



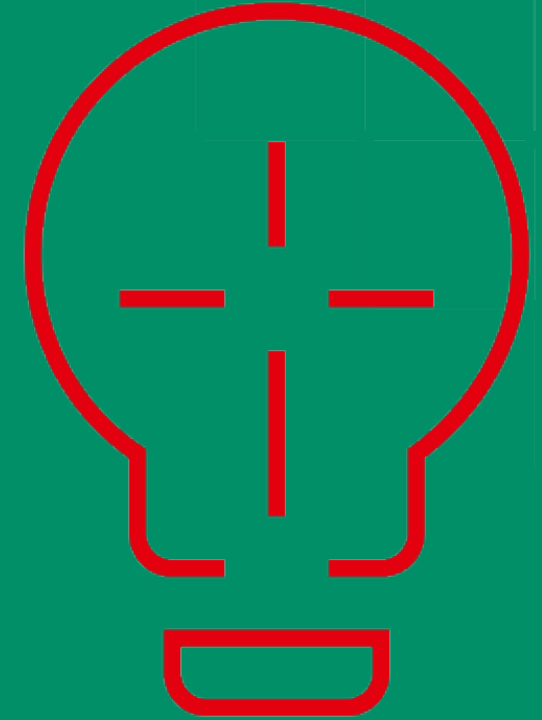
ISO Standardization Foresight Framework. Ideation Workshops

December 2022



Ideation Workshops

ISO's Ideation Workshops are designed to collect ideas from stakeholders for future standardization opportunities. We are seeking to involve a wide range of stakeholders, from both within and outside the ISO community. And especially those particularly attuned to signals of change. The ideation workshops will invite participants to **reflect together on how the trend will evolve in the future and identify emerging areas for future standardization**, drawing on participants' insights and knowledge. **Our ability to reach new and diverse stakeholders will be key to our success in these workshops.**



About this document

This document was realized as preparatory material for the Ideation Workshop on Energy Sources. It contains high-level information on trends in Energy Sources so that participants can start thinking in advance about the questions and topics to be discussed at the workshop.

Reading this material ahead of the workshop is optional, i.e., you can easily participate without having read the material in advance. In the workshop you will be guided through a step-by-step process.

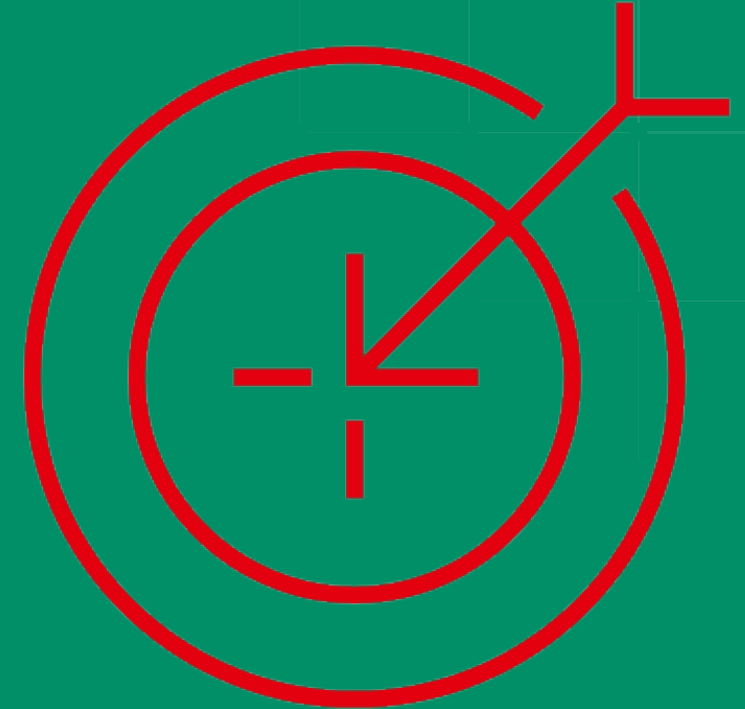
This workshop is taking place in the larger context of the ISO Standardization Foresight Framework, which aims to integrate foresight tools and methodologies into ISO's core processes, making the organization more future orientated.

Activities in the ISO Standardization Foresight Framework are still in a pilot phase and are currently focusing on:

Environmental scanning, i.e., identifying and monitoring changes emerging in the standardization environment by identifying trends from the spheres of **SOCIETY**, **TECHNOLOGY**, **ENVIRONMENT**, **ECONOMY**, **POLITICS**, and **SCIENCE**.

Ideation, i.e., identifying and analyzing emerging needs and future opportunities for standardization.

Across its foresight activities, ISO involves its members and stakeholder as well as relevant experts in order to include a variety of perspectives. More details on ISO's foresight approach are available at <https://www.iso.org/foresight.html>.





Trend Nudge

“Energy sources until 2050”

A document developed in preparation for the ISO ideation workshops in December 2022



Guiding questions for the workshop

1. How could global energy sources develop between now and 2050?
2. What kind of challenges and opportunities (societal, technological, economic, environmental, or political) could emerge as a result of developments related to energy sources?
3. How can standardization help to address these challenges and seize these opportunities?



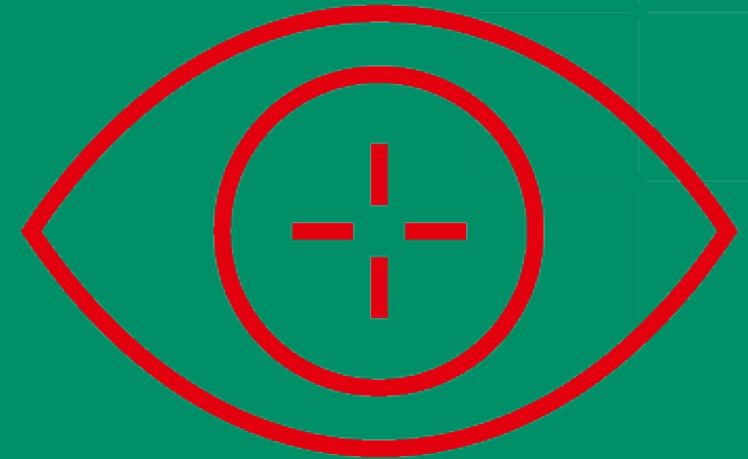
Energy sources

Meeting the growing energy demand while cutting greenhouse gas emissions means a vast expansion in **low- and zero-carbon energy**: wind, solar, hydroelectric, nuclear, geothermal, bioenergy, and others. There is some cause for optimism: **renewables** are the fastest-growing means of **energy production**, with massive investments being made by many countries. Renewables, particularly **solar**, are even becoming competitive with **fossil fuels** faster than expected.

Despite the impressive growth of renewables, they alone are unlikely to sustain increasing energy demands without miraculous technological innovations to render them much cheaper and more efficient. Therefore, it's likely, e.g., they will need to be combined with **nuclear energy** and **carbon capture**, along with improved **energy efficiency** measures to stem rising demand.

An additional challenge is **energy independence**. Countries are facing the challenge of increasing demand while needing to cut emissions AND ensure energy security. An increased focus on ensuring energy security could significantly affect the trajectory of this trend, either slowing or increasing the shift to zero carbon energy.

See: [*Foresight trend report: Scaling up the energy transition*](#), ISO News 2022



Scope and key aspects

- **Investment in renewable energy sources and "clean" energy technologies.** Growth in these high performing, innovative, low carbon and cost-effective technologies will be required to make today's energy system more sustainable, competitive and secure.
- **Prioritization of energy efficient practices.** Focusing on efficiency is one of the fastest and most cost-effective ways to reduce CO₂ emissions, contribute to energy security and help to make organizations more competitive.
- **Utilization of Carbon Capture and Storage.** Achieving 2050 climate objectives in a cost-effective way may require scaling up of carbon capture and storage.
- **The future of nuclear power.** Achieving a viable and diverse energy mix, limiting CO₂ emissions, and maintaining energy security and independence could require nuclear power to remain a significant source of electricity generation into the future.
- **The decline of oil, gas and coal.** Global policy focus on climate action and achieving net zero means that dependency on fossil fuels will need to significantly decrease.

The trend in focus: Energy sources

'Energy Sources' refers to the transformation of the energy sector to minimize greenhouse gas emissions. It is the drive to ensure that energy production becomes affordable, reliable, and sustainable, e.g., by phasing out fossil fuels, scaling up low- and zero-carbon energy sources and additional solutions such as carbon capture, and improving every aspect of energy management, from producer to consumer.

Selected facts and figures

- The world population is expected to reach 8.6 billion in 2030, 9.8 billion in 2050 and 11.2 billion in 2100.¹ The energy that powers our daily lives produces three-quarters of global emissions.²
- Global energy consumption will likely grow by nearly 50% between 2020 and 2050.³
- It's estimated that almost 90% of global electricity generation in 2050 will come from renewable sources, with solar photovoltaic and wind together accounting for nearly 70%.⁴
- The energy mix is expected to rapidly shift towards power, synfuels, and hydrogen, representing an estimated 32% of the global energy mix by 2035 and 50% by 2050.⁵
- Since the start of 2018, momentum behind Carbon capture, utilization and storage has been growing. Project developers have announced ambitions for over 200 new capture facilities to be operating by 2030, capturing over 220 Mt CO₂ per year. Nevertheless, even at such level, Carbon capture, utilization and storage deployment would remain substantially below what is required in the Net Zero Scenario.⁶
- The IAEA sees world nuclear generating capacity more than doubling to 873 gigawatts net electrical (GW(e)) by 2050, compared with current levels of around 390 GW(e).⁷
- Energy efficiency represents more than 40% of the emissions abatement needed globally by 2040 to be in line with the Paris Agreement.⁸

The trend in focus: Energy sources

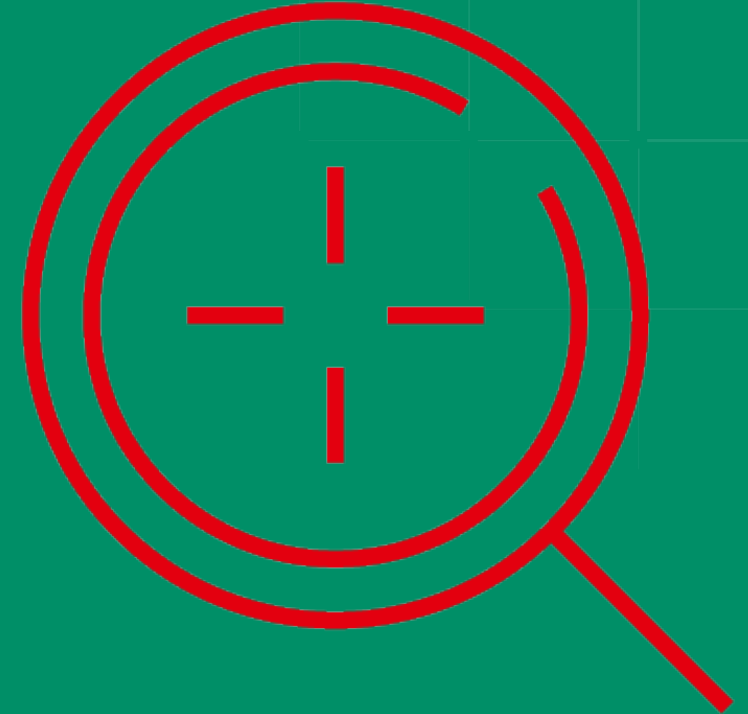
References

1. [The World Population Prospects: The 2017 Revision](#), UN 2017
2. [Net zero by 2050 plan for energy sector is coming](#), IEA 2021
3. [International Energy Outlook 2021](#), EIA 2021
4. [Net Zero by 2050. A Roadmap for the Global Energy Sector](#), IEA 2021
5. [Global Energy Perspective 2022](#), McKinsey 2022
6. [Carbon Capture, Utilisation and Storage](#), IEA 2022
7. [IAEA Projections for Nuclear Power Growth Increase for Second Year Amid Climate, Energy Security Concerns](#), IAEA 2022
8. [How Energy Efficiency Will Power Net Zero Climate Goals](#), IEA 2021

Food for thought

What if in 2050...

- the global economy is four times larger than today and requires 80% more energy?
- individuals and business receive tax credits based on yearly energy efficiency gains?
- international law requires that 100% of energy comes from renewable sources?
- the top three most profitable global companies are all carbon capture and storage companies?
- nuclear power is seen as the only way countries can guarantee their energy independence?



Emerging needs for standardization

- Need for standards to drive impactful climate action
- Increasing demand for new standards, e.g., especially in new technologies such as carbon capture or green hydrogen
- Need to ensure that existing standards are used to their best advantage by, e.g., engaging with new stakeholders, timely updating of standards, etc.
- ...

The trend in focus: Energy sources

ISO Technical Committees

- [*ISO/TC 67*](#) *Oil and gas industries including lower carbon energy*
- [*ISO/TC 85*](#) *Nuclear energy, nuclear technologies, and radiological protection*
- [*ISO/TC 180*](#) *Solar energy*
- [*ISO/TC 197*](#) *Hydrogen technologies*
- [*ISO/TC 207/SC 7*](#) *Greenhouse gas and climate change management and related activities*
- [*ISO/TC 265*](#) *Carbon dioxide capture, transportation, and geological storage*
- [*ISO/TC 301*](#) *Energy management and energy savings*