



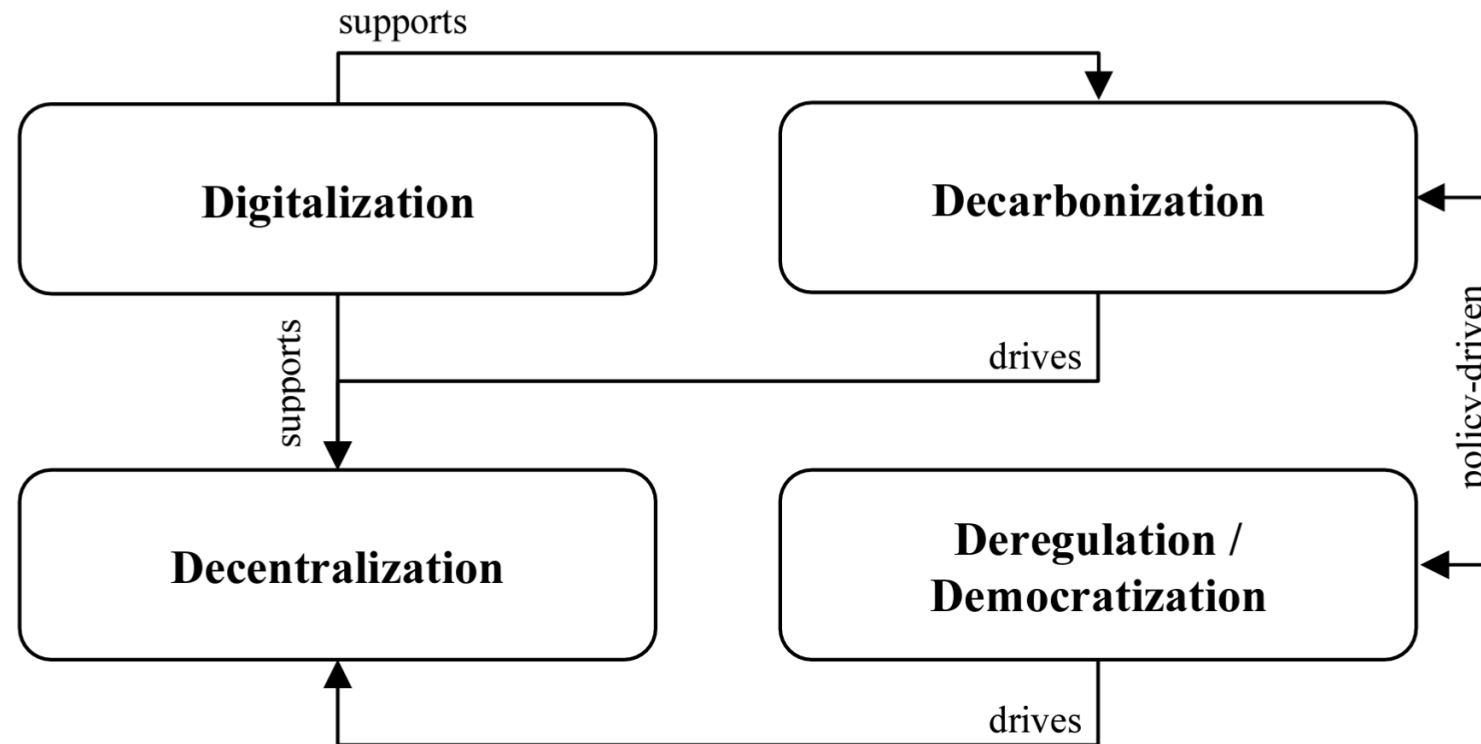
UNECE



Decarbonization, Digitalization, and Decentralization of Energy Systems

Opportunities and challenges of the use of AI in energy

Transformation of the energy sector



The role of AI in energy

Smart grid management and optimization

- Efficiency enhancement
- Reliability improvement
- Sustainability focus
- Real-time analysis
- Predictive maintenance
- Demand response

Smart generation services

- Output forecasting
- Renewable energy integration
- Storage solutions
- Plant optimization
- Capacity forecasts

Energy trading, market design and operations

- Market trend prediction
- Automated bidding
- Risk management
- Market transparency

Data management and data security

- Cybersecurity measures
- Operational data analysis
- System interoperability
- Compliance and governance

Delivered energy and managed services

- Rates design
- Balanced EV integration
- Demand forecasting
 - Residential
 - Commercial
 - Industrial

Challenges in AI integration



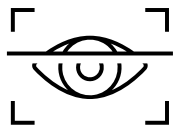
Data privacy and security: ensuring the safety of personal and operational data



Energy consumption: AI systems, including data centres, add to energy demands



Skills gap: need for professionals with expertise in ai and energy

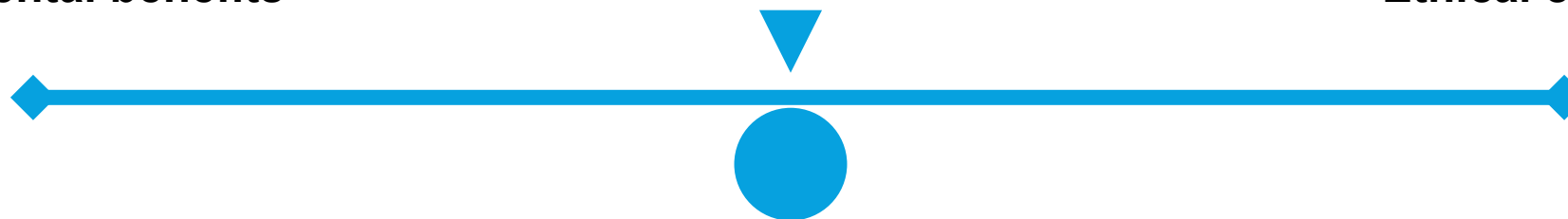


Transparency and ethics: mitigating risks of bias and ensuring responsible AI deployment

Balancing benefits and risks

Enhanced decision-making
Optimized resource use
Predictive maintenance
Empowered consumers
Environmental benefits

Cybersecurity threats
Data privacy concerns
Energy consumption of AI systems
Transparency and trust
Ethical concerns



Policy recommendations

Promote **upskilling** in digitalization in energy

Encourage **open data initiatives** while safeguarding privacy.

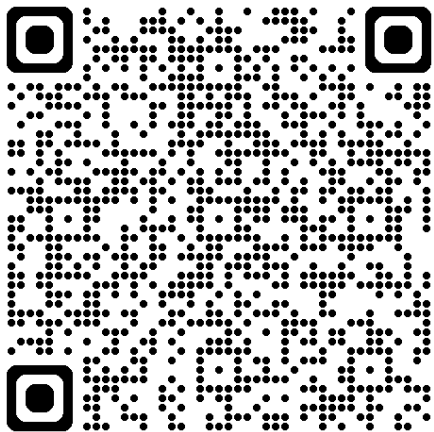
Provide incentives for **digital infrastructure investments**.

Establish **ethical guidelines** to align AI use with sustainability goals

Key policy interventions and normative work to adapt to the new energy context:

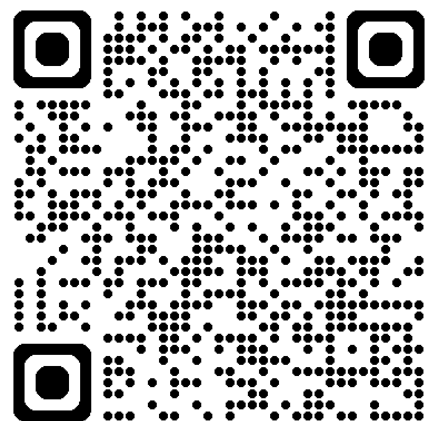
- Data protection
- Cybersecurity
- Supportt to R&D and technological innovation
- Cross-industry collaboration
- Behavioural change and market adaptation
- Responsible use of digital technologies

What is UNECE doing in this direction?



Developed in line with core functions of UNECE, a rich body of our **instruments** drives progress of UNECE member States towards the green transformation.

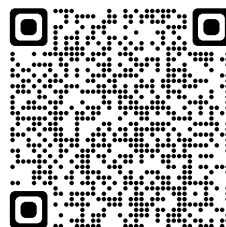
See: Toolbox of ECE instruments (E/ECE/1505):



Linked to energy, UNECE **pioneers sectoral digitalization** efforts: **UNECE Task Force on Digitalization in Energy** is a platform for cross-sectoral dialogue that shapes the respective policy agenda.

See: Task Force information and documentation:

UNECE Task Force on Digitalization in Energy



<https://unece.org/sustainable-energy/energy-efficiency/digitalization-energy>



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Thank you!

Igor Litvinyuk

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Sustainable Energy Division

UNECE

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