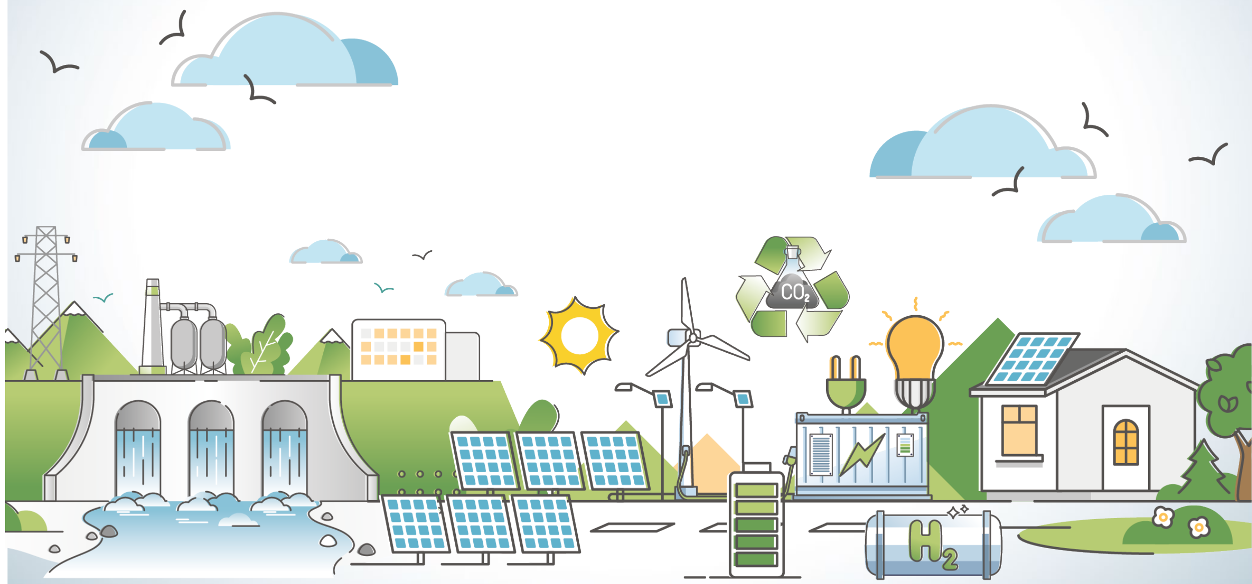
UNFC and UNRMS for Nuclear Fuel Resources

King Lee,
Chair, EGRM Nuclear Fuel Resources Working Group and
World Nuclear Association



RESOURCE MANAGEMENT WEEK 2023

ASSURING SUSTAINABILITY IN RESOURCE MANAGEMENT

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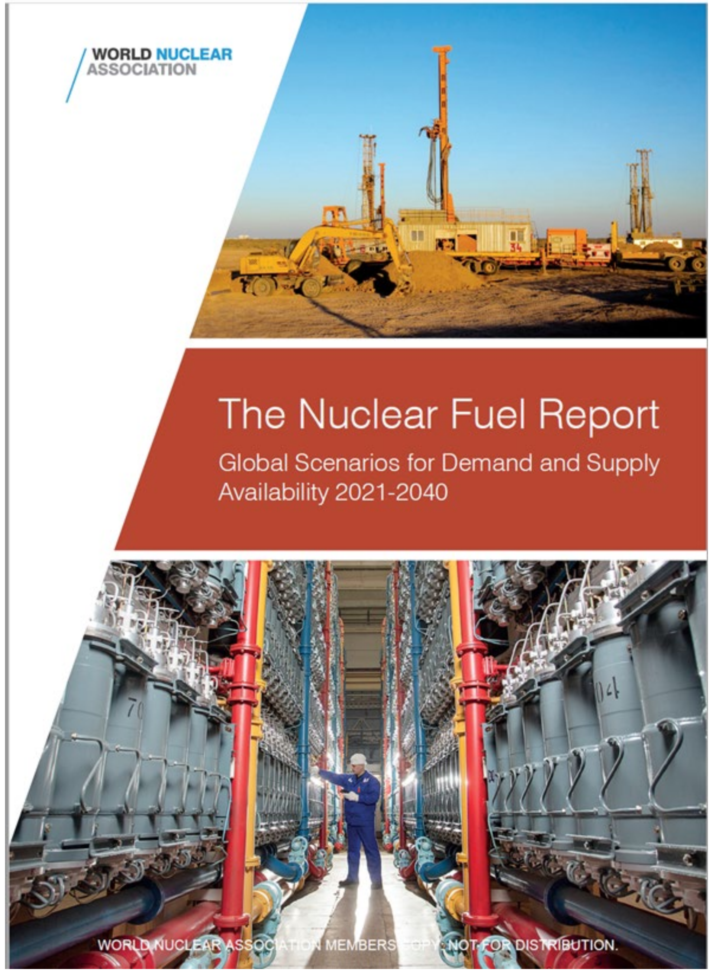
Future nuclear energy prospects, and what it means for uranium requirements

- World Nuclear Association has published reports on the supply and demand of nuclear fuel since its foundation in 1975
- It is based on three scenarios for future reactor development – lower, reference and upper. These are developed by WNA member experts
- It describes the current supply capacities in natural uranium, conversion, enrichment and fabrication services – and the future capacity needs under the scenarios

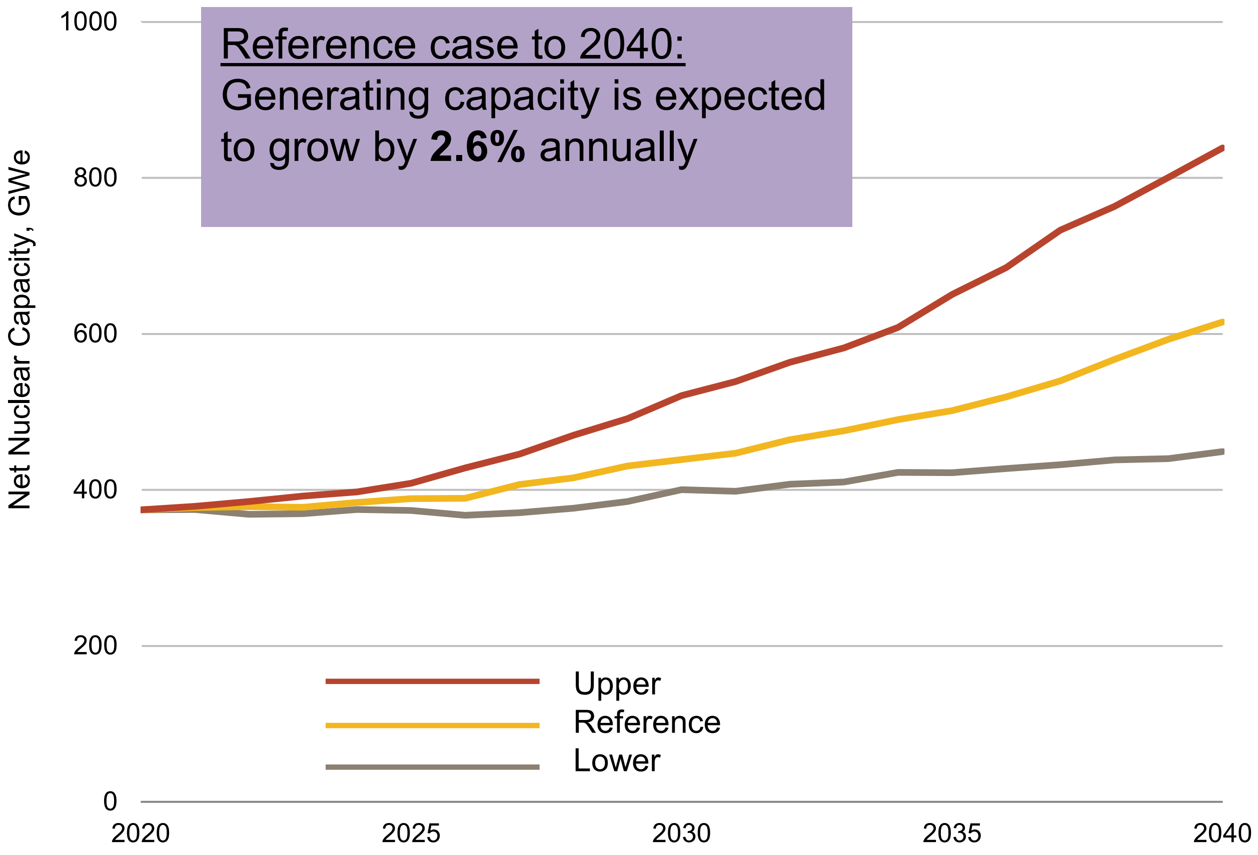


Demand for nuclear energy is set to increase

Near/mid term In the Reference and Upper Scenarios there is some decline in global nuclear generating projections over 2025-2035 due to various delays caused by the Covid-19 pandemic and reconsideration of nuclear programmes in some countries.

Long term: Beyond 2035 there is a more positive outlook due to wider prospects for the nuclear energy and improved climate change policies.

Working on the Fuel Report 2023 report, nuclear energy demand looking to significantly increase because of recent energy policies to address energy security.

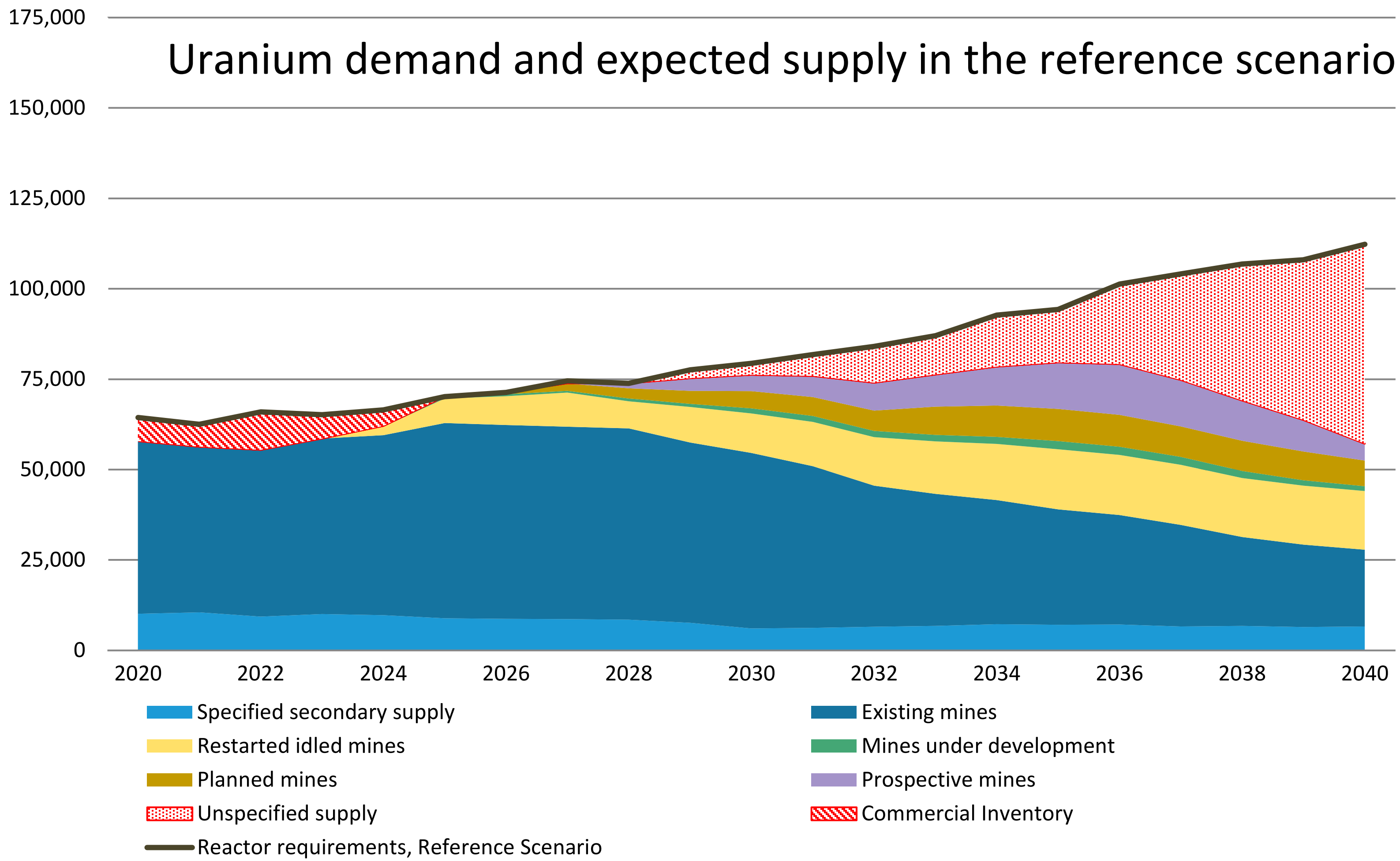


In the long run intense development of new uranium mines will be needed to fill the supply gap

In 2020, only 74% of world reactor requirements were covered by primary uranium supply.

In the near-term shortage in uranium supply will be largely covered by commercial inventories (unspecified supply)

By mid-2020s, restart of idled capacity is expected, however the decrease of supply from the presently-known existing mines will continue due to further depletion of uranium resources.



Carbon Neutrality – energy and resource demand

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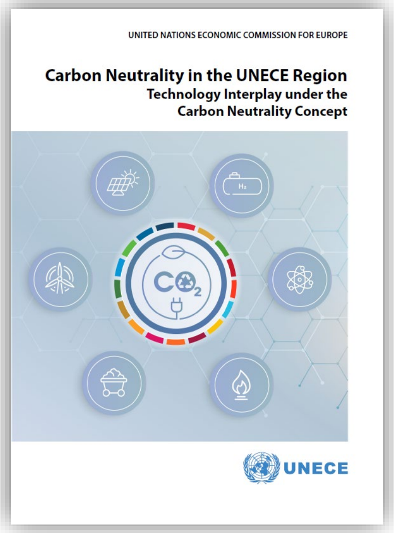
The UNECE Carbon Neutrality Toolkit is integrated approach looking at interplay of all low- and zero-carbon technologies including; renewables, CCUS, nuclear and hydrogen.

In-depth analysis of selected low- and zero-carbon technologies including:

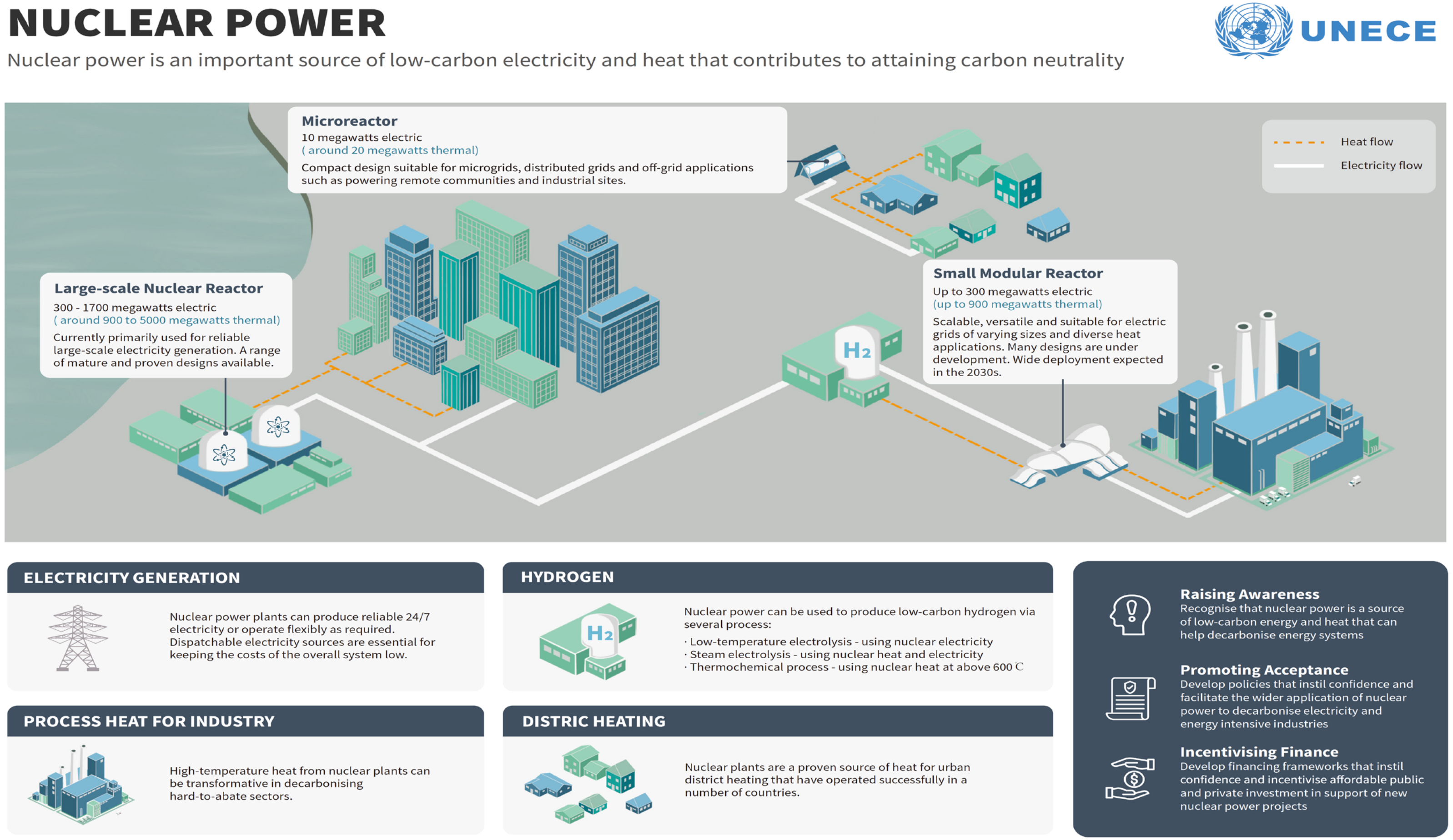
- CCUS,
- Nuclear power
- Hydrogen



Nuclear Power Brief

Technology Brief on nuclear power, provide an overview of nuclear energy as an important source of low-carbon electricity and heat that contributes to attaining carbon neutrality:

- Large scale reactors and Small Modular Reactors (SMR)
- Flexible operation of large reactors and SMR
- SMR providing low-temperature district heat (DH) in the cogeneration mode
- SMR producing high temperature process heat for industrial applications
- Hydrogen production (including high temperature solid oxide electrolyzes)



Carbon Neutrality – need more nuclear and uranium

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Carbon Neutrality Innovation Scenario

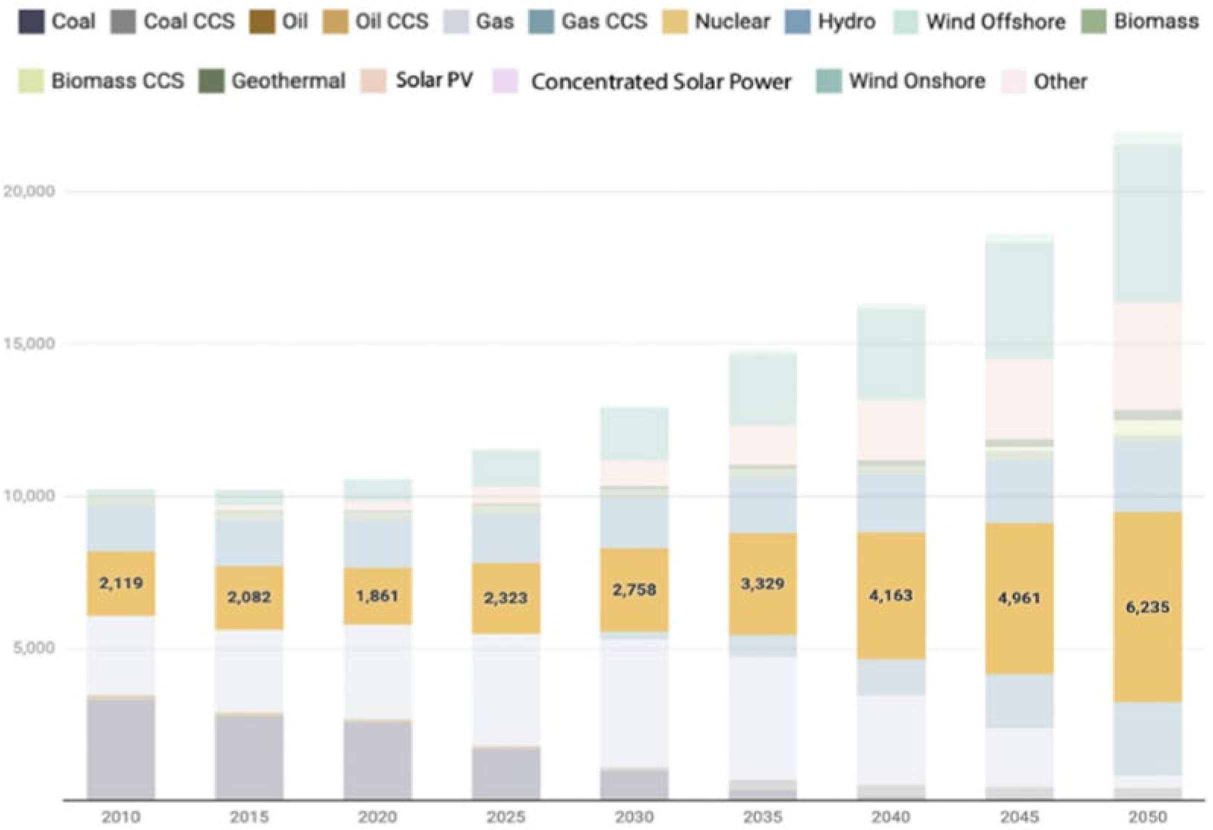
For the UNECE region by 2050, the amount of generation from nuclear energy more than triples, with 6235 TWh (~28% supply)

874 GWe of installed nuclear capacity, of which 432 GWe is projected to be SMRs, by 2050.

Potentially significant increase demand of uranium required for Carbon Neutrality.

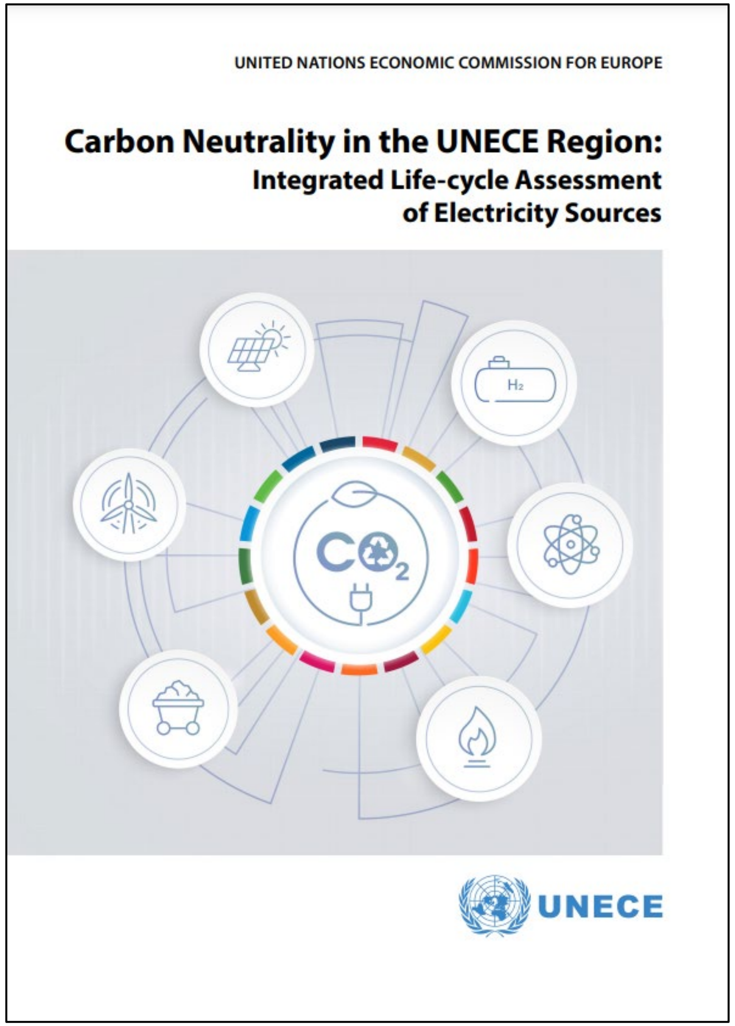
FIGURE 26

Electricity Generation Mix [TWh] Carbon Neutrality Innovation Scenario



Life cycle assessment of electricity sources

- UNECE conducted an LCA study to assess the life cycle environmental impacts of electricity generation options such as coal, natural gas, hydropower, concentrated solar power (CSP), photovoltaic (PV) technologies, wind power and nuclear energy.
- These options have been evaluated for climate change, freshwater eutrophication, ionizing radiation, human toxicity, land occupation, dissipated water and resource use.
- The study is part of the UNECE Carbon Neutrality Toolkit, which provides the pathway to bold, immediate and sustained action to decarbonize energy through international cooperation.



Life cycle assessment - Greenhouse gas (GHG) emissions

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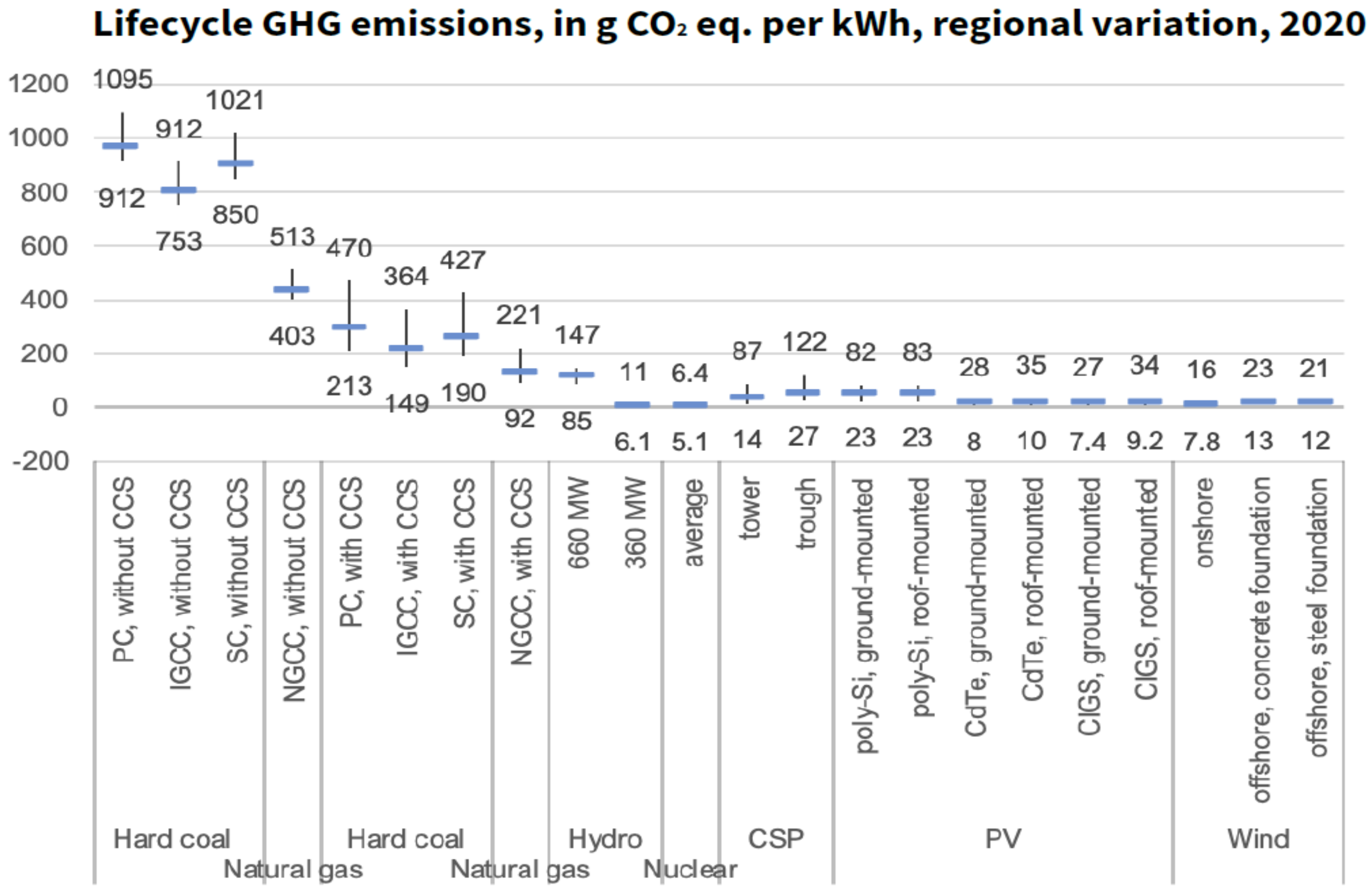
UNECE Life Cycle Assessment compared the main electricity generating technologies over a broad range of impact categories.

Greenhouse gas (GHG) emissions

- Nuclear power's lifecycle emissions are estimated with the lowest GHG of all technology assessed.

Figure 1 Lifecycle greenhouse gas emission ranges for the assessed technologies

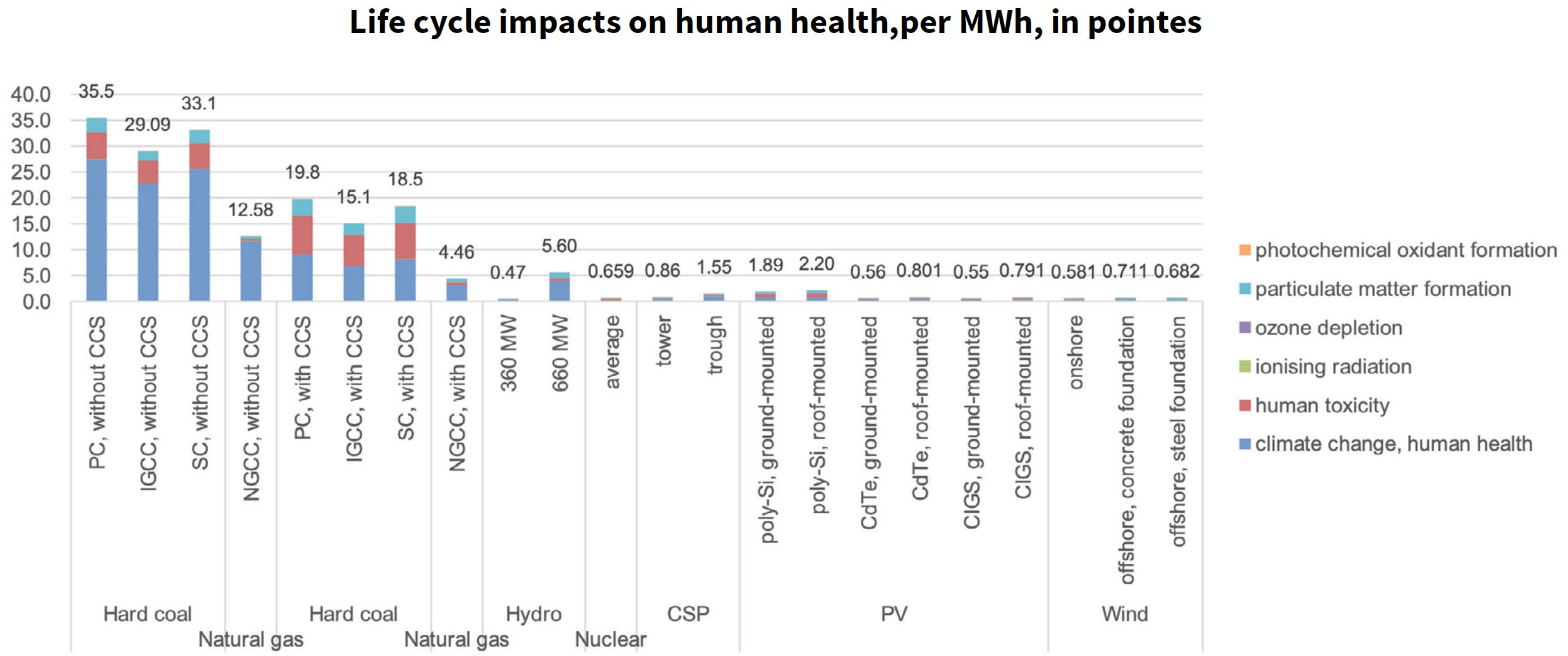


Life cycle assessment - Impact on human health

Human health

Nuclear power has a low impact on human health.

Figure 50 **Life cycle impacts on human health, in points, including climate change.**
Note on unit: 1 point is equivalent to the impacts (in disability-adjusted life years, DALY) of 1 person (globally) over one year.



Life cycle assessment - Impact on ecosystems

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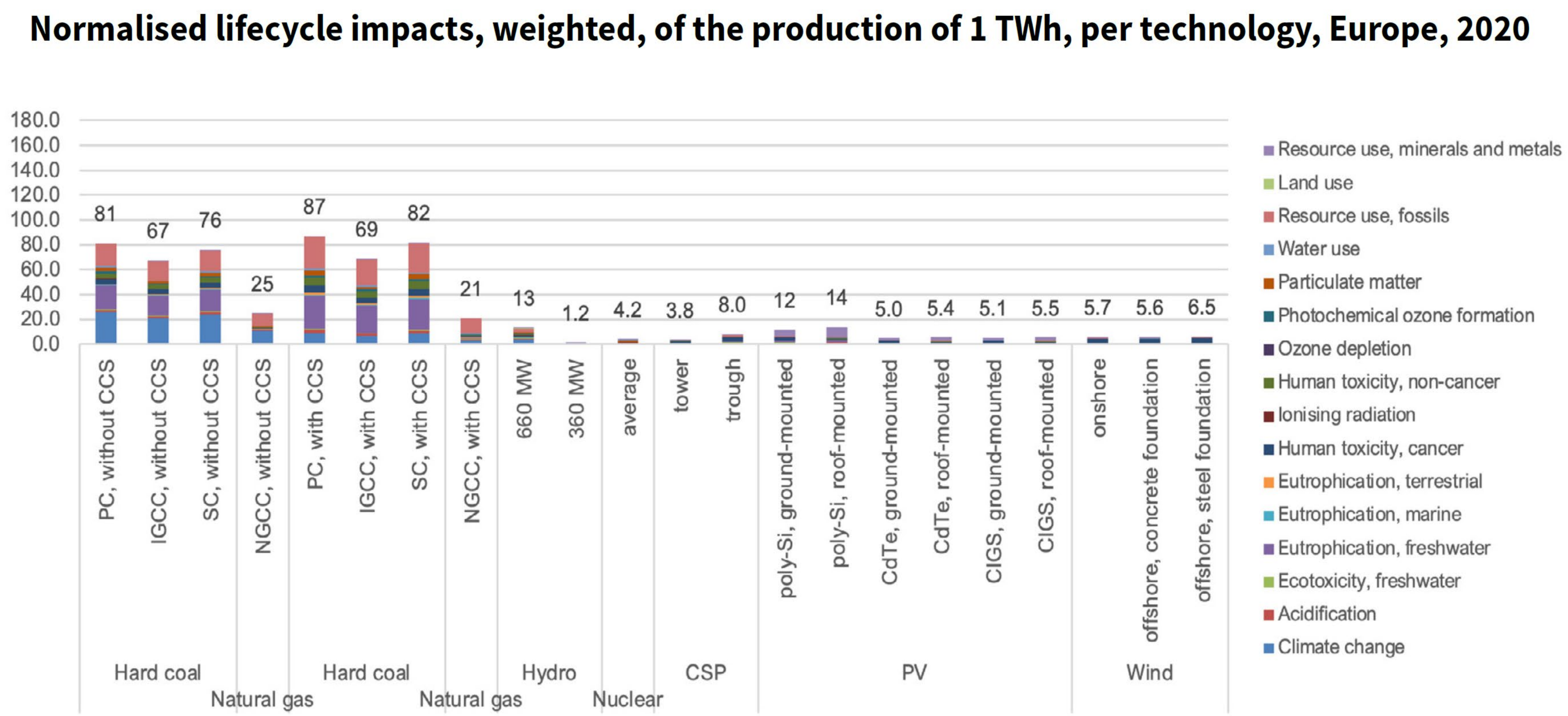
Ecosystems

"Nuclear power show a very low score on the ecosystem damage indicator"

Figure 53 Normalised, weighted, environmental impacts of the generation of 1 TWh of electricity



Nuclear and Uranium Sustainability

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UNECE information contributed to the discussion on nuclear energy sustainability as part of EU Taxonomy environmentally sustainable economic activities.

Currently ongoing discussion regarding uranium inclusion within the mining economic activities as part of the EU Taxonomy.

European Commission

EN English

Home › Publications › EU taxonomy: Commission presents Complementary Climate Delegated Act to accelerate decarbonisation

EU taxonomy: Commission presents Complementary Climate Delegated Act to accelerate decarbonisation

First published on	02 February 2022
Author	Financial Stability, Financial Services and Capital Markets Union
Topics	Banking and financial services

On 2 February 2022, the Commission approved in principle a Complementary Climate Delegated

Best Practices in Uranium Mining and Processing

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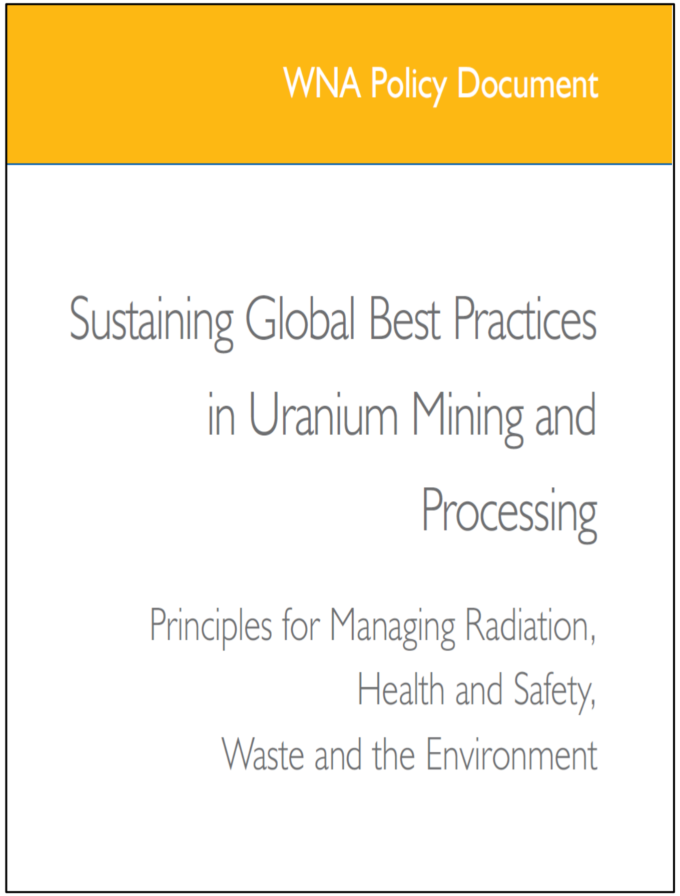
The World Nuclear Association has developed Industry Best Practices in Uranium Mining and Processing for responsible management of uranium mining and processing projects.

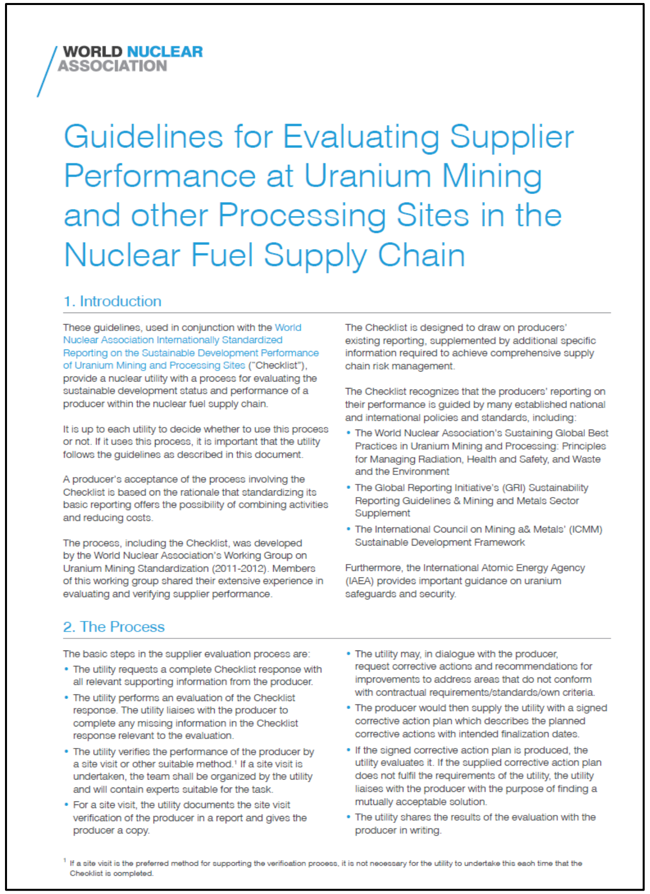
Currently reviewing and updating a assessment tool of uranium mining and processing supply chain, considering development of UNRMS, other regulations and standards.



WNA Policy Document

Sustaining Global Best Practices in Uranium Mining and Processing

Principles for Managing Radiation, Health and Safety, Waste and the Environment



WORLD NUCLEAR ASSOCIATION

Guidelines for Evaluating Supplier Performance at Uranium Mining and other Processing Sites in the Nuclear Fuel Supply Chain

1. Introduction

These guidelines, used in conjunction with the World Nuclear Association Internationally Standardized Reporting on the Sustainable Development Performance of Uranium Mining and Processing Sites ("Checklist"), provide a nuclear utility with a process for evaluating the sustainable development status and performance of a producer within the nuclear fuel supply chain.

It is up to each utility to decide whether to use this process or not. If it uses this process, it is important that the utility follows the guidelines as described in this document.

A producer's acceptance of the process involving the Checklist is based on the rationale that standardizing its basic reporting offers the possibility of combining activities and reducing costs.

The process, including the Checklist, was developed by the World Nuclear Association's Working Group on Uranium Mining Standardization (2011-2012). Members of this working group shared their extensive experience in evaluating and verifying supplier performance.

The Checklist is designed to draw on producers' existing reporting, supplemented by additional specific information required to achieve comprehensive supply chain risk management.

The Checklist recognizes that the producers' reporting on their performance is guided by many established national and international policies and standards, including:

- The World Nuclear Association's Sustaining Global Best Practices in Uranium Mining and Processing: Principles for Managing Radiation, Health and Safety, and Waste and the Environment
- The Global Reporting Initiative's (GRI) Sustainability Reporting Guidelines & Mining and Metals Sector Supplement
- The International Council on Mining a& Metals' (ICMM) Sustainable Development Framework

Furthermore, the International Atomic Energy Agency (IAEA) provides important guidance on uranium safeguards and security.

2. The Process

The basic steps in the supplier evaluation process are:

- The utility requests a complete Checklist response with all relevant supporting information from the producer.
- The utility performs an evaluation of the Checklist response. The utility liaises with the producer to complete any missing information in the Checklist response relevant to the evaluation.
- The utility verifies the performance of the producer by a site visit or other suitable method.[1] If a site visit is undertaken, the team shall be organized by the utility and will contain experts suitable for the task.
- For a site visit, the utility documents the site visit verification of the producer in a report and gives the producer a copy.
- The utility may, in dialogue with the producer, request corrective actions and recommendations for improvements to address areas that do not conform with contractual requirements/standards/own criteria.
- The producer would then supply the utility with a signed corrective action plan which describes the planned corrective actions with intended finalization dates.
- If the signed corrective action plan is produced, the utility evaluates it. If the supplied corrective action plan does not fulfil the requirements of the utility, the utility liaises with the producer with the purpose of finding a mutually acceptable solution.
- The utility shares the results of the evaluation with the producer in writing.

[1] If a site visit is the preferred method for supporting the verification process, it is not necessary for the utility to undertake this each time that the Checklist is completed.

Thank you!

King Lee,
Chair, EGRM Nuclear Fuel Resources Working Group and World Nuclear Association

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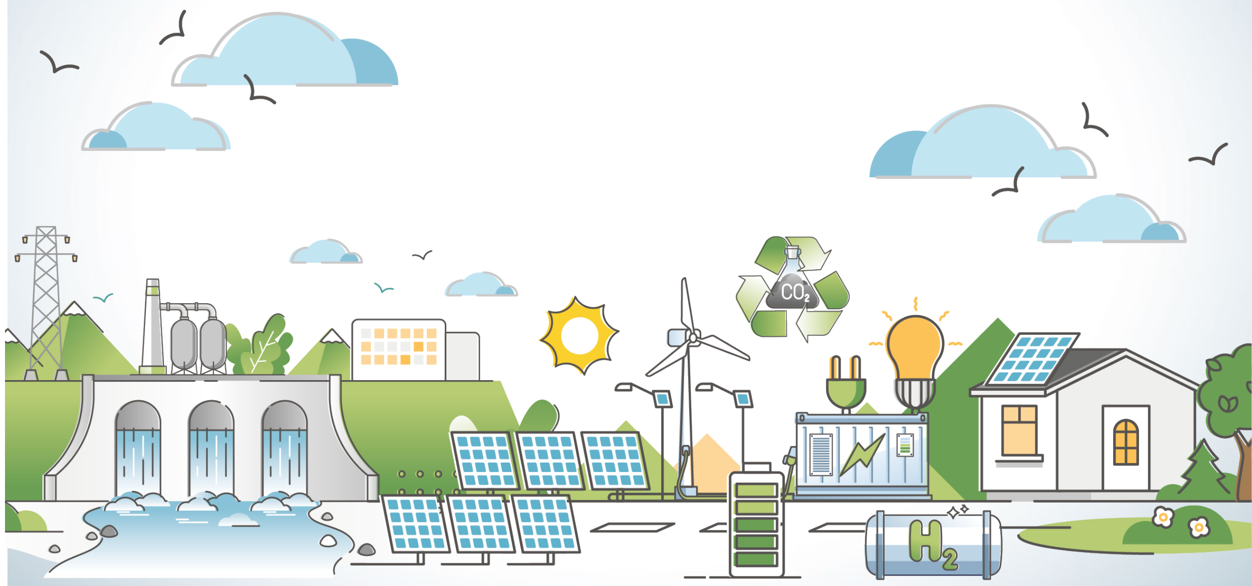
Date 27 April 2023, Geneva



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