$3B export deal to construct two new CANDU reactors⁴⁷
- **2023:** 55% of Canadians support use of nuclear energy per IPSOS survey⁴¹
- **2024:** EDC issues a letter of interest for up to \$2B to support Poland's first nuclear power plant⁵⁸
- **2024:** Robotic startups rake in \$4.2B in USD funding¹⁶⁷
- **2024:** TC Energy agreement to enable Indigenous 5.34% equity in natural gas⁶⁵
- **2028:** The Crane Clean Energy Center, formerly Three Mile Island Unit 1, resumes operations following refurbishment to deliver clean energy to Microsoft's data centers⁵³
- **2030:** Data centers consume up to 9% of electricity in the United States⁸⁴
- **2030:** Global investments in nuclear rise to \$70B per year⁸²
- **2030:** Canada doubles radioisotope production to support new medical treatments, in response to Isotopes for Hope campaign⁸¹
- **2033:** Units 3, 4, 5, 7, and 8 at Bruce Power are all operational⁸⁸
- **2040:** Global SMR market reaches \$150-300B⁸²





The Nuclear Touch: Smart Surface Viral Ad

Imagine: A hyper-targeted augmented reality campaign that hijacks smart urban surfaces and wearables, putting nuclear energy back in the cultural consciousness.



Artifact

Future World 1:
Incremental Growth





Green Collar Jobs: Pride of Work

Imagine: Skilled labour shortages persist, prompting an industry-wide embrace of automation, AI, and robotics. But pride, humour, and camaraderie keep the work human. These green collar workers are proof that nuclear work isn't just a job, it's a movement.



Artifact

Future World 1:
Incremental Growth





Imagine a world in 2050
where there is...





Transformation

Breakthrough innovations and bold investments unlock nuclear's full potential, revolutionizing energy.

Scenario

2





Transformation

Atomic Ascent:

The Revolution That Reshaped Humanity

The world is celebrating an unprecedented milestone: just two years ago, net-zero carbon emissions became a reality, an achievement once deemed impossible. The catalyst? A nuclear renaissance.

Nuclear energy has become the bedrock of the clean energy transition, thriving on the back of record investments, public trust, and technological innovation. Canada—once a regional player—now stands among the world’s foremost energy powers, having embraced a full-spectrum nuclear strategy.

A diverse fleet of small modular reactors, large-scale builds, plant uprates, and early fusion pilots power nearly every corner of the country, providing clean, stable energy across provinces that once relied on fossil fuels.

Nuclear isn’t just part of Canada’s energy mix—it’s the foundation. Its widespread deployment across provinces has unlocked true energy sovereignty, shielding the nation from global energy volatility and propelling a new era of industrial and economic growth.

But nuclear’s impact doesn’t stop at electricity. It is revolutionizing healthcare, supercharging clean manufacturing, and reshaping the geography of opportunity. As climate change displaces millions globally, Canada’s energy boom has fueled a great migration northward. Once-remote regions have transformed into “Nuclear Cities”—self-sustaining, high-tech hubs powered by advanced reactors. Indigenous-led enterprises have played a central role in their design and governance, helping define a new model for inclusive, climate-resilient urban development.

These cities are magnets for talent—scientists, entrepreneurs, and innovators drawn by world-class research facilities and abundant clean energy. Alongside them, thousands of climate migrants have found new beginnings, turning energy innovation into a force for equity and renewal.

Canada’s leadership now extends far beyond its borders. The country has become a global exporter of nuclear technology, talent, and clean energy, forging deep energy partnerships across continents. Its dominance in medical isotopes has fueled a booming medical tourism industry, while breakthroughs in betavoltaics power life-saving implants and wearable tech, transforming public health.

Even space is within reach. Canadian firms are powering lunar settlements, space tourism, and deep-space research missions. The rise of LunaStay™, a nuclear-powered lunar hospitality platform, now allows visitors to experience Nova Aurora—a self-sustaining Moon base built entirely around clean, limitless energy.

The stock market has followed suit. Nuclear companies now rank among the world’s most valuable, forming the backbone of “Nuclear Investment Portfolios,” now considered blue-chip assets. Canadian conglomerates—spanning sectors from pharma and AI to aerospace—are leading major international projects. At the centre of it all is the Global Energy Exchange (GEX), the world’s first autonomous energy trading platform, where nations, corporations, and individuals trade, buy, and donate surplus clean energy in real time.

One thing is certain: Canada’s atomic ascent is about far more than megawatts. It’s about resilience, innovation, and the power to lead not just a clean energy revolution—but a new chapter in human history.





Atomic Ascent: The Revolution that Reshaped Humanity

How did we get here?

A global milestone has been reached—net-zero carbon emissions are now a reality, driven by an extraordinary nuclear renaissance. Nuclear energy has surged forward thanks to unprecedented, investments, innovation and collaboration.

By 2031, a landmark AI policy accord was signed by Canada and other nuclear leaders, establishing global standards for AI integration in reactor operations. This set the stage for the 2038 debut of NX-1, the world's first fully AI-operated nuclear facility, demonstrating automation's ability to drive efficiency and safety.

As Arctic trade routes opened, the first Indigenous-led Nuclear City was built in 2040, marking the beginning of a larger expansion. Over the following decade, these self-sustaining hubs grew into economic and research centres supporting trade, security and community growth.

The following years saw exponential growth, culminating in the 2042 IPO of a major nuclear conglomerate, making it the world's most valuable company. That same year, a record number of international patients travelled to Canada for nuclear-powered medical treatments from isotope-based cancer therapies, making it one of the world's leading medical tourism destinations.

By 2044, a national survey proved that nuclear had become the most desirable career path in Canada, outranking medicine, law, technology and finance as top talent flocked to its high salaries, innovation, and purpose-driven opportunities.

In 2048, a joint NASA-ESA-CSA venture launched the first permanent lunar base, powered by a British-Canadian reactor, cementing nuclear's role in off-world expansion.

By 2050, nuclear had become the foundation of a thriving, healthy, decarbonized world.

Signals

- **1979:** Robot helps remove waste from Three Mile Island Unit 2¹⁶⁸
- **2022:** NASA and U.S DOE award contracts to Lockheed Martin, Westinghouse and IX to develop Lunar fission power concepts⁴⁰
- **2023:** 55% of Canadians support use of nuclear energy according to an IPSOS survey¹¹
- **2024:** Betavolt reveals its miniature betavoltaic device⁵⁹
- **2024:** Number of unique ships entering Artic increases by 37% from 2013¹³⁷
- **2025:** Karman+ receives \$20M USD in seed funding to advance asteroid mining⁶⁸
- **2025:** Accenture survey finds Gen Z and Millennials prioritize flexible, purpose driven work and tech enabled roles¹⁰⁶
- **2026:** Artemis II space mission launches humans around the moon¹²⁶
- **2028:** The Crane Clean Energy Center, formerly Three Mile Island Unit 1, resumes operations following refurbishment to deliver clean energy to Microsoft's data centers⁵³
- **2030:** Artic Ocean has experienced its first ice-free day¹⁶⁹
- **2030:** Global investments in nuclear rise to \$70B per year⁸²
- **2035:** Humanoid robots market valued at \$38 billion USD¹⁷⁰
- **2040:** Global SMR market reaches \$150-300B⁸²



GEX GLOBAL ENERGY EXCHANGE



GEX: Global Energy Exchange

Imagine: The world's first fully autonomous energy trading hub, where nations, corporations, and individuals buy, sell, and donate surplus energy in real time. GEX ensures no watt goes to waste.





Nova Aurora: Nuclear-Powered Lunar Base

Imagine: The first-ever space travel platform that lets you book accommodations in the heart of Nova Aurora, a self-sustaining lunar base — powered by clean, limitless nuclear energy.



Artifact

Future World 2:
Transformation





Imagine a world in 2050
where there is...





Stagnation

Strained systems, talent gaps, and uneven innovation keep nuclear in a holding pattern.

Scenario

3





Stagnation

Power Paralysis

Hesitation Stalls Progress

For years, nuclear energy stood at a crossroads—heralded as a climate savior but hampered by slow movement and systemic strain.

As global energy demand surged, nuclear’s promise remained unfulfilled. Momentum faded not from failure, but from a convergence of mounting challenges: stretched supply chains, escalating costs, and a workforce crisis that hollowed out capacity.

Regulatory systems have been strained by increasing complexity and demand for project approvals. The result: an industry caught in a holding pattern—stable, but stagnant.

In Canada, the sector moved cautiously. Retired reactors were refurbished, and modular designs gained attention, but these efforts never reached full momentum. Innovation existed in pockets but rarely scaled. The result was a steady but subdued trajectory—reliable enough to maintain presence, but too hesitant to lead.

Now, after years of stagnation, nuclear is inching forward once again. International goals to triple capacity have re-entered the conversation, though with tempered expectations. Large plant refurbishments are seeing renewed investment. Small Modular Reactors (SMRs) show promise, but deployment remains limited. Global optimism resurfaced at the HoloSummit 2050, where world leaders signed The Nuclear Accord—an effort to reignite coordinated investment. Behind the optimism lies pragmatism: this resurgence is not a comeback—it’s a recovery.

Canada is also finding its footing again. Indigenous equity partnerships are advancing, supported by government guarantees and hard-won trust. Through focused efforts to improve capacity and coordination, regulatory processes have become more adaptive—enabling greater throughput while upholding rigorous safety standards. Canada has avoided high-risk bets on unproven technologies, favouring gradual progress over bold leaps. That approach has ensured stability, but at the cost of long-term global competitiveness.

Digital tools like AI and digital twins have improved plant efficiency, even as talent gaps persist. Virtual reality is easing knowledge transfer between generations, but experience is still walking out faster than it can be replaced.

Training pipelines are growing—but slowly. Skilled workers are in short supply, and recruitment hinges on the promise of high value, meaningful work supported by advanced automation in order to ward off fierce competition from other sectors.

Public perception is shifting. Once viewed as outdated, nuclear is undergoing a much-needed rebrand. Events like the Nu Power Gala, a glitzy showcase of clean energy innovation, aim to make nuclear feel aspirational, not just necessary. With influencers and media figures rallying behind it, nuclear is regaining cultural relevance.

But inevitability doesn’t equal impact. The industry’s greatest challenge is no longer public trust or technical feasibility—it’s time. If nuclear is to fulfill its potential, it must break free from inertia and prove it can deliver—not eventually, but now.





Power Paralysis: Hesitation Stalls Progress

How did we get here?

For years, nuclear struggled to gain momentum. Yet as climate change worsened and energy crises deepened, governments reconsidered nuclear's role.

By the 2030s, nuclear interest stagnated as cost overruns and schedule delays slowed new builds. **In 2032**, the decommissioned Gentilly-2 nuclear plant in Quebec was recommissioned, one of the few active projects in an otherwise hesitant landscape. Most provinces remained unconvinced, favouring alternatives over nuclear expansion.

By the mid-2030s, worsening energy crises and rolling blackouts forced policymakers to rethink long-term energy planning. Unstable grids and soaring demand fueled public frustration, pressuring the government to secure reliable baseload power. Nuclear was no longer just an option—it was a necessity.

By 2037, after years of debate, Canada announced a cautious national nuclear strategy to stabilize, not accelerate, the industry.

Regulatory capacity improved through targeted efforts to streamline coordination, but investments remained measured. To meet demand, new reactors in Alberta and Saskatchewan broke ground, marking a broader provincial shift toward nuclear stability.

A coordinated campaign leveraged influencers and cultural figures to reshape public perception, positioning nuclear as the clean energy solution for the next generation.

By 2042, the Energy Sovereignty Act aimed to accelerate Indigenous equity in nuclear, though progress was uneven. Government intervention ensured meaningful participation, and hard-fought negotiations shaped new partnerships.

By 2045, nuclear had begun reestablishing itself as a reliable energy source, though progress remained measured. Advocates were cautiously optimistic, but uncertainties still loomed over the industry's long-term trajectory.

Signals

- **2012:** Gentilly-2 Nuclear Facility in Quebec closes²¹
- **2020:** Model turned nuclear influencer Isabelle Boemeke begins campaigning for nuclear energy on social media³⁵
- **2023:** The North Shore Mi'kmaq Tribal Council announces equity agreements with Moltex Energy and ARC Clean Technology⁴⁸
- **2024:** Canada, UK, and U.S. nuclear regulators publish paper outlining high-level principles for deploying AI⁶²
- **2024:** Generation Atomic advocates for nuclear growth at UN Climate Conference¹¹⁸
- **2024:** The CNSC approves the continued operation of the Pickering Nuclear Station's B until 2026⁵⁴
- **2024:** U.S. Nuclear Regulatory Commission begins revising licensing rules to remove burdens⁶⁰
- **2024:** A micro reactor firm sues the U.S. Nuclear Regulatory Commission for complex and costly requirements⁶¹
- **2028:** The Crane Clean Energy Center, formerly Three Mile Island Unit 1, resumes operations following refurbishment to deliver clean energy to Microsoft's data centers⁵³
- **2030:** data centers consume up to 9% of electricity in the United States⁸⁴
- **2030:** AI market grows 36.6% from 2024⁹²
- **2050:** Global electricity demand doubles from 2024¹⁷¹





Holo Summit 2050: The Nuclear Accord

Imagine: A real-time, holographic diplomatic summit where world leaders convene across continents to sign a renewed nuclear investment accord, driven by the urgency of the climate crisis.



Artifact

Future World 3:
Stagnation





NU Power Gala: Influencing Nuclear's Story

Imagine: A luxurious, high-profile gala marking the launch of the NU Power brand, where influencers, media icons, and early adopters come together to celebrate nuclear's clean-energy revolution.



Artifact

Future World 3:
Stagnation





Imagine a world in 2050
where there is...





Collapse

A failing industry sees plants decommissioned, investments abandoned, and nuclear power marginalized.

Scenario

4





2050

Collapse

Power Down

Nuclear's Fading Light

The year is 2050, and nuclear power is a relic of a bygone era. The world's energy demands have never been higher, but the industry that once promised infinite power now exists only in fragments: silent reactors and rusting infrastructure are monuments to what could have been.

The collapse wasn't sudden. The signs had been there all along: disinvestment, lack of coordinated effort. Nuclear power, once central to grid stability, missed a critical window for growth.

Now, extreme weather continues to pound the planet, leaving grids fragile and unstable. Blackouts roll through cities with no predictability, while AI-driven monitoring systems like Power Pulse dictate who gets electricity and who is left in the dark. Households and businesses alike rely on its alerts, warning them when energy is being diverted to priority services. In an age of scarcity, power has become currency.

In Canada, energy demand continues to climb, but to drive down costs, the sector passed over new builds and next-generation technologies in favour of incremental improvements. Now, nuclear is unable to scale rapidly or compete on price. Intensive industries are turning to alternative energy sources—hydrogen, advanced geothermal, and long-duration battery storage—reshaping the energy mix and leaving nuclear as a niche player.

At the same time, complex and time-consuming stakeholder approval processes are struggling to keep pace, preventing projects from reaching the scale and speed required by the moment.

Indigenous communities, promised economic participation for years, walked away after repeated failures to deliver. Public trust eroded. Financial backers disappeared.

Even Canada's once-thriving medical isotope industry is in decline, as breakthroughs in gene editing, disease detection, and advanced imaging are reducing reliance on radioactive compounds for medical applications.

The echoes of a cyberattack on a Canadian nuclear facility still linger—public confidence and investment remain absent

As the industry crumbles, decommissioned reactors stand empty. The autonomous robot DecomRover, designed to dismantle defunct plants, is an internet sensation, live-streaming its slow, methodical demolition to millions.

Abandoned plants dot the landscape, their control rooms collecting dust, their turbines frozen in time. The workforce that once powered them has long since moved on, absorbed into booming tech firms, renewable energy projects, or entirely different fields. The last generation of nuclear engineers has retired, taking their expertise with them.

And so, an industry that once symbolized humanity's energy future has become little more than a cautionary tale—one of missed opportunities, slow collapse, and an irrevocable failure to evolve.





Power Down: Nuclear's Fading Light

How did we get here?

In the 2020s, nuclear was viewed as a promising source of clean, affordable, and reliable energy. But persistent cost overruns, slow innovation uptake, and a lack of alignment across industry, regulators, and investors stalled momentum—while other technologies advanced with greater speed and scale.

In 2028, tech giants suffered a major setback in SMR commercialization, delaying adoption by five years due to security flaws. In Canada, long approval timelines, unclear policy signals, and public hesitation deterred investment—evoking parallels with the earlier failure of the Google Sidewalk Labs project in Toronto. Throughout the 2030s, schedule delays, cost overruns, and investor skepticism grew.

By 2034, several major tech companies abandoned nuclear, citing slow returns and the need for rapid energy scaling. Many redirected investments to alternative power sources, pulling critical funding away from nuclear.

In 2038, a cyberattack on a Canadian nuclear plant—though not catastrophic—exposed security vulnerabilities, triggering panic. "#BreakTheChainReaction" trended #1 on Canadian social media, forcing corporations to withdraw support. Within weeks, the government froze nuclear investments.

By 2039, Indigenous leaders across multiple provinces issued a joint moratorium on new nuclear projects, citing losses from failed equity investments. This sparked a larger divestment movement, accelerating nuclear's decline.

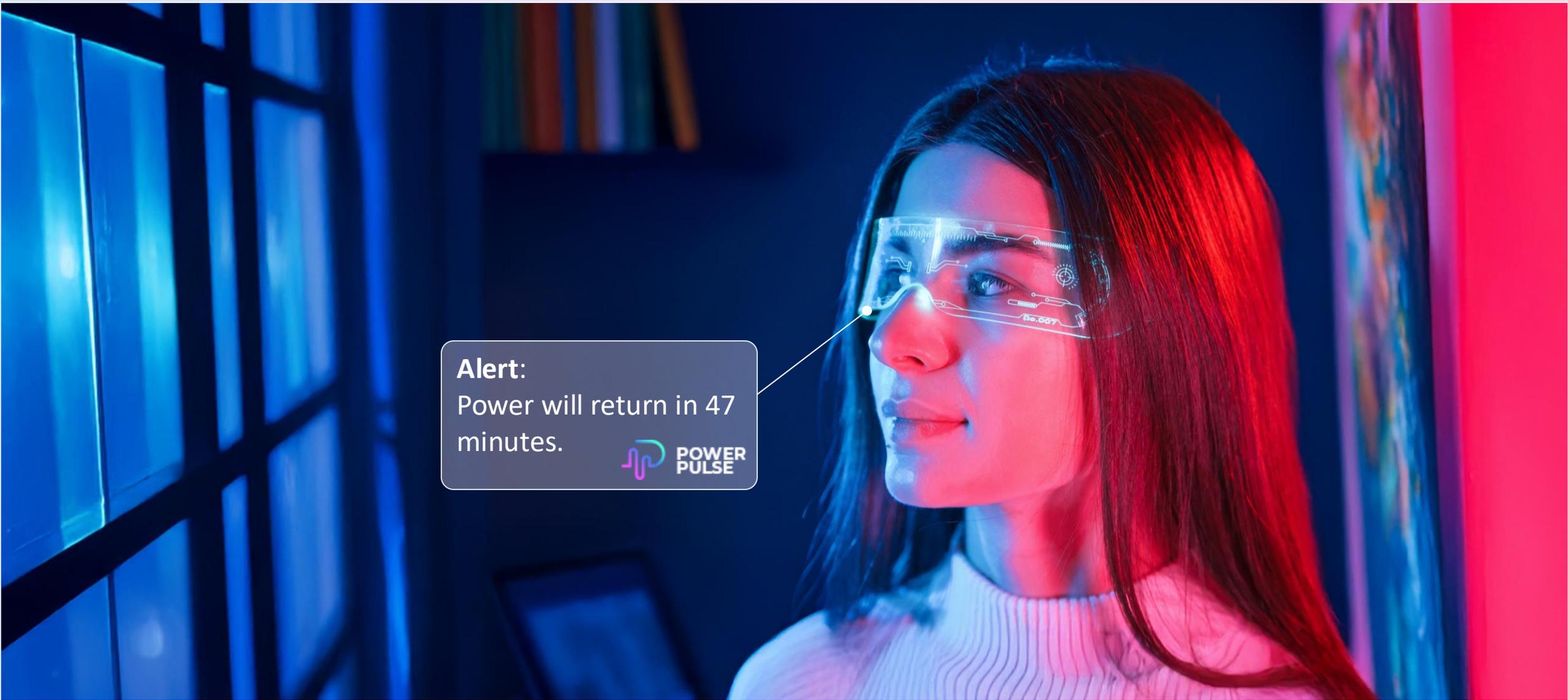
In 2044, Canada officially cut all subsidies, shifting funds to renewables, green hydrogen, hydro, wind, and natural gas.

By 2045, nuclear's decline was irreversible. Shutdowns outpaced new builds, and the industry became a shadow of its former self.

Signals

- **2020:** Google Sidewalk Labs project in Toronto fails due to excessive government oversight and public outcry¹⁷²
- **2022:** The International Energy Agency reports that cyberattacks against utilities have doubled globally since 2020, with 1,101 weekly attacks³⁹
- **2023:** Power outages in the US increases 64% from early 2000's¹⁷³
- **2023:** The North Shore Mi'kmaq Tribal Council announces equity agreements with Moltex Energy and ARC Clean Technology⁴⁸
- **2024:** Sellafield Limited is fined \$332,500 for cybersecurity shortfalls⁶⁴
- **2024:** Telesco robot used in Fukushima decommissioning¹⁷⁴
- **2024:** Canada, UK, and U.S. nuclear regulators publish paper outlining high-level principles for deploying AI⁶²
- **2024:** A micro reactor firm sues the U.S. Nuclear Regulatory Commission for complex and costly requirements⁶¹
- **2025:** Keboawek First Nation wins court challenge over not being properly consulted for nuclear waste site⁷¹
- **2032:** Global market for water desalination reaches approx. \$37B USD¹⁷⁵
- **2040:** 1 in 4 children live in areas of extremely high-water stress¹⁷⁶





Alert:
Power will return in 47
minutes.



PowerPulse: Adaptive Energy Routing

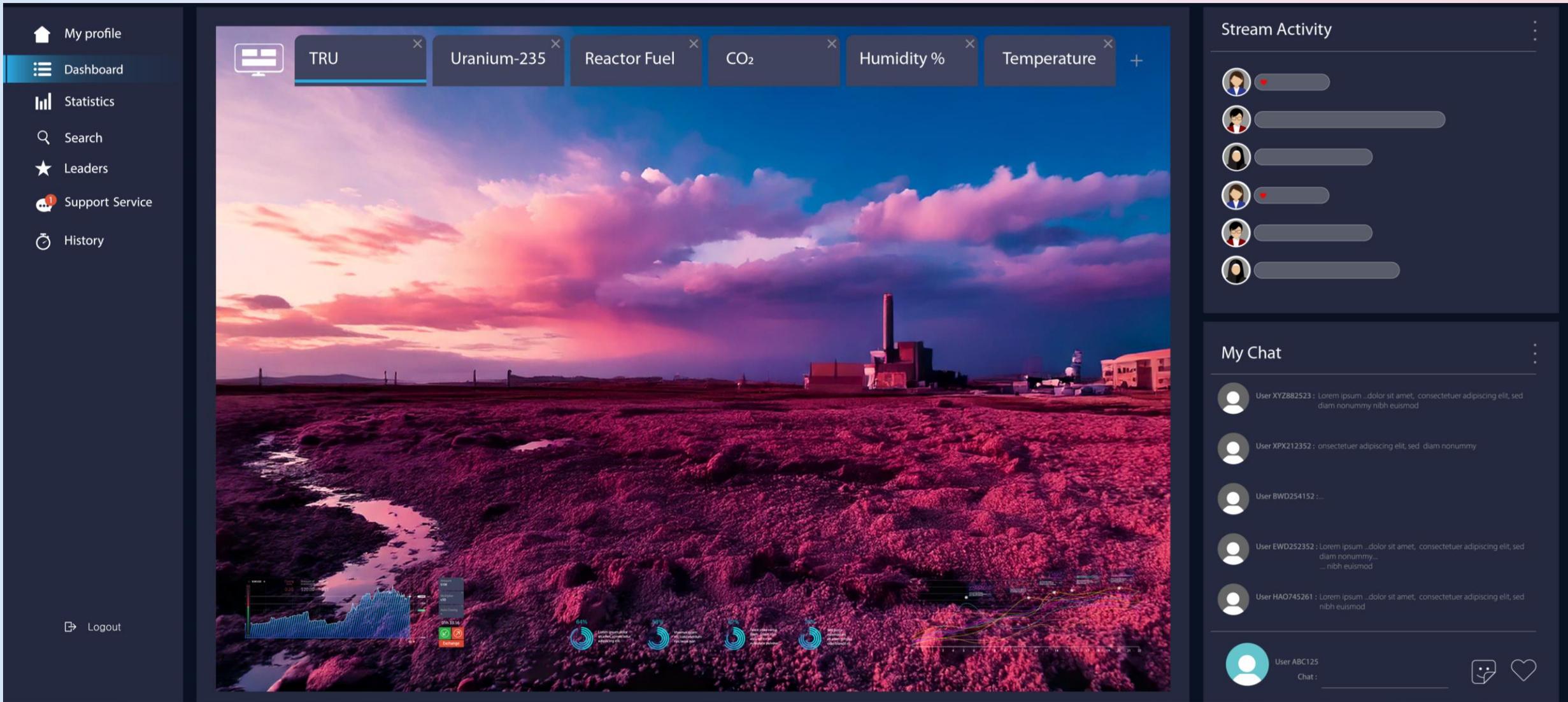
Imagine: An AI-powered energy monitoring system that tracks demand, predicts outages, warns of blackouts and indicates when energy will be redirected to priority services.



Artifact

Future World 4:
Collapse





DeComRover: Live Stream Decommissioning

Imagine: An autonomous robot designed to safely decommission nuclear plant remnants, live-streaming cleanup and providing real-time environmental data for future study.



Artifact

Future World 4:
Collapse





Acting

Laying the Groundwork





2050

No-Regrets Moves

There are many paths forward, but the next move doesn't have to be overwhelming. These no-regrets strategies create an important foundation for the resilience of your existing operating fleet and for future new builds.

Resilience & Growth

01

Fortify Canada's Supply Chain

A strong, reliable supply chain is needed to expand nuclear energy and cement Canada's role as a global leader in nuclear innovation.

02

Diversify Nuclear Funding Models

Attracting new investors and long-term funding will reduce financial risks and accelerate deployment.

03

Expand Nuclear Strengths

Expanding domestic generation capacity, refurbishing existing plants, and exporting expertise globally will drive nuclear growth and international leadership.

Technology & Talent

04

Strengthen the Talent Pipeline

Investing in talent attraction, development, and retention—including training, diversity, and career growth initiatives— is essential for local and global relevance.

05

Modernize Technology

From AI-assisted decision-making to modular construction, emerging technologies can boost efficiency, cut costs and drive scalability.

06

Innovate Beyond Grid Power

Embracing new markets, industrial applications, and nuclear cogeneration will allow the industry to remain resilient in changing economic conditions.

Public Support & Policy

07

Boost Public Support of Nuclear

Continue building momentum and sustaining public support by engaging influencers, communities, and policymakers.

08

Partner for Regulatory Agility

An agile regulatory framework can support emerging technologies while maintaining top-tier safety and environmental standards.

09

Advance Waste Solutions

Lead the way by developing innovative long-term disposal solutions as part of sustainable waste management planning.





No-Regrets Moves

Resilience & Growth

01

Fortify Canada's Supply Chain

A strong, reliable supply chain is needed to expand nuclear energy and cement Canada's role as a global leader in nuclear innovation.

As an organizational leader:

- **Assess** your supply network to identify bottlenecks and opportunities.
- **Support** suppliers with the tools, technology and training needed to meet industry standards and grow with you.
- **Engage** with regulators and policymakers to balance supply chain growth with safety.

As an industry-builder:

- **Establish** long-term, supply agreements to stabilize demand and attract investment.
- **Build** consortiums and integrate provincial supply chains to create a unified network.
- **Invest** in production methods, modular construction, and standardization.
- **Strengthen** global partnerships to secure materials, and position Canadian suppliers as reliable global players.

02

Diversify Nuclear Funding Models

Attracting new investors and long-term funding will reduce financial risks and accelerate deployment.

As an organizational leader:

- **Align** your capital strategy with long-term growth.
- **Build** flexible funding models.
- **Engage** investors to position nuclear as a competitive asset, highlighting cost reductions, innovation, and long-term returns.

As an industry-builder:

- **Attract** private investment, including institutional investors and green finance.
- **Partner** with government to de-risk nuclear, through mechanisms like tax credits and co-investment.
- **Reframe** nuclear as a clean energy solution that meets ESG criteria to expand investor interest.

03

Expand Nuclear Strengths

Expanding domestic generation capacity, refurbishing existing plants, and exporting expertise globally will drive nuclear growth and international leadership.

As an organizational leader:

- **Expand** domestic capacity by securing new reactor sites and fostering early engagement with local communities.
- **Modernize** and extend plant life through refurbishments and technology upgrades.
- **Assess** opportunities to export services, technology, and operational knowledge.

As an industry-builder:

- **Lead** internationally by positioning as a global nuclear solution provider.
- **Promote** SMR/MMR adoption through collaborative R&D, shared infrastructure, and harmonized design standards.
- **Advocate** for supportive policies that drive investment in next-generation reactors and long-term energy security.





No-Regrets Moves

Technology & Talent

04

Strengthen the Talent Pipeline

Investing in talent attraction, development, and retention—including training, diversity, and career growth initiatives— is essential for local and global relevance.

As an organizational leader:

- **Partner** with schools and universities to build a talent pipeline.
- **Invest** in upskilling on new technologies and reskilling from other industries.
- **Prioritize** diversity, inclusion and building a culture attractive to top talent.
- **Clarify** career paths and create mentorship programs to retain skilled professionals.

As an industry-builder:

- **Promote** nuclear careers through national campaigns and STEM programs.
- **Expand** scholarships and internships to make nuclear education more accessible.
- **Modernize** training and licensing to meet future workforce needs.
- **Increase** diverse representation and remove barriers to entry.

05

Modernize Technology

From AI-assisted decision-making to modular construction, emerging technologies can boost efficiency, cut costs and drive scalability.

As an organizational leader:

- **Integrate** automation, AI, and digital tools (where regulations allow) to streamline operations and reduce costs.
- **Upgrade** legacy systems to improve efficiency and future-proof your workforce.
- **Invest** in digital twins, predictive maintenance, and advanced analytics to strengthen decision-making and resilience.

As an industry-builder:

- **Drive** technology adoption by standardizing digital solutions sector-wide.
- **Collaborate** on industry-wide innovation to modernize nuclear design, construction, and operations.
- **Advocate** for regulatory updates that support emerging technologies while maintaining safety and compliance.

06

Innovate Beyond Grid Power

Embracing new markets, industrial applications, and nuclear cogeneration will allow the industry to remain resilient in changing economic conditions.

As an organizational leader:

- **Expand** into emerging markets such as medical, industrial, and nuclear cogeneration.
- **Invest** in R&D and partnerships to accelerate innovation in non-traditional nuclear applications.
- **Position** your organization within industries that benefit from nuclear's reliability, sustainability, and heat generation capabilities.

As an industry-builder:

- **Foster** cross-sector collaborations to integrate nuclear solutions into medicine, industrial manufacturing, and data center operations.
- **Advocate** for policies and funding that drive nuclear innovation across diverse applications, ensuring the industry's role in both energy security and technological advancement.





No-Regrets Moves

Public Support & Policy

07

Boost Public Support of Nuclear

Continue building momentum and sustaining public support by engaging influencers, communities, and policymakers.

As an organizational leader:

- **Educate** the public and policymakers on nuclear's safety, environmental, and economic benefits.
- **Highlight** its role as a reliable, low-carbon energy source and engage openly to build trust and address concerns.
- **Partner** with Indigenous communities.

As an industry-builder:

- **Work with** governments, environmental groups, and stakeholders to position nuclear as vital to clean energy.
- **Advocate** for policies that encourage public—private partnerships to foster investment and innovation.
- **Lead** efforts to reshape public views on nuclear's safety and sustainability.

08

Partner for Regulatory Agility

An agile regulatory framework can support emerging technologies while maintaining top-tier safety and environmental standards.

As an organizational leader:

- **Advocate** for regulatory reforms that allow deployment of new technologies without compromising safety.
- **Streamline** approvals to reduce deployment delays.
- **Engage** in pilot projects to demonstrate safe, efficient regulatory approaches.

As an industry-builder:

- **Lead** efforts to modernize regulations while maintaining safety standards.
- **Collaborate** with regulators to create flexible frameworks and adapt regulations to address energy demand, support innovation and promote growth.
- **Push** for standardized approval processes across jurisdictions.

09

Advance Waste Solutions

Lead the way by developing innovative long-term disposal solutions as part of sustainable waste management planning.

As an organizational leader:

- **Invest** in waste solutions, like advanced recycling and deep geological storage.
- **Build** public trust by engaging communities and demonstrating long-term safety commitments.
- **Collaborate** with regulators to streamline approvals for innovative waste solutions.

As an industry-builder:

- **Standardize** and scale sustainable waste practices across the sector.
- **Drive** investment in closed-loop fuel cycle technologies to reduce waste and boost resource efficiency.
- **Advocate** for policies that support long-term, science-backed disposal solutions and position as an environment leader.





Conclusion





The Choices Ahead

Securing Canada's Nuclear Future

The future of Canada's nuclear industry is at a crossroads. While the demand for clean, reliable energy has never been greater, geopolitical and financial uncertainty, as well as public skepticism threaten to hold the sector back. But the opportunity is enormous if we take decisive action today.

For Canada to remain competitive, we must modernize nuclear technology, strengthen our supply chain, and attract sustainable funding. Emerging advancements like AI-driven reactors, and robotics can make nuclear more efficient, cost-effective, and scalable.

But innovation alone isn't enough. Without a skilled workforce to build and operate the next generation of reactors, progress will stall. Canada must invest in training, education, and diversity initiatives to ensure a robust talent pipeline.

Public trust remains a challenge. While nuclear power offers a low-carbon future, concerns around waste, safety, and regulation still linger in the conversation. Support for approaches to engagement that are transparent, science-driven, and community-focused, can help shift perceptions and position nuclear as a cornerstone of Canada's clean energy strategy.

Beyond electricity, nuclear's potential is vast. From medical isotopes that save lives to powering space exploration, the industry is on the verge of a transformation. But this future won't happen by accident. It requires bold leadership, strategic investment, and regulatory agility to unlock nuclear's full potential.

Leaders in the sector have an opportunity and a responsibility to drive this transformation. Strengthening domestic supply chains, securing long-term investment, and pushing for regulatory reforms while maintaining high safety standards will help create a more agile and competitive industry.

Expanding reactor capacity and advancing SMR/MMR deployment can accelerate nuclear's role in decarbonization, while new partnerships with Indigenous communities, educational institutions, and private investors can secure the workforce and funding needed for sustainable growth.

The industry must not only deliver technological innovation but also redefine its business model to embrace new markets, from industrial applications to medical and space technologies.

The next decade will determine whether Canada emerges as a global nuclear leader—or watches from the sidelines as others drive the energy transition.

The future is unwritten. But if we act now, we can shape it.





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Acknowledgements





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Acknowledgements

Executive Sponsors



The executive sponsors whose leadership, vision and expertise have been instrumental in shaping this work.

Martine Lapointe
Power and Utilities Lead, Canada

Ken Yau
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Michael Krause
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Jennifer Wong
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Terry Maxey
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Acknowledgements

Additional Accenture Contributors

We sincerely appreciate the valuable insights and contributions from Accenture colleagues across the industry and various practices (Strategy & Consulting, Technology & Operations, Innovation Services) who participated in working sessions and shared their expertise. Your input helped shape the perspective and enrich this work. Thank you for your time and thoughtful engagement.

AC Vachon

Alex Bettencourt

Alison Donkers

Angad S. Chopra

Ash Anderson

Bethany Patton

Chris Foster

Chris White

Des Bell

Greg Ferguson

Hannes Fourie

Jeffrey Colborn

Jeffrey Morris

John Drossis

Justin Petkau

Kate Gay

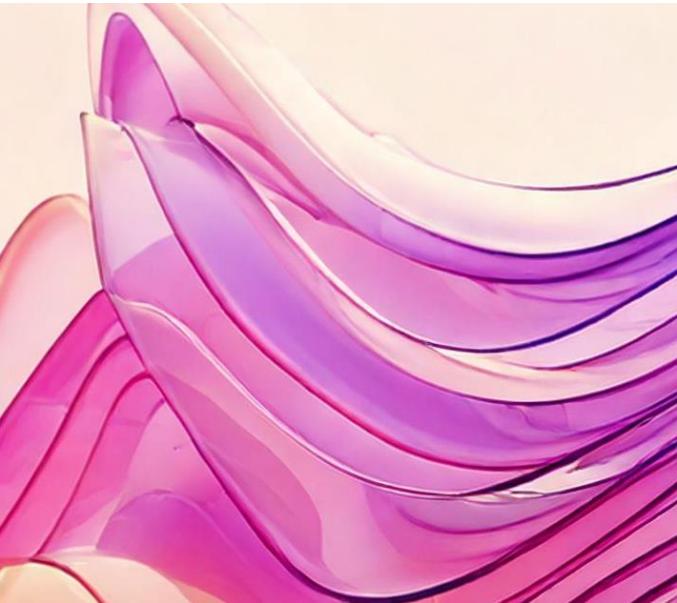
Leo Saagi

Maciej Hryniewicki

Mark Lloyd

Michael Loughlean

Sheri Williams





Acknowledgements

External

Julianne den Decker

AtkinsRéalis/Candu Energy Inc.

George Christidis

Canada Nuclear Association

Chris Benedetti

Sussex Strategy Group



Disclaimer

Please note that while we greatly appreciate the insights and ideas provided by our external contributors, the viewpoints expressed in this document are solely those of Accenture and do not necessarily represent the perspectives of any external companies or individuals mentioned.





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