Pathways to Resilient and Carbon Neutral Energy Systems

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Towards sustainable renewable energy investment and deployment

Trade-offs and opportunities with water resources and the environment

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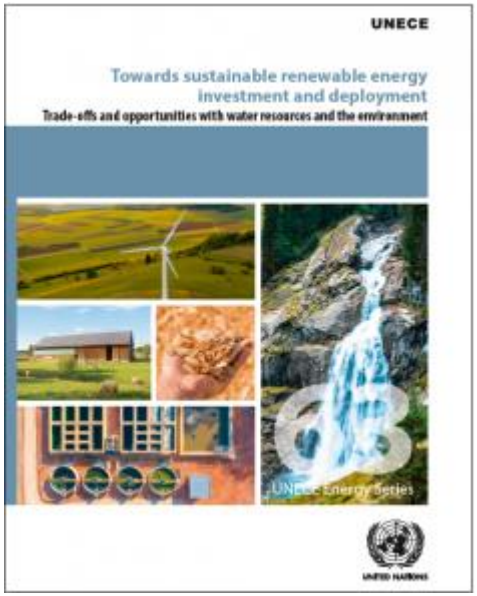
ENERGY

This report suggests a **non-comprehensive "tool-kit"** for policy makers to **identify**, **evaluate**, and **act upon the synergies and trade-offs** brought by the deployment of renewable energy.



- **Aim** is to upscale renewable energy while at the same time facilitate progress in the other sectors (**water, agriculture, and environment**).
- It uses the **nexus approaches** to achieve economic, social and environmental sustainability while improving quality of life.
- **A key factor is the capacity of energy policy makers to engage with other sectors and to convene these multi-stakeholder dialogues** to successfully exploit synergies and effectively address trade-offs.

Hard Talks: An Innovative Policy Dialogue Tool For Unblocking Renewable Energy Barriers to Investment

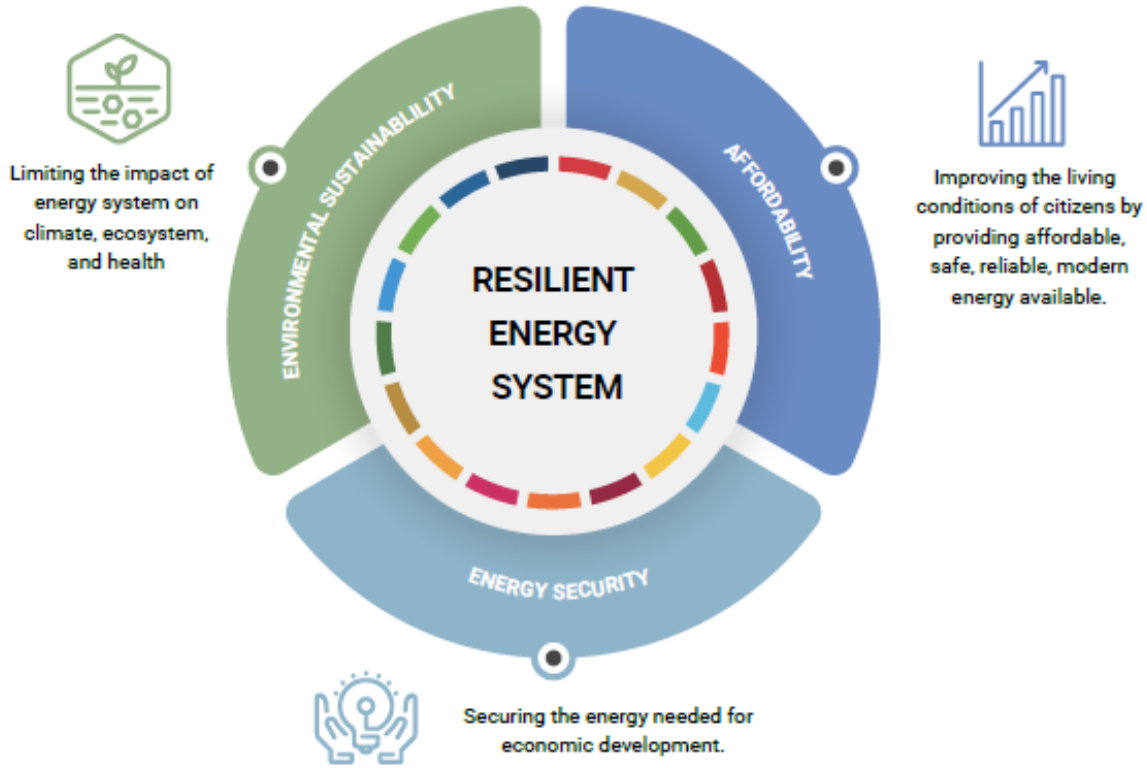
- A uniquely formatted **multi-stakeholder** dialogue among key national and international actors
- **Demand-driven**: adapted to the specifications and requirements of the host country;
- Discussion guided by a **practical "problem/solution" Discussion Paper;**
- **Neutral international facilitators** for the dialogue
- Involves a one or two-day format to **deliver key messages** from experts and main stakeholders through specific
- **Recommendations**, **prioritizing next steps,** that are sent to all participants and high-level decision-makers for further action

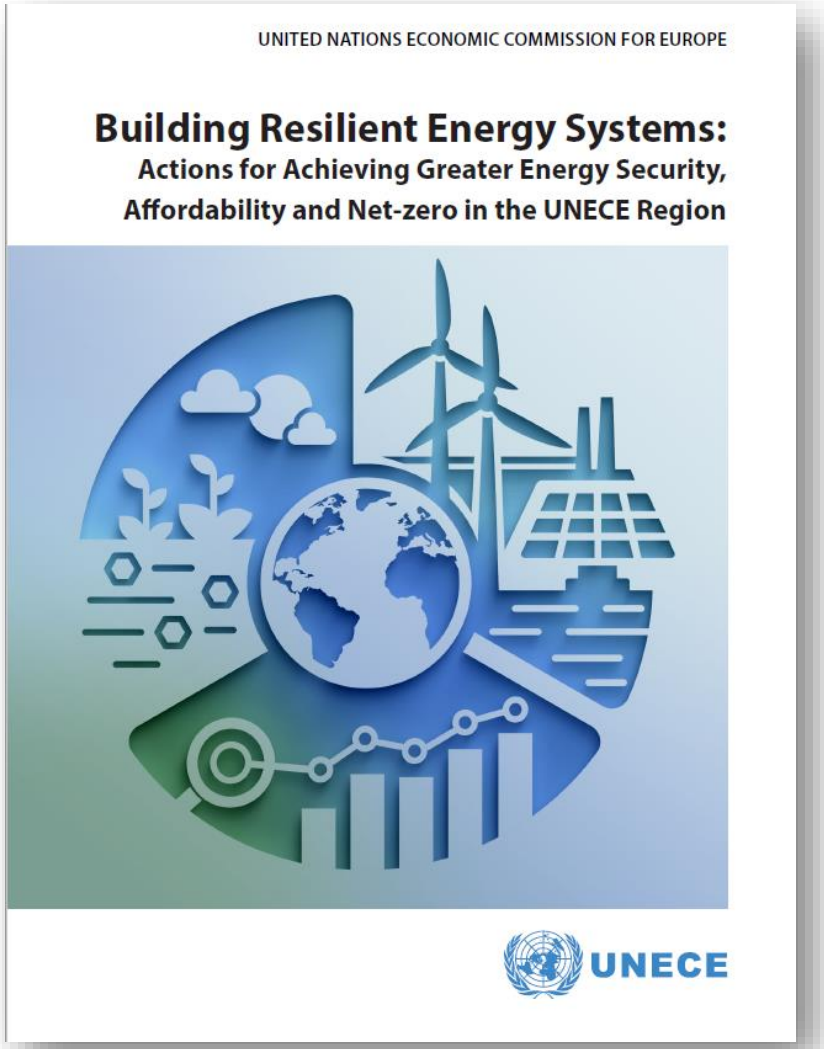
Building Resilient Energy Systems

Technical Considerations and Actions for Achieving Energy Security, Affordability, and Sustainability Net-Zero for Europe, North American and Central Asia

What is a resilient energy system?

- A **resilient energy system** ensures that energy makes an optimal contribution to a country's **social, economic, and environmental** development.
- **Energy security** strengthens energy independence through interconnectivity and trade.
- **Affordability** reduces costs of electricity, heating, cooling, and transport.
- **Environmental sustainability** lowers the carbon footprint and enhances efficiency across the energy supply chain.





Recommendations for Policymakers

The Expert Groups have aligned on five important recommendations to build a resilient energy system and achieve balance among affordability, energy security, and environmental sustainability:

1. **Prioritize and maximize the implementation of energy efficiency solutions** to drive down primary energy consumed while meeting economic and societal needs.
2. **Digitalize the energy system** and take advantage of increasing consumer digital literacy capturing the enormous optimization opportunity in the value chain.
3. **Accelerate fuel switching** to optimize the carbon footprint of end use energy and replace carbon intensive fuels where practical with low- and zero-carbon options.
4. **Manage resources effectively, sustainably, and with circular economy considerations**, using the UN framework Classification (UNFC) and UN Resource Management System (UMRMS).
5. **Accelerate the deployment of low- and zero-carbon technologies** by scaling renewable energy, nuclear power and advanced fossil fuels with carbon capture, use and storage.

Key Considerations for Policymakers

As policymakers look across the options included and assess what will be best for their circumstances, it is important to bear in mind the following key considerations:

1. Recognize that there is not a one-size-fits-all approach.
2. Consider long term goals as they design policies today.
3. Address behavioural barriers to unlock innovation and digitalization potential.
4. Build a workforce to deliver on a just energy transition and address the skills shortage.
5. Integrate resiliency concerns into existing and related planning efforts.
6. Consider climate change impacts on supply and demand.

UNECE Carbon Neutrality Toolkit

Building Resilient Energy Systems

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Building Resilient Energy Systems

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TECHNOLOGY BRIEF

CARBON CAPTURE, USE AND STORAGE (CCUS)

UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

Carbon Neutrality in the UNECE Region:
Integrated Life-cycle Assessment
of Electricity Sources

UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

Carbon Neutrality in the UNECE Region
Technology Interplay under the
Carbon Neutrality Concept

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NUCLEAR POWER

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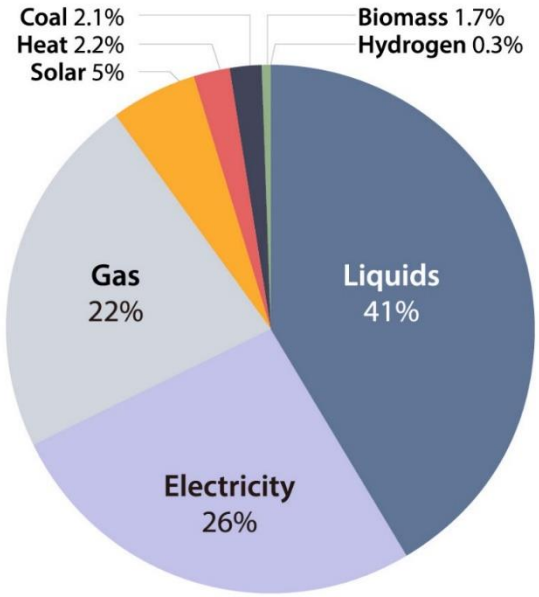
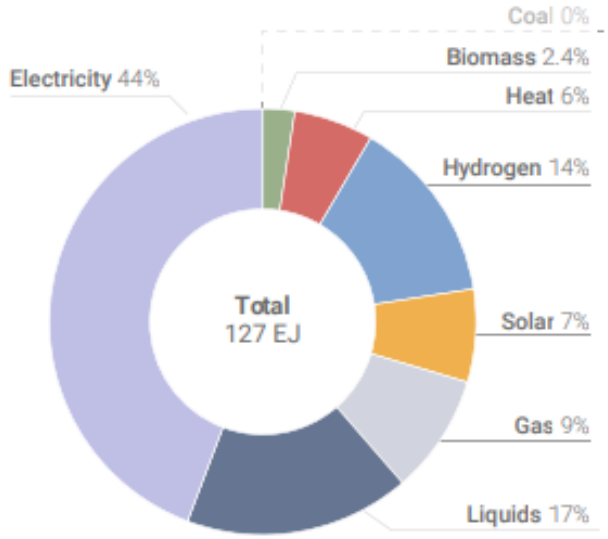
Diversifying resource base to attain a resilient energy system

What energy resources will be at the core of a future energy system?

Final Energy Supply [EJ]
Comparison between Carbon Neutrality and Reference Scenarios



Reference Scenario
Final Energy 2050



Carbon Neutrality Innovation Scenario
Final Energy Supply 2050

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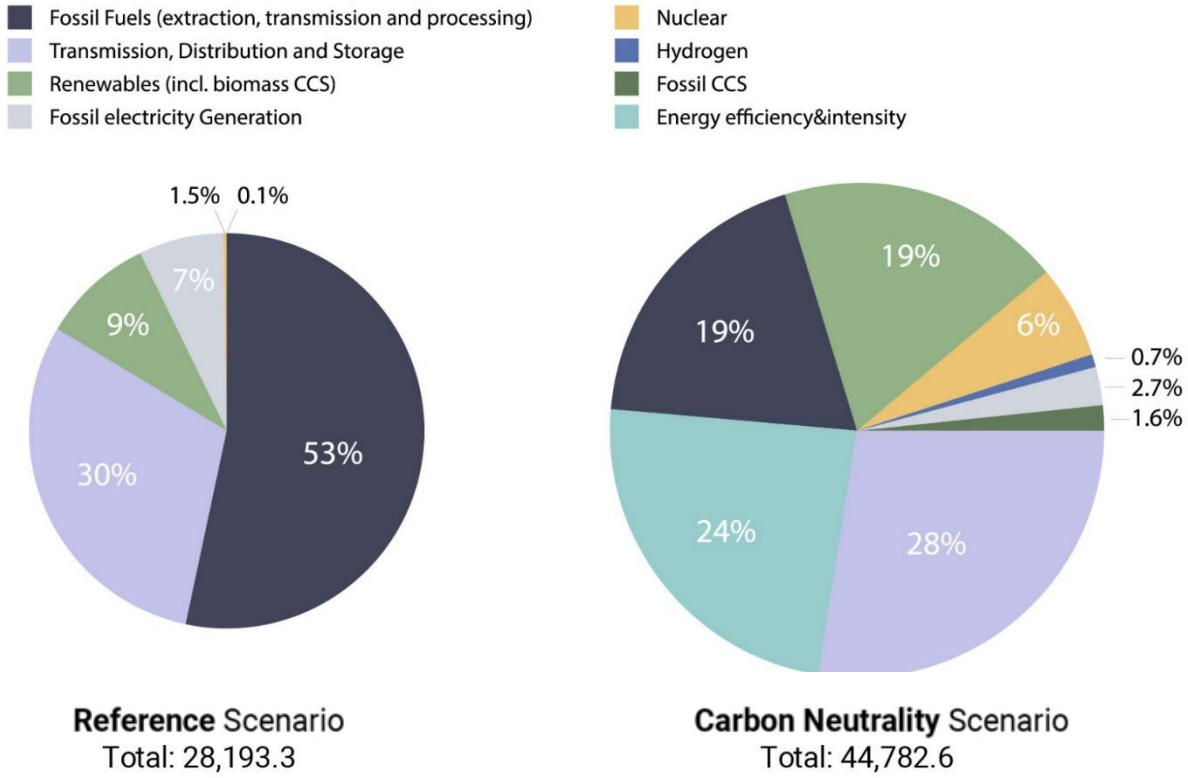
Investments are needed across all low- and zero-carbon technologies

What is the difference between current vs. required spending?



Total Investment Needs for UNECE Energy System Reference and Carbon Neutrality Scenarios [USD, Billion]

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Thank you!

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