Project Brief

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Project: Kaleidoscope of Nuclear Futures

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Nuclear Futures for a Better Tomorrow

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Executive Summary

This project brief describes emerging trends and presents forecasts for the evolving role of nuclear power across energy, security, infrastructure, and geopolitics in the year 2050. By using Strategic Foresight, this study recognises that the future is not a fixed destination to be predicted, but a space of alternative possibilities that can and should be actively shaped through today's decisions. It offers stakeholders a concise blueprint for how to develop and subsequently analyse possible future scenarios to anticipate nuclear risks and opportunities in Switzerland and beyond. The insights can help identify areas of alignment and inform the development of a regional or global nuclear strategy that strengthens resilience, supports responsible expansion, and ensures energy and security policies are guided by shared knowledge and evidence.

The project brief ist the starting point on a long-term assessment on how to contribute to the development of a shared, forward-looking strategy for navigating the future of nuclear power by scaling the impact of young voices. It is important to ensure that new generations are not only consulted but actively engaged in defining long-term nuclear strategies and governance pathways.

Introduction

The global nuclear landscape is currently undergoing its most significant transformation (Shifotoka, 2026). Driven by the dual challenge of the climate crisis and a rapidly shifting geopolitical order, countries, international organisations, and societies are now forced to re-evaluate the role of nuclear technology.

However, the discourse surrounding nuclear use is often trapped in today's reference points, frequently overlooking the long-term systemic shifts that will define the next 25 years.

This project brief **„Nuclear Futures for a Better Tomorrow"**, describes the trends and forecasts for nuclear power in the year 2050. By using strategic foresight methods, this study recognises that the future is not a fixed destination to be predicted, but a space of alternative possibilities that can and should be actively shaped through today's decisions. The brief also describes the lessons learned from the workshop Youth Foresight Workshop held on 3rd November 2025 in London with the title: Nuclear Futures for a Better Tomorrow.

The following sections outline this foresight process:

- **Contextualising the Present:** We begin by examining the current drivers of change—from technological breakthroughs in Small Modular Reactors (SMRs) to the evolving security architecture of Europe.
- **Mapping the Alternative:** Using the Mānoa School archetypes, we present four distinct scenarios that challenge our assumptions about growth, stability, and societal transformation.
- **Bridging the gaps between generations and disciplines:** Central to this brief are the insights gathered from a participatory workshop held at the Swiss Embassy in London, where young professionals and students translated these abstract futures into concrete risks and opportunities.

As the UK, Switzerland, and the EU navigate an increasingly fragmented global environment, the ability to think „prospectively" becomes a vital tool for sovereignty and sustainability. This report serves as a roadmap for policymakers, industry leaders, and citizens to engage in a more nuanced, imaginative, and ultimately more effective dialogue about collective nuclear futures.

Methodology

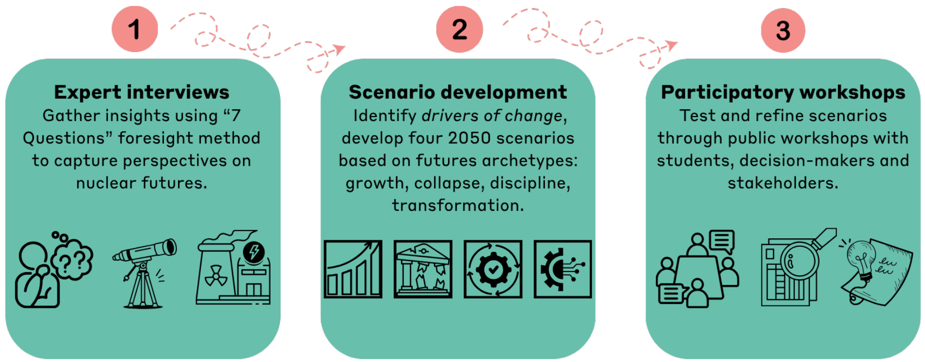
This project brief is based on a detailed study conducted over the course of one year using several foresight methodologies. Foresight is an "umbrella term for those innovative strategic planning, policy formulation, and solution design methods that don't predict or forecast the future, but work with alternative futures", thereby allowing for the formulation and implementation of desired policy pathways, ultimately creating betterment in society, politics, and for individuals (UNDP Global Centre for Public Service Excellence, 2018).

Initially, to rapidly gather the necessary expertise and obtain pragmatic insights from renowned experts in the nuclear field, the research team conducted interviews using the foresight method "7 Questions". According to the School of International Futures, 7 Questions is an interview technique popularised by Shell that allows for gaining insights from stakeholders in a specific field while also gathering insights into experts' views of the future (Glenday et al., 2023).

Following the interviews, the research team then conducted an internal workshop to distill the results, identify 16 drivers of change and potential future trends, and subsequently ideate four scenarios on nuclear futures. Foresight scenarios are narrative-based and visualise possible futures of a given topic. They are created with the objective of (i) providing a basis for innovation, (ii) stimulating strategic thinking, and (iii) encouraging collective awareness and debate (Futuribles, 2026). Most importantly, they do not aim to predict the future accurately. The four scenarios are built on the methodology pioneered by the Mānoa School of Futures Studies and the four archetypes created by Jim Dator. These archetypes – Growth, Collapse, Discipline, and Transformation – represent four fundamental paths of development for human civilizations that have repeatedly occurred throughout human history and can be found in all cultures (Bezold, 2009): In the **growth scenario**, growth is the ultimate goal of all systems and governments. Current trends continue to intensify. The **collapse scenario** is characterised by the breakdown and failure of the existing system. This is not necessarily a worst-case scenario, but recession, regression, and dysfunctionality become the norm.

In the **discipline scenario**, the system reaches the limits of growth. Through compromise and coordination, a certain balance between opposing forces is achieved. In contrast, the **transformation scenario** is characterised by profound technological, social, and political developments. Synergies are at the forefront, and a fundamentally new system emerges.

In the third and final step, the four scenarios were tested and critically discussed in a public workshop organised together with the Swiss Embassy in London in November 2025 gathering around 25 students, decision makers, and stakeholders from politics, academia, and the private sector. This methodical approach – called prospective-action research, or "participatory futures – aims to "facilitate empowerment and transformation through engagement and participation", thereby allowing ideally young participants to engage them in questioning the status quo, formulating their own ideas for the futures of a given topic, and ultimately giving each and everyone agency in defining the future (Gidley et al., 2009). A detailed overview of the methods used in the workshop can be found in the Annex.



Nuclear Futures Youth Workshop

Structure of the Workshop

The foresight workshop, organised in cooperation with the Swiss Embassy in London, was attended by twenty-four young professionals from a wide range of fields connected to nuclear issues. The session was designed to break disciplinary silos and to enable cross-sectoral thinking through an immersive exploration of alternative nuclear futures.

After an introduction to the workshop's objectives and methodology, participants received an overview of the four scenarios developed for this project (as presented in the previous chapter). To facilitate a transition from conceptual understanding to experiential engagement, a symbolic immersion ritual was used: participants took a pill to the future, accompanied by a future-themed playlist, allowing them to imagine being transported into their respective future scenarios. A personalised letter from the future was then handed to each participant, indicating the scenario in which they had "arrived" and determining their subsequent group assignment. Four groups were formed, one for each scenario.

In the first exercise, each participant created a **short personal profile** of an imagined future self. Reflections were encouraged on age, occupation, continuity or change in professional identity, everyday routines, and leisure activities within the assigned scenario. These profiles were shared within the groups, enabling participants to situate themselves within the scenario's internal logic and to develop a shared sense of identity. The second exercise introduced a more analytical perspective. Within each group, **risks and opportunities** associated with the scenario were identified across six thematic fields: Politics & International Relations; Economy & Industry; Climate & Environment; Technology & Innovation; Public Perception & Knowledge; and Health & Equity. Through this structure, participants were guided to consider how political dynamics, technological developments, environmental pressures, societal attitudes, and equity concerns might diverge across different futures. Once the scenario work was complete, participants were symbolically brought back to the present using the same playlist and reconvened in plenary, where insights were exchanged and compared across the four groups.

The following section presents the consolidated findings from each scenario, providing a comparative overview of the distinct dynamics, risks, and opportunities identified in the four futures.

Risks & Opportunities

This section presents a structured assessment of risks and opportunities associated with nuclear technologies under four contrasting future scenarios. The analysis is organised across six thematic categories: politics (i), economy and industry (ii), climate and environment (iii), health and equity (iv), public perception and knowledge (v), and technology and innovation (vi), to provide a consistent framework for comparison. By examining how different trajectories of nuclear development, governance, and societal engagement shape potential outcomes, the section highlights the complex interplay between strategic decision-making, regulatory frameworks, and societal impacts. The purpose is to inform policy discussions by identifying areas of vulnerability and potential leverage, supporting more resilient, equitable, and sustainable approaches to nuclear energy and technology.

Scenario 1: **Growth**

In the Growth scenario, large-scale expansion massively influences daily life. New reactors, upgraded grids, and advanced control rooms signal progress and ambition, yet the broader atmosphere is marked by caution. Geopolitical tensions and weakened non-proliferation norms create a persistent sense of uncertainty in international affairs. The speed of expansion raises concerns about whether oversight and safety culture can keep pace, particularly as the demand for skilled professionals grows. Public debates about radiation, waste, and environmental impacts remain visible, especially in communities located near new sites. The system feels highly modern and efficient, but also tightly interconnected, making it sensitive to disruption. Cyber threats, technical issues, or political instability could significantly undermine these rapidly expanding systems.

At the same time, the benefits are tangible and shape everyday confidence in the future. Energy supply is more stable, supporting industry, households, and climate targets. New jobs and training pathways offer opportunities for younger generations, while innovation in modular reactors and AI-supported monitoring enhance perceptions of technological leadership. Expanded access to medical isotopes improves healthcare outcomes, reinforcing the sense that nuclear growth delivers practical value. Living in this scenario would mean navigating a world that is forward-looking and solution-driven, yet aware that its strength depends on careful governance and continued public trust.

Scenario 2: **Collapse**

Everyday life is shaped by insecurity and fragmentation in the Collapse scenario. International treaties and oversight mechanisms have broken down, and the risk of nuclear escalation is no longer abstract but part of the political reality. Borders are hardened, resources are tightly controlled, and nationalist strategies dominate decision-making. The absence of shared safety standards and functioning global supply chains increases the likelihood of accidents and mismanagement, while nuclear waste accumulates without coordinated solutions. Public trust in institutions continues to erode as misinformation spreads and social tensions rise, deepening inequality and instability. The widespread use of AI for surveillance and security reinforces a sense of constant monitoring, but without clear rules or accountability. Living in this scenario would feel constrained and tense. A world that is focused on short-term survival rather than long-term stability.

Opportunities, where they exist, are pragmatic and often born out of necessity. In some regions, ad-hoc coalitions and new regional alliancesemerge to secure resources and maintain a minimum level of cooperation. Informal and private diplomacy becomes a key tool for stabilizing supply chains and preventing further escalation. Health and science diplomacy gain importance in responding to repeated crises, strengthening emergency preparedness, and catastrophe response. In resource-secure states, conditional public support for nuclear energy persists when alternatives fail, driven more by urgency than by ambition. Overall, this future is defined less by growth than by endurance: resilience is built in fragments, and stability, where achieved, remains fragile and unevenly distributed.

Scenario 3: **Discipline**

Living in the reality of scenario 3 will be dangerous, fragile and signifies - for the majority of the world's population - a life with a plurality of risks: New proxy wars and intervention in smaller states plague especially the countries of the Global South, resource-rich developing countries risk domination from powerful private and public actors with the majority of government spending going to defense. Small to mid-scale nuclear accidents and illegal waste dumping will become the norm, not the exception. Increased health risks due to radiation related diseases on a global scale lead to an even more unequal access to treatment and health expertise. Societies are subject to increasing censorship and propaganda leading to the normalisation of pro-nuclear narratives. AI and similar technologies support this trend, renewable energy research is neglected.

At the same time, the world of scenario 3 harbors unexpected opportunities for countries, societies, and individuals: Among allied states at least, the new power dynamics lead to strengthened co-operation, stable deterrence between larger blocs limits the risk of an outright large-scale nuclear conflict. Due to a limitation of the globalised economy, local trade and manufacturing flourish, transport emissions are at a new low due to localised supply chains, the new centralised systems lead to overall faster decision-making processes. In tightly regulated systems, there is a low radiation and fallout risk, a high discipline in safety standards and nuclear literacy lead to health benefits for individuals, especially in the Global North. Education becomes clustered around nuclear issues and therefore standardised and leads to reduced inequalities in the educational sector. Entrepreneurial ethos, especially in the nuclear field is highly valued and subject to increased funding.

Scenario 4: **Transformation**

In the transformation scenario, everyday life is shaped by a profound shift towards a system of nuclear phase-out. This trajectory is characterized by a favourisation of circular economy, decentralized renewable energy source and large-scale restoration of former industrial sites. While this signals long-term environmental safety, the transition is marked by regional instability as nuclear-dependent "company towns" face economic decline and job losses. Globally, the erosion of specialized expertise poses a unique risk: as nuclear knowledge fades over generations, the challenge of managing digital archives and legacy waste remains vulnerable to information leaks and mismanagement.

Despite these hurdles, the scenario offers a vision of ecological renewal and reduced geopolitical friction. A move toward comprehensive disarmament and international collaboration on climate research fosters a more peaceful global atmosphere. The economy adapts through green innovation, with new employment emerging in decommissioning, AI-supported environmental monitoring, and the renaturation of former sites. Even nuclear heritage becomes a point of reflection through memorialization and "nuclear tourism." Living in this world means navigating a distributed, ethically grounded energy system where resilience is defined by intergenerational equity.

Conclusion & Next Steps

The Growth scenario highlights that rapid technological expansion without equally strong governance and oversight risks creating a system that is efficient but inherently vulnerable. Its stability depends on whether safety, expertise, and international coordination can keep pace with ambition. At the same time, Growth demonstrates the potential of nuclear energy to anchor climate action, economic renewal, and technological leadership, provided that public trust and regulatory robustness are sustained.

On the other hand, Collapse illustrates how the erosion of cooperation and trust can transform nuclear risk from a managed challenge into a persistent threat, where insecurity becomes the defining condition of daily life. Where opportunities emerge in this scenario, they are reactive rather than strategic. They can be small pockets of resilience that mitigate decline but struggle to rebuild a stable and cooperative global order.

In contrast, the Discipline scenario paints a world where nuclear risks become systemic: proxy wars, resource domination, and normalised accidents disproportionately harm the Global South, while censorship and pro-nuclear narratives suppress dissent. Yet within this instability, localised opportunities arise, allied states deepen co-operation, deterrence limits large-scale conflict, and regionalised economies cut emissions. Tightly controlled systems in the Global North deliver safety and nuclear literacy benefits, but opportunities remain reactive, offering short-lived stability rather than a path to equitable global renewal. The scenario reveals how fragility and adaptation can intertwine, with outcomes shaped by unequal access to power and governance.

Finally, the Transformation scenario describes a paradigm shift toward a circular economy and decentralized renewables. While this path minimizes long-term risks from radiation and accidents, it introduces challenges like the loss of specialized expertise and economic instability in formerly nuclear-dependent regions. Nevertheless, it opens avenues for comprehensive disarmament, green innovation, and ecological renewal. It envisions a world where stability is defined not by technological dominance, but by proactive remediation and a conscious engagement with the nuclear legacy.

Looking Beyond this Project Brief

Foresight is a valuable tool in navigating uncertainty, allowing policymakers to explore potential futures and anticipate emerging risks and opportunities. The completion of the UK workshop marks not an endpoint but the start of the next phase of this project, as a methodological approach and analytical foundation have been established on which we aim to build future sessions. The framework developed through this process provides a structured approach exploring nuclear futures across policy, technology, security, infrastructure, and energy systems. In this next phase, this structure will serve as the base for workshops and dialogues with additional stakeholders across countries and regions.

By applying the same foresight methodology across diverse national and institutional contexts, we aim to better understand where perspectives converge, where they diverge, and how different actors assess risks, opportunities, and strategic priorities related to nuclear power. Through comparative analysis and international engagement, this process aspires to contribute to the development of a shared, forward-looking strategy for navigating the future of nuclear power by scaling the impact of young voices in shaping the futures they will live in, thereby ensuring that emerging generations are not only consulted but actively engaged in defining long–term nuclear strategies and governance pathways.

We invite partners, institutions, and governments interested in applying or adapting this methodology within their own context to collaborate with us. Expanding this dialogue across countries and sectors will be essential to building a more coherent and internationally informed approach to nuclear futures.

Endnotes

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Layout

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Annex

Annex 1: Expert Interview Questions

Section 1: Understanding the Current Landscape (H1 – Present State & Trends)

1. What is the purpose? (Framing the Issue)
- What are the most pressing challenges in nuclear policy, security, energy, or governance today?
- What interdisciplinary approaches (e.g., policy, science, law, technology) have been most effective in addressing nuclear issues?
- What knowledge gaps or barriers prevent progress in nuclear governance?
- What are the biggest positive/negative factors (e.g. if we compare states) that lead to a successful nuclear policy, security, energy or governance today?

2. Who are the users? (Key Stakeholders & Actors)
- Who are the primary decision-makers shaping nuclear policies today? (e.g., governments, private sector, international organizations)
- Are there any emerging actors (e.g., AI governance bodies, private nuclear companies) that might play a larger role in the future?
- What are the key alliances and rivalries shaping nuclear policies today?
- How are these actors collaborating? What are the existing networks of collaboration?

3. What is changing? (Emerging Trends)
- What are the most significant current trends in nuclear security, nonproliferation, and energy that we see today?
- What technological advancements (e.g., AI in nuclear command, small modular reactors) are already reshaping nuclear policy?

- How is the geopolitical landscape (e.g., US-China-Russia tensions, regional conflicts) influencing nuclear governance?

Section 2: Uncertainties and Future Disruptions (H2 – Transition & Wildcards)

4. What are the uncertainties? (Critical Unknowns)
- What are the biggest unresolved questions in nuclear policy, security, and energy?
- What external shocks (e.g., cyber threats, AI governance failures, geopolitical instability) could significantly alter nuclear governance?
- Are there assumptions we take for granted today that might no longer be valid in 20 years?

5. What might the future look like? (Exploring Alternative Scenarios)
- Can you describe a best-case and worst-case nuclear future by 2040?
- What factors would need to change to reach a desirable nuclear future?
- If an unexpected event (wildcard) were to disrupt nuclear governance, what might it be?

Section 3: Implications and Strategic Adaptation

6. What are the implications? (Long-Term Consequences)
- If current trends continue, what are the most significant long-term consequences for nuclear security, energy, and governance?
- How will these changes impact international relations, arms control, and nonproliferation efforts?
- What ethical or legal challenges do emerging nuclear technologies pose?

7. What should we do? (Strategic Actions & Policy Recommendations)
- What immediate actions should governments, scientists, and policymakers take to address nuclear risks?
- How can interdisciplinary collaboration be improved in nuclear governance?

- What policy, technological, or diplomatic strategies would best prepare us for nuclear futures?
- What are the existing networks or the gaps, where a network is needed, that could positively contribute to a future with nuclear security or a future with a safe use of nuclear energy?

Closing & Next Steps

- Is there anything we haven't asked that you think is crucial for understanding the future of nuclear issues?
- Do you know anyone else that we should interview about this issue?

Annex 2: "Drivers of change" and the Four Scenarios

Having defined sixteen drivers of change for the futures and their resulting trends (for a comprehensive list see below), each of the four scenarios presents an initial visualisation of the future, followed by a presentation of the global power relations present in that scenario, the international agreements in place (if there are any), a short description of how everyday life is for the citizens, and finally, the positioning of the UK, Switzerland, and the EU in the world the scenario describes.

1. Drivers & trends

„Drivers" are the underlying forces that drive change, and „Trends" are the resulting observable developments.

Nr.	Driver	Core Statement	Possible Trends
1	Private Sector	The private sector must take on public responsibilities and seeks profit opportunities.	Increase in private investments in nuclear technology, commercial reactors
2	International Collaboration	Loss of trust in multilateral organizations makes international cooperation more difficult.	Regional alliances instead of global cooperation, bilateral agreements
3	Political (in) stability	Return to nationalism and distrust in coherent political decisions increase military spending.	Arms race, shift in geopolitical power blocs
4	Public Opinion	Growing concern about nuclear risks and declining labor market interest influence decisions.	Demands for stricter safety standards, shortage of young professionals in the nuclear sector
5	Climate Change	Debate on the role of nuclear energy in climate protection is gaining importance.	Promotion of "green" nuclear energy, integration into CO_2 reduction strategies
6	Public Education and Awareness	Knowledge gap between the public and experts makes informed discussions difficult.	Awareness campaigns, expert-public engagement programmes
7	Inter-generational Knowledge Management	Growing inventories require long-term knowledge transfer among experts.	Knowledge databases, mentoring programmes, digital archiving
8	High-risk Events / Black Swan	Geopolitical tensions increase the risk of unexpected disasters.	Enhanced safety and crisis plans, emergency drills
9	Power-dynamics North-South	Stagnating power relations influence nuclear developments.	Focus on technology transfer, regional power projects
10	Technological Advancements & AI	AI and technology increase efficiency, safety, and military impact.	Automated safety controls, AI-supported risk analyses
11	Need for Electricity	Rising energy demand drives the need for nuclear solutions.	Construction of new reactors, investments in energy infrastructure
12	National Economic Interests	National interests promote nuclear development for stable energy and strategic advantages.	Government subsidies, national nuclear programmes

13	Biodiversity	Loss of biodiversity and ecological factors influence site selection.	Environmental assessments for reactor construction, site relocations
14	Intergenerational Fairness	Discussion about fairness between generations shapes decisions.	Long-term safety concepts, sustainable resource planning
15	Supply Chains	Global supply chains are under pressure.	Localization of materials, strategic stockpiling
16	(Global) Health	Nuclear waste and radiation risks require increasing attention.	Health protection, safety regulations, medical research

2. The four scenarios

*„**Growth**“ stands for continued growth and innovation, while „**Collapse**“ represents crises and the breakdown of existing systems. „**Discipline**“ describes a future characterized by strict regulation and stability, whereas „**Transformation**“ refers to profound, often disruptive changes driven by new values or technologies.*

2.1 Growth: Nuclear Renaissance 2050

A future in which nuclear energy gains renewed importance due to increasing energy demands, technological progress, and private investments. Nuclear infrastructure is massively expanded, modular reactors are rapidly developed, and artificial intelligence manages monitoring, safety, and efficiency. National interests and fragmented international cooperation lead to regulatory gaps, while geopolitical tensions and an arms race shape the global order. Public concern about risks and environmental impacts coexists with the acceptance of nuclear energy; the shortage of skilled workers is addressed through education and knowledge management. Energy supply, technological innovation, and safety are closely interconnected, yet the system remains vulnerable. A world that grows and renews itself technologically, but stays fragile.

Global Power Relations
The world of 2050 is multipolar: the USA, China, Russia, the EU, and India compete for technological supremacy. Energy self-sufficiency becomes a central factor of power. Nuclear technology is used strategically for supply, deterrence, and influence.

International Agreements
Multilateral structures are weakened. The IAEA has lost its authority; regional control mechanisms are emerging. A new regulatory framework for the use of AI in nuclear safety forms the only widely recognized international standard.

Everyday Life
Electricity is generally available, but price fluctuations and uncertainties shape daily life. In many countries, AI-based energy and safety monitoring systems are omnipresent. Health and environmental concerns are part of public discourse; radiation protection and crisis preparedness are integrated into daily routines.

Positioning of the UK, Switzerland, and the EU
The UK leads as a global centre for nuclear innovation, regulation, and AI-driven safety systems, exporting expertise and setting international standards. Switzerland supports as a neutral advisor, offering precision monitoring tools and safety frameworks. The EU continues to expand its nuclear capacity to ensure energy independence, aligning with UK-led safety norms despite internal policy tensions.

Trends based on drivers

- **Private Sector:** Private investments in commercial reactors and modular nuclear technology are increasing; profit interests drive rapid expansion, partly at the expense of safety standards.
- **International Cooperation:** Trust in multilateral institutions such as the IAEA is declining; regional alliances and bilateral agreements are replacing global cooperation, creating oversight gaps.
- **Political Stability:** Nationalist strategies and distrust of coherent decision-making increase military spending; arms races and geopolitical tensions intensify.
- **Public Opinion:** Concerns about nuclear risks, health, and the environment are growing; shortages of young professionals in the nuclear field and demands for stricter safety standards shape public debates.

- **Climate Change:** Nuclear energy is promoted as a "green" component in CO_2 reduction strategies; its role in decarbonization is central to discussions.
- **Education & Awareness:** Knowledge gaps between the public and experts hinder informed discussions; awareness campaigns and public engagement programmes are expanding.
- **Knowledge Management:** Long-term knowledge transfer is ensured through databases, mentoring programmes, and digital archives to preserve expertise for operation and decommissioning.
- **High-Risk Events:** Geopolitical tensions and security gaps increase the risk of unexpected disasters; emergency plans and crisis simulations are being expanded.
- **North–South Dynamics:** Technology transfer and regional nuclear projects shape power relations; industrialized nations secure advantages while other countries deliberately develop independent systems.
- **Technological & AI Advances:** AI controls reactors, automates safety checks, and supports risk analyses; technological dependencies are growing.
- **Electricity Demand:** Rising energy needs drive the construction of new reactors; nuclear infrastructure is massively expanded to close supply gaps.
- **Economy:** Government subsidies and national programmes promote the nuclear industry, making nuclear energy a strategic economic factor.
- **Biodiversity:** Environmental assessments and ecological factors influence site selection; compromises between energy demand and ecosystems are becoming more common.
- **Intergenerational Fairness:** Long-term safety concepts aim to protect future generations but face tensions between profit and resource demands.
- **Supply Chains:** Global supply chains are strained; strategic stockpiling and local production ensure the supply of materials and components.
- **Global Health:** Radiation risks and waste issues require extensive health monitoring; medical research to minimize risks is increasing.

Immersion 2025

The world is experiencing a new phase of nuclear energy. Rising energy demand, population growth, and technological progress have made nuclear technologies attractive again. Private companies are investing heavily in commercial reactors; modular plants are being developed faster than ever before; and artificial intelligence is managing the monitoring and safety of many power plants. Global cooperation is weakened: multilateral institutions such as the IAEA have lost trust. Instead, regional alliances and bilateral agreements take over control, leaving gaps in international oversight. Nationalist strategies and geopolitical tensions have triggered a new arms race. Nations are securing energy self-sufficiency, while power shifts are fragmenting the global order. Public opinion is divided. Many accept nuclear energy as indispensable for a stable electricity supply and climate goals, while others worry about radiation, waste, and health risks. At the same time, there is a shortage of young professionals in the nuclear field. Education campaigns and citizen dialogues aim to strengthen knowledge and trust, while long-term knowledge databases and mentoring programmes preserve the experience of experts. New technologies and AI increase efficiency and safety, but also create new dependencies. Emergency drills and crisis plans are an integral part of daily life. Environmental assessments accompany every reactor construction, while national interests and economic profits often outweigh ecological concerns. In this world, energy supply, technology, and safety are closely intertwined. Energy is reliably available, yet the system remains fragile, as rapid growth, limited international control, and geopolitical competition interact. The nuclear renaissance brings progress, power, and risk at once. A world that grows, but remains vulnerable.

2.2 Collapse: Nuclear Chaos

A future in which national actors dominate the global stage, international rules and agreements have disappeared, and trust virtually no longer exists. Nuclear technologies, both civilian and military, are largely used without control, while public panic, economic instability, and environmental burdens increase. Long-term cooperation, knowledge transfer, and intergenerational fairness are practically abolished, and artificial *intelligence plays a central role in monitoring, control, and risk management in a fragmented, insecure world.*

Global Power Relations
The world is fragmented into isolated centers of power. No dominant global pole, no long-term alliances. Each state focuses on self-interest and military strength. Trust and cooperation have virtually vanished, and conflicts are multiplying.

International Agreements
International treaties and safety standards barely exist. National solo efforts and short-term bilateral agreements dominate. Globally coordinated monitoring of nuclear facilities or weapons is practically nonexistent

Everyday Life
Daily life is characterized by uncertainty, fear, and scarce resources. Power supply and healthcare systems are fragmented, and the threat of nuclear accidents is omnipresent. Communities isolate themselves; long-term cooperation or partnerships virtually no longer exist.

Positioning of the UK, Switzerland, and the EU
The UK retreats into isolation, prioritizing energy security and national control over cooperation or transparency. Switzerland follows suit, focusing on internal safety and neutrality through self-containment. The EU is turning inward as well, ending coordinated efforts with the UK and Switzerland amid eroding regional stability and trust.

Trends based on drivers
- **Private Sector:** Companies operate in isolation; profit interests override safety concerns. Commercial nuclear projects proceed without international oversight, partly in unstable regions.
- **International Cooperation:** Global cooperation has collapsed; multilateral organizations no longer hold authority. Only fragmented, short-term alliances remain.
- **Political Stability:** Nationalist and autarkic strategies lead to conflicts, military armament, and regional power struggles.

- **Public Opinion:** Fear, panic, and distrust dominate the population. Protests and unrest worsen economic instability.
- **Climate Change:** The environment is heavily burdened; overuse and waste of resources lead to ecosystem crises. Decarbonization strategies are deprioritized, and climate protection becomes secondary.
- **Education & Awareness:** Knowledge transfer has broken down; public debates are highly fragmented, and expert knowledge is rarely passed on.
- **Knowledge Management:** Long-term safety planning hardly exists; databases, mentoring, and archiving are neglected.
- **High-Risk Events:** At least one nuclear military incident has already had catastrophic consequences. Further accidents are likely.
- **North–South Dynamics:** Global power shifts are chaotic; access to technology and energy depends on national strength and chance.
- **Technological & AI Advances:** AI is central to surveillance, safety control, and military operations, but is barely regulated.
- **Electricity Demand:** Energy availability is fragmented; local shortages and unreliable supply dominate daily life.
- **Economy:** Global markets have collapsed; resources are hoarded, and national economies are under extreme pressure.
- **Biodiversity:** Ecological damage is increasing; protective measures are neglected.
- **Intergenerational Fairness:** Future prospects are minimal; younger generations inherit an unstable, insecure environment.
- **Supply Chains:** Global supply chains are disrupted; materials are hoarded locally, and reliance on imports causes shortages.
- **Global Health:** Radiation risks and insufficient healthcare strain the population; public health structures are severely weakened.

Immersion 2025
The year 2050 reveals a world sunk into fragmentation, distrust, and fear. National actors dominate the global stage, international agreements and oversight mechanisms have vanished, and most resources are hoarded behind militarized borders. A previous nuclear military incident has exposed the fragility of global order and thrown populations into

panic. Cooperation between states has nearly ceased; war, tension, and rivalry define everyday life. Trust virtually does not exist, and even non-state actors possess access to nuclear capabilities, making the risk of further catastrophes ever-present. Artificial intelligence permeates life — monitoring, controlling, and planning security measures, but without clear rules or international oversight. Long-term cooperation, knowledge sharing, and intergenerational fairness have disappeared; young people inherit a world filled with uncertainty, scarce resources, and constant danger. The environment suffers from neglect and exploitation, while national interests and survival strategies take precedence. Even Switzerland, the UK and the EU, once pioneers of stability and cooperation, have retreated behind fortified borders, focusing on self-sufficiency and internal security. The world is shattered, societies are dominated by fear, panic, and distrust, and each day is a balance between caution and survival. Nuclear risks, rogue actors, war, and the absence of any global cooperation define daily life, and the future appears bleak, uncertain, and driven by the struggle to survive.

2.3 Discipline: Nuclear Control

A future in which a strict framework of nuclear security shapes the world. A few major global actors dominate the stage, defend their borders, and focus heavily on military deterrence. Artificial intelligence plays a central role in monitoring, control, and regulation, especially in the nuclear sector. Nuclear technologies are fully regulated, trade across national borders does not occur, and energy is cheap within the major powers, while global inequality reaches historic levels.

Global Power Relations
The world is multipolar: the USA, China, and Russia each dominate their own blocs. Security and defense strategies are strictly enforced; mutual deterrence (Mutually Assured Destruction – MAD) ensures stability. There is little cooperation between the blocs, but also no open conflict — a new Cold War.

International Agreements
Global agreements are rare and tightly regulated. The most important is the Global Nuclear Security Pact, which prescribes strict controls for nuclear materials and the integration of AI into security protocols. Trade in nuclear technologies across national borders is prohibited.

Everyday Life
Within the major power states, people benefit from cheap, reliable energy, technological convenience, and high security, but live under constant surveillance. In less powerful states, energy is scarce, economic opportunities are limited, and access to nuclear technology is severely restricted. A culture of safety, compliance, and regulatory awareness shapes education and professional life.

Positioning of the UK, Switzerland, and the EU
The UK anchors a tightly regulated nuclear order, emphasizing strict safety, defence, and compliance across its energy systems. Switzerland upholds a neutral, regulatory role, ensuring transparency and technical oversight within international frameworks. The EU cooperates closely with the UK through the European Nuclear Security Alliance, promoting disciplined governance and mutual deterrence in a controlled global system.

Trends based on drivers
- **Private Sector:** Nuclear infrastructure and technologies are highly regulated; private innovations are allowed only within strict safety boundaries.
- **International Cooperation:** Cooperation occurs only among a few major powers; multilateral initiatives are rare and tightly controlled.
- **Political Stability:** Hardened fronts and strategic blocs lead to a “Cold War 3.0”; defense and deterrence (MAD) dominate decision-making.
- **Public Opinion:** Populations in central power states benefit from energy surpluses but live under intense surveillance; outside these blocs, there is energy poverty and fear of isolation.
- **Climate Change:** Energy surpluses in central states enable low-CO_2 industries, but global decarbonization remains fragmented.
- **Education & Awareness:** Educational programmes emphasize safety culture, technological competence, and regulatory understan-

ding — especially regarding AI and nuclear energy.

- **Knowledge Management:** Strict protocols secure expert knowledge; databases, audits, and compliance systems are central to this.
- **High-Risk Events:** The risk of uncontrolled incidents is minimal due to overregulation; safety standards are nearly absolute.
- **North–South Dynamics:** Energy and technology flows are heavily restricted; economic inequality increases, and developing countries remain dependent and poor.
- **Technological & AI Advances:** AI controls reactors, safety checks, and nuclear logistics; regulation and surveillance dominate.
- **Electricity Demand:** Energy is cheap and abundant in major power states, but outside these blocs, it is a luxury and scarce.
- **Economy:** National interests determine energy exports; trade in nuclear technology across borders is banned, and economic disparity grows.
- **Biodiversity:** Environmental standards are observed within major powers but barely enforced elsewhere; site selection is heavily regulated.
- **Intergenerational Fairness:** Future prospects are secured within the blocs but marginalized outside them.
- **Supply Chains:** Nuclear supply chains are strictly controlled and globally fragmented.
- **Global Health:** Radiation risks are minimal, safety protocols are strict; health benefits exist only within regulated systems.

Immersion 2050

The year 2050 is characterised by strict order, control, and nuclear discipline. Only a few major states dominate the world; their borders are militarized, and their focus lies on defense and deterrence. The doctrine of Mutually Assured Destruction (MAD) ensures that any attack on a nuclear-armed opponent would trigger an immediate and catastrophic response, preventing any state from launching a first strike. Artificial intelligence manages reactors, safety checks, and the logistics of nuclear materials, guided by the strictest protocols and constant surveillance. Nuclear technology is fully regulated, trade across borders is banned, and energy is cheap and abundant within the major powers, while other regions suffer from poverty and energy scarcity. People in these dominant states enjoy energy surpluses and technological comfort but live under continuous control and limited freedoms. Knowledge and expertise are systematically managed; innovation occurs only within tightly prescribed limits: compliance and safety culture shape education and professional life. Between the major blocs, a new Cold War — Cold War 3.0 — defines the era, marked by strategic competition, hardened fronts, and comprehensive security doctrines. Switzerland and the EU act as neutral mediators, creating buffer zones and regulated cooperation to mitigate extremes, promoting a balance between safety, innovation, and economic fairness. The world is strictly ordered, technologically advanced, yet deeply fragmented, defined by discipline, surveillance, nuclear deterrence, and profound global inequality.

2.4 Transformation: Beyond the Nuclear – Regenerative Futures

A future in which the world deliberately abolishes nuclear energy and nuclear weapons. Society turns toward decentralized, renewable energy systems, holistic sustainability, and ecological resilience. Nuclear infrastructure is dismantled, and public support for nuclear power fades in favor of renewable, community-based models.

Global Power Relations

The decline of nuclear energy weakens traditional nuclear powers. Influence shifts to those states that master renewables, grid technologies, and climate adaptation. Energy security is defined locally and in a decentralized manner.

International Agreements

Comprehensive disarmament treaties are concluded. New frameworks regulate waste monitoring, reactor decommissioning, and the right to clean energy. Artificial intelligence is governed under ecological safety standards — no longer in a nuclear context.

Everyday Life

Nuclear technology disappears from daily life. People live within local, clean energy systems with participatory energy planning. Cultural narratives promote harmony with nature and long-term ecological

Positioning of the UK, Switzerland, and the EU

The UK, once a strong advocate of nuclear power, transitions reluctantly but decisively toward renewables and hydrogen, focusing on workforce transformation and local energy resilience. Switzerland leads in decommissioning expertise and long-term waste management, maintaining its neutral, technical role. The EU drives large-scale renewable integration and social energy equity, and together the three act as anchors of stability and cooperation in a post-nuclear world.

Trends based on drivers

- **Private Sector:** Shift toward solar, wind, storage, and hydrogen technologies; decommissioning becomes a growth industry.
- **International Cooperation:** Multilateral institutions focused on nuclear issues lose relevance; new alliances promote renewable energy, climate resilience, and restorative justice.
- **Political Stability:** Partial instability in regions undergoing phase-out, but overall lower conflict risk; renewable energies strengthen independence.
- **Public Opinion:** Skepticism and rejection toward nuclear energy and weapons; lost trust cannot be regained.
- **Climate Change:** Decarbonization without nuclear power; key tools include renewable energy, smart grids, and changing lifestyles.
- **Education & Awareness:** Environmental ethics shape education systems; anti-nuclear narratives dominate.
- **Knowledge Management:** Focus on long-term waste monitoring and risk prevention; nuclear professions are declining.
- **High-Risk Events:** A major incident (accident or security breach) triggers the transition away from nuclear energy.
- **North–South Dynamics:** The Global South rejects nuclear development and becomes a pioneer in decentralized energy solutions.
- **Technological & AI Advances:** AI supports environmental monitoring, smart grids, and the remediation of former nuclear sites.
- **Electricity Demand:** Met through renewable energies and efficiency measures; decentralized grids smooth out demand peaks.

- **Economy:** Nuclear energy loses competitiveness; capital flows into green innovation, decommissioning, and ecological restoration.
- **Biodiversity:** Fewer site conflicts; contaminated areas are renatured.
- **Intergenerational Fairness:** The phase-out is seen as a gift to future generations and as protection against long-lasting risks.
- **Supply Chains:** Simplified, local structures replace complex nuclear value chains.
- **Global Health:** Reduced radiation risk; alternative radiological methods gain importance.

Immersion 2025

The world has left the nuclear age behind. After a series of safety incidents, political tensions, and growing public skepticism, many nations decided to end all forms of nuclear use, from energy and weapons to research. A nuclear accident in 2030 accelerated this process and led to a new global agreement: nuclear technologies belong to the past. Over the next two decades, reactors, facilities, and storage sites worldwide were decommissioned. Specialized teams dismantle infrastructure and secure remaining materials under international supervision. Knowledge about radiation and radioactive substances is preserved in digital archives, not for future reactivation, but for long-term monitoring and risk prevention. Energy supply now relies on decentralized, renewable systems managed by local communities. New professions have emerged around decommissioning, environmental restoration, and material cycles. The era of large-scale technologies has given way to a time of regional self-organization and resource-efficient innovation. In education and culture, the nuclear age is viewed as an instructive but closed chapter—a symbol of humanity's relationship with power, risk, and responsibility. The world of 2050 is not free of challenges, yet it follows a new principle: security through reduction, stability through cooperation. The nuclear age has ended, and in its place stands a cautious, learning, and regenerative society.

Annex 3: Risks and opportunities of each scenario

Scenario 1: Growth

Category	Risks	Opportunities
Politics & IR	Increased nuclear arms proliferation; weakening of non-proliferation norms; heightened risk of nuclear conflict; intensified geopolitical competition	Enhanced energy security; strategic geopolitical influence through nuclear leadership
Economy & Industry	Shortage of skilled workforce; profit-driven expansion at the expense of safety standards; strained global supply chains	Job creation; growth of supporting and secondary industries; government subsidies and national nuclear programmes; private investment in advanced reactors
Climate & Environment	Environmental degradation; long-term nuclear waste management challenges; ecological trade-offs in site selection	Contribution to net-zero targets; optimized site selection through environmental assessments; reduced reliance on fossil fuels
Health & Equity	Elevated radiation risks due to inadequate oversight; disproportionate siting in disadvantaged communities; long-term health monitoring burdens	Expanded availability of medical isotopes; increased investment in radiation monitoring and public health research
Public Perception & Knowledge	Public concern over radiation, waste, and environmental impacts; knowledge gaps between experts and the public; declining trust in global oversight institutions	Growing acceptance of nuclear energy for climate and energy security goals; public engagement, education campaigns, and citizen dialogues; strengthened knowledge management and expertise preservation
Technology & Innovation	Ethical and governance challenges in AI-driven decision-making; technological dependencies on complex systems; cybersecurity vulnerabilities	Workforce upskilling; technological leadership; scalable modular reactors; AI-supported safety, monitoring, and efficiency; advanced human–machine interaction

Scenario 2: Collapse

Category	Risks	Opportunities
Politics & IR	Nuclear war and military escalation; collapse of international treaties and oversight; rise of nationalist and isolationist strategies	Emergence of regional alliances in the Global South opposing European isolationism; ad-hoc multilateral coalitions for survival and security
Economy & Industry	Absence of safety standards; profit-driven operations; collapse of global markets and supply chains; resource hoarding and economic inequality	Informal and private diplomacy to secure resources and stability
Climate & Environment	Severe environmental degradation; increased carbon footprint; expanded uranium extraction; ecosystem collapse and climate neglect	Short-term prioritization of energy availability over climate goals
Health & Equity	Accumulation of nuclear waste without regulation; lack of international storage cooperation; healthcare system collapse; widening economic and health inequalities	Expansion of health and science diplomacy; increased catastrophe preparedness and emergency response capacity
Public Perception & Knowledge	Civil unrest and social instability; widespread misinformation; erosion of trust in institutions; racism and rising nationalism; breakdown of knowledge transfer	Conditional public support for nuclear power in resource-secure states when alternatives fail
Technology & Innovation	Disrupted supply chains and material scarcity; unequal access to technology; unregulated AI use for surveillance and military control	Extractive technological relationships exporting nuclear technology to states with limited capabilities

Scenario 3: Discipline

Category	Risks	Opportunities
Politics & IR	Proxy wars and interventions in smaller states; fragile deterrence dynamics; centralized decision-making; incompatibility with democratic governance; high nationalism and political tension; war escalation due to minimal communication between blocs	Strengthened cooperation among allied states; stable deterrence through strict control frameworks; political influence and power consolidation within blocs
Economy & Industry	Exploitation or misinformation of mining communities; corruption and bribery in resource-rich developing countries; high defense spending and debt from arms races; rare metal scarcity; fragile and controlled supply chains; blurred boundaries between government and private sector	Profit generation while decarbonizing; increased local trade and manufacturing; employment growth in nuclear sector; faster decision-making in centralized systems; access to resources through Global South exchange
Climate & Environment	Nuclear accidents; illegal waste dumping; long-term waste storage planning; permanently unusable land; high water and energy use for AI systems	Decarbonization within dominant power blocs; reduced transport emissions due to localised supply chains
Health & Equity	Unequal access to health knowledge and radiation-related expertise; widening global inequality in safety and healthcare	Very low radiation risk within regulated systems; high safety standards and controlled health benefits in central states
Public Perception & Knowledge	Workforce exploitation; high terrorism risk; censorship and propaganda; concentrated pro-nuclear narratives	High nuclear literacy and safety awareness; standardized education on nuclear and AI systems; leadership development within controlled institutions
Technology & Innovation	Neglect of renewable energy research; extreme consequences of black-swan events; overdependence on AI; dual-use technology risks; economic stagnation driven by profit maximization over social welfare	Advanced AI-driven control, monitoring, and compliance systems; accumulation of nuclear expertise and operational experience; increased funding for regulated entrepreneurship

Scenario 4: Transformation

Category	Risks	Opportunities
Politics & IR	Leakage of sensitive information from digital nuclear archives to malicious actors; transitional instability in regions dependent on nuclear infrastructure	International collaboration on medical, climate, and environmental research; comprehensive disarmament and reduced geopolitical conflict
Economy & Industry	Job losses and regional economic decline in former nuclear-dependent sectors	New tourism linked to nuclear heritage and memorialization; employment in decommissioning, waste monitoring, and ecological restoration; growth of green innovation and local energy economies
Climate & Environment	Environmental impacts from renewable energy waste and material cycles; land-use conflicts during large-scale renewable deployment	Decarbonization without nuclear power; expansion of renewable energy systems; lifestyle changes reducing energy demand; new recycling and circular-economy solutions; ecosystem restoration and renaturation of former nuclear sites
Health & Equity	Decline in medical research relying on nuclear isotopes; unequal transition impacts on affected workers and regions	Reduced risk of radiation exposure and nuclear accidents; improved intergenerational and social equity through risk reduction
Public Perception & Knowledge	Loss of public trust in nuclear institutions and expert communities; fading nuclear knowledge over generations	Learning from nuclear accidents and tragedies; increased awareness of non-nuclear energy alternatives; environmental ethics shaping education and culture
Technology & Innovation	Loss of advanced nuclear expertise and long-term knowledge erosion	AI-supported environmental monitoring; smart and decentralized grids; technologies for site remediation and long-term risk prevention

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Nuclear Futures for a Better Tomorrow

This Project Brief is based on a detailed study conducted over the course of one year using several foresight methodologies. It offers stakeholders a concise blueprint for how to develop and subsequently analyse possible future scenarios to anticipate nuclear risks and opportunities in Switzerland and beyond.