# From forecasts to decisions – do we need to care about AI safety?

Lukas Strauss

austro control
DIGITAL SERVICES

**IEA Wind TCP Task 51 Workshop "Forecasting extremes in the power system"**
**30 Sept – 1 Oct 2025, Offenbach am Main, Germany**

# About this talk

- Not a scientific talk
- Not *the* AI expert
- Austro Control Digital Services (ACDS)
  - tailored solutions to integrate weather impact into decision making

 Aviation Sector

 Energy Sector

# Projects at ACDS


**SIMONA**
**AI-based image recognition system** to determine visibility conditions at airports


**PROFICIENT**
**Extreme production anomaly detection and attribution**
for Austria's wind power

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- Austro Control Digital Services (ACDS)
  - tailored solutions to integrate weather impact into decision making

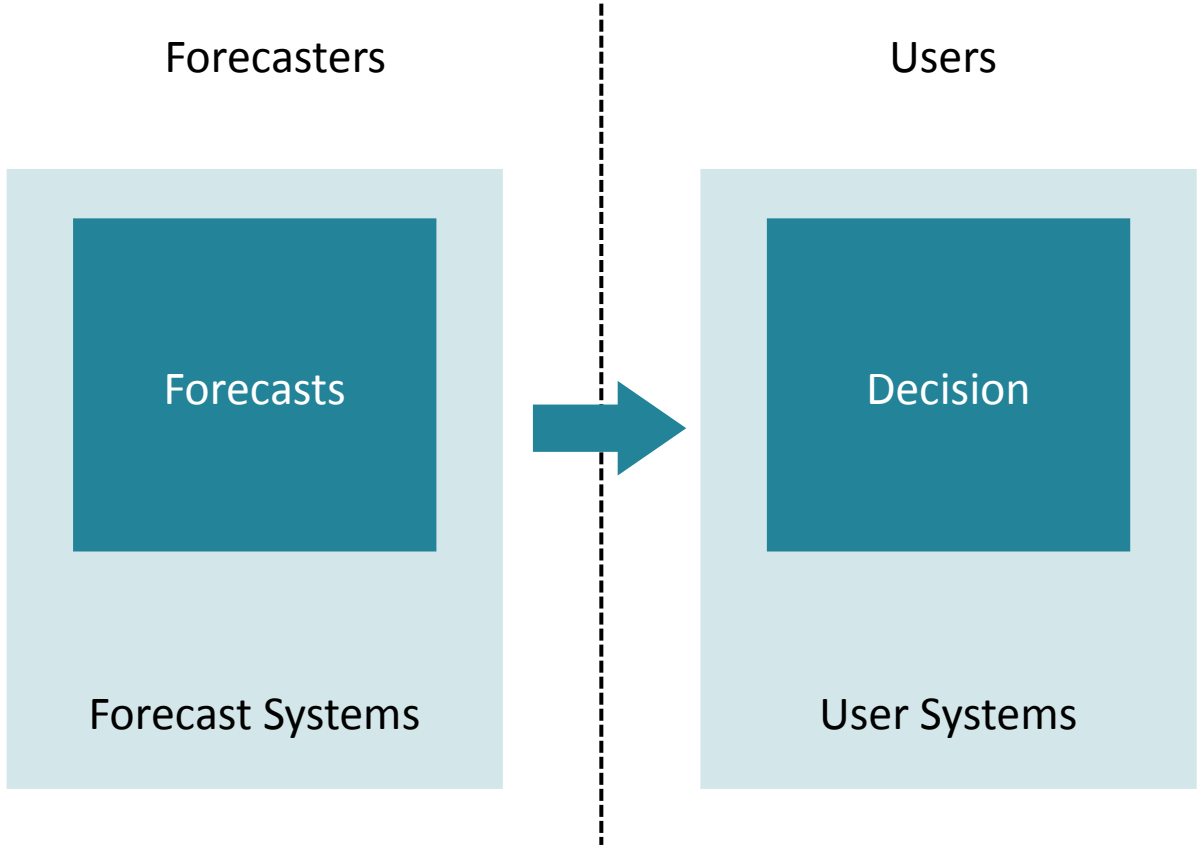
 Aviation Sector

 Energy Sector

- How safe are our AI-driven decision support systems?

# Context and motivation

# From forecasts to decisions

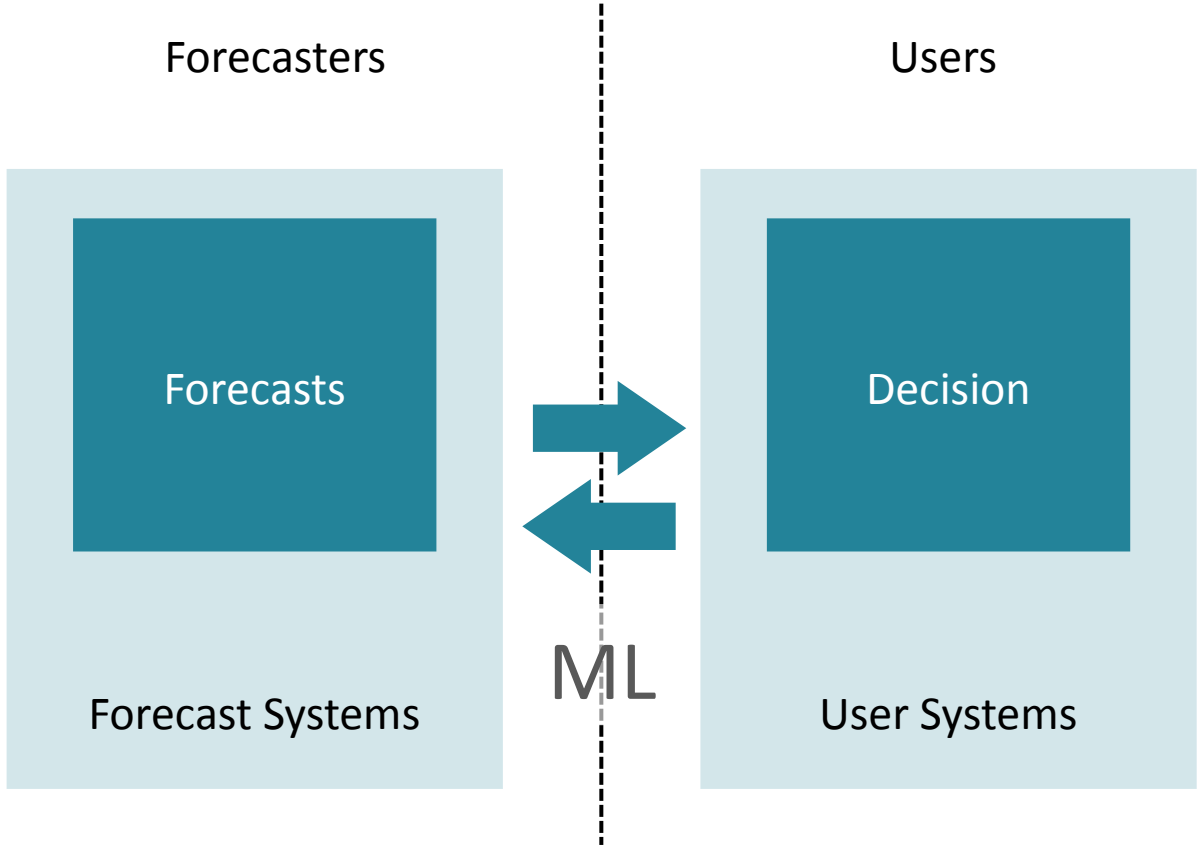



## Yesterday

Forecasts "as is"

E.g., wind power forecasts for maintenance planning

# From forecasts to decisions

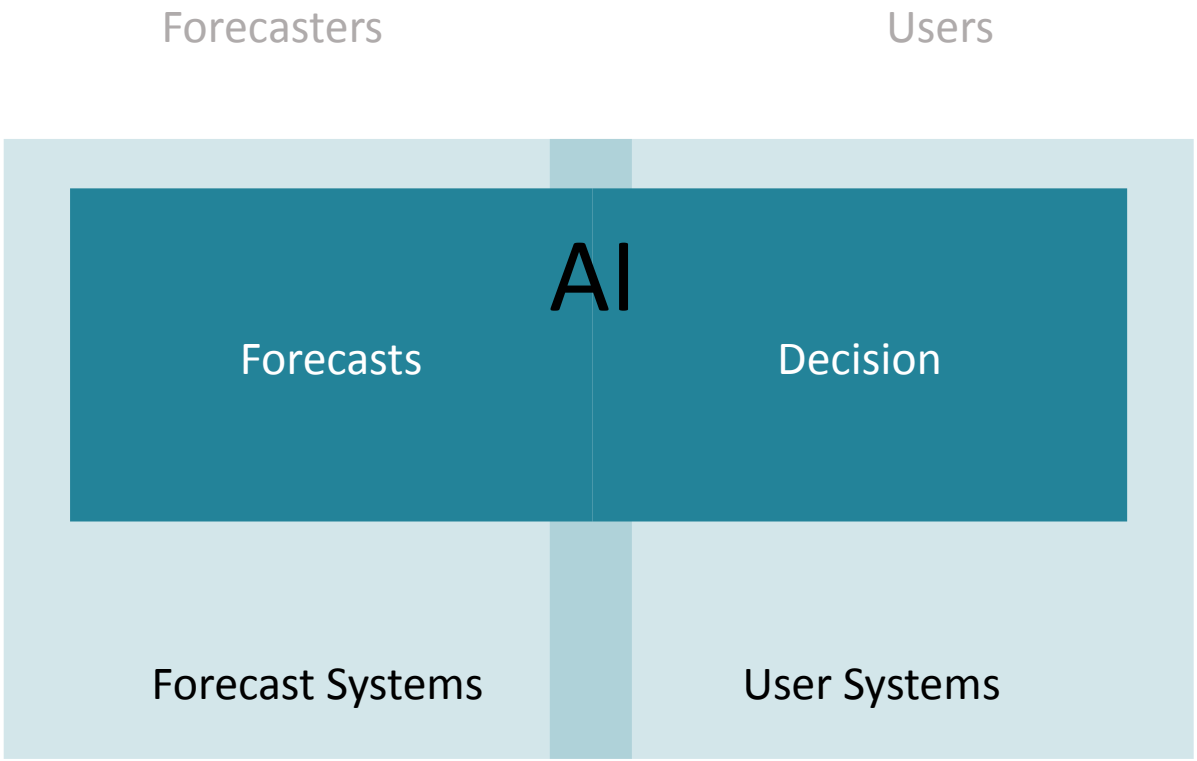



## Today

Optimization on application variables

E.g. bidding on the market, load balancing

# From forecasts to decisions

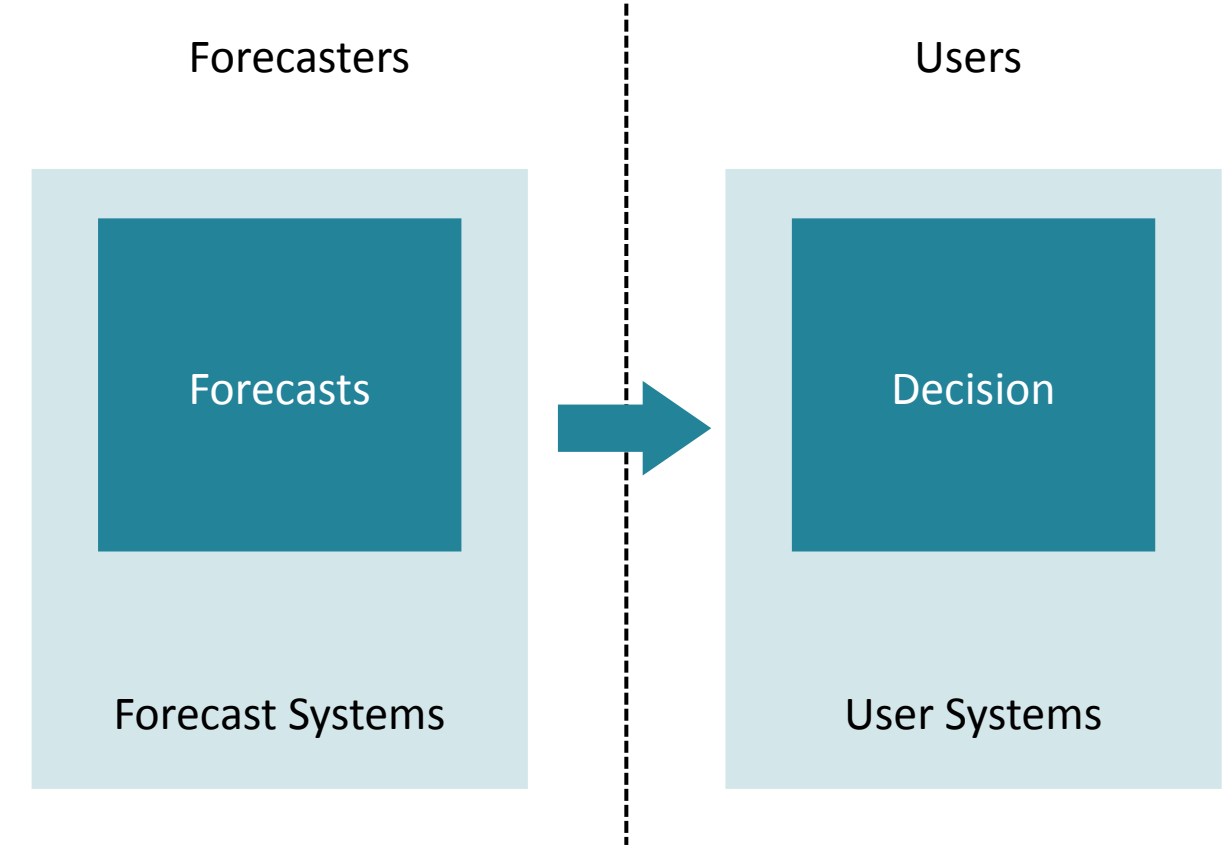



## Tomorrow
(the day after tomorrow)

Forecasts become decisions

E.g., in operating a system-critical power grid

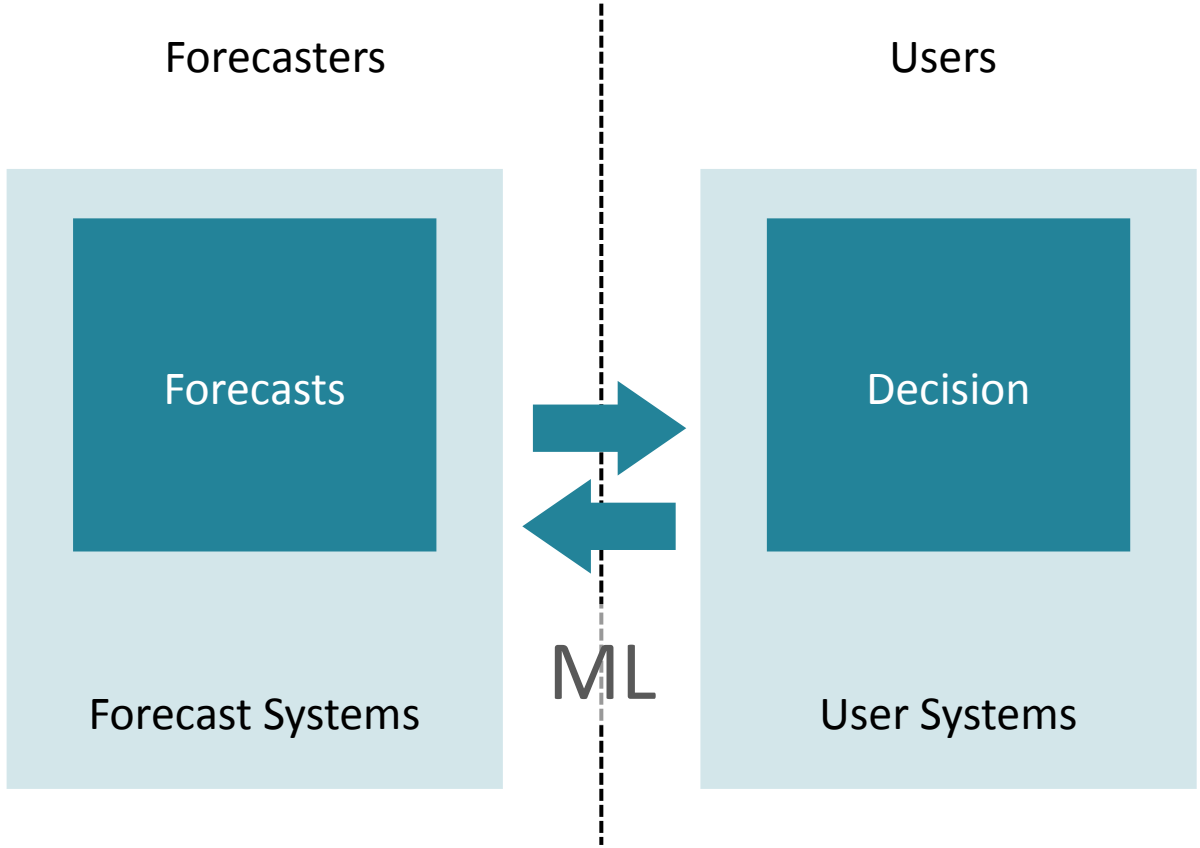
# From forecasts to decisions




Prediction

"This coming night, a down-ramp event will occur in your control area between 22:45 and 01:00 with a magnitude of 2.5 GW."

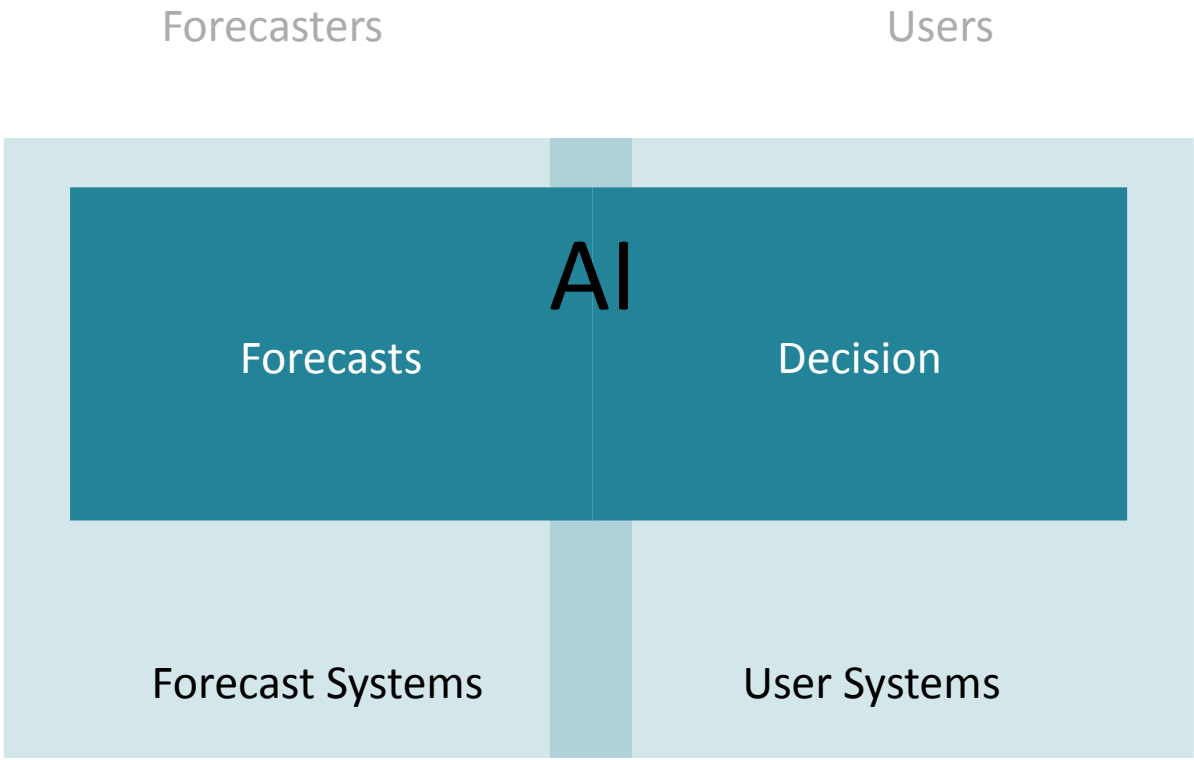
# From forecasts to decisions




Prescription

"This coming night, starting at 22:45, request reserves on the order of 2.5 GW to compensate missing wind power as anticipated."

# From forecasts to decisions




Action

"Tonight, starting at 22:45, I will request reserves from gas power plants at locations X, Y und Z vor, to automatically balance a power loss of up to 2.5 GW."

# From forecasts to decisions

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"Tonight, starting at 22:45, I will request reserves from gas power plants at locations X, Y und Z vor, to automatically balance a power loss of up to 2.5 GW."

What could go wrong?

# From forecasts to decisions

**Incomplete data base**
Power plant Y currently in maintenance

**Case outside Operational Design Domain**
Ramp event of this scale not included in training data set

## What could go wrong?

**Imperfect interaction AI <> human operator**
Dual intervention in the system not thought through

**Too high complexity of the event**
Simultaneous cold spell, reserves exhausted

**Action**

"Tonight, starting at 22:45, I will request reserves from gas power plants at locations X, Y und Z vor, to balance automously a power loss of up to 2.5 GW."

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**We need to do our AI (safety) homework!**

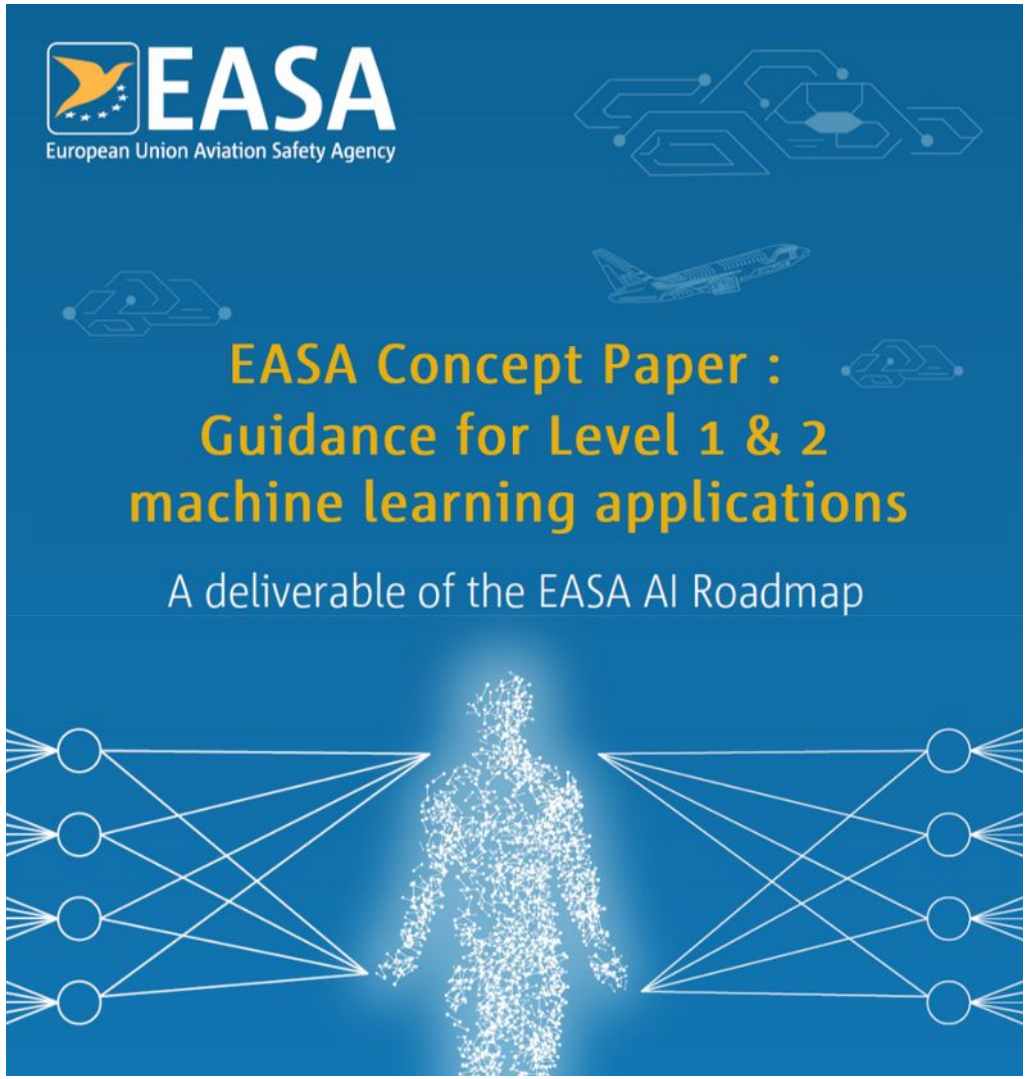
# A peek into another sector …

# AI safety in the aviation sector

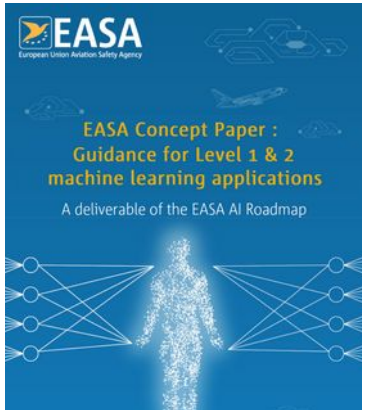
## EASA AI Guidelines

European Union Aviation Safety Agency

"It aims at guiding applicants when introducing AI/ML technologies into systems intended for use in safety-related or environment-related applications."



# AI safety in the aviation sector



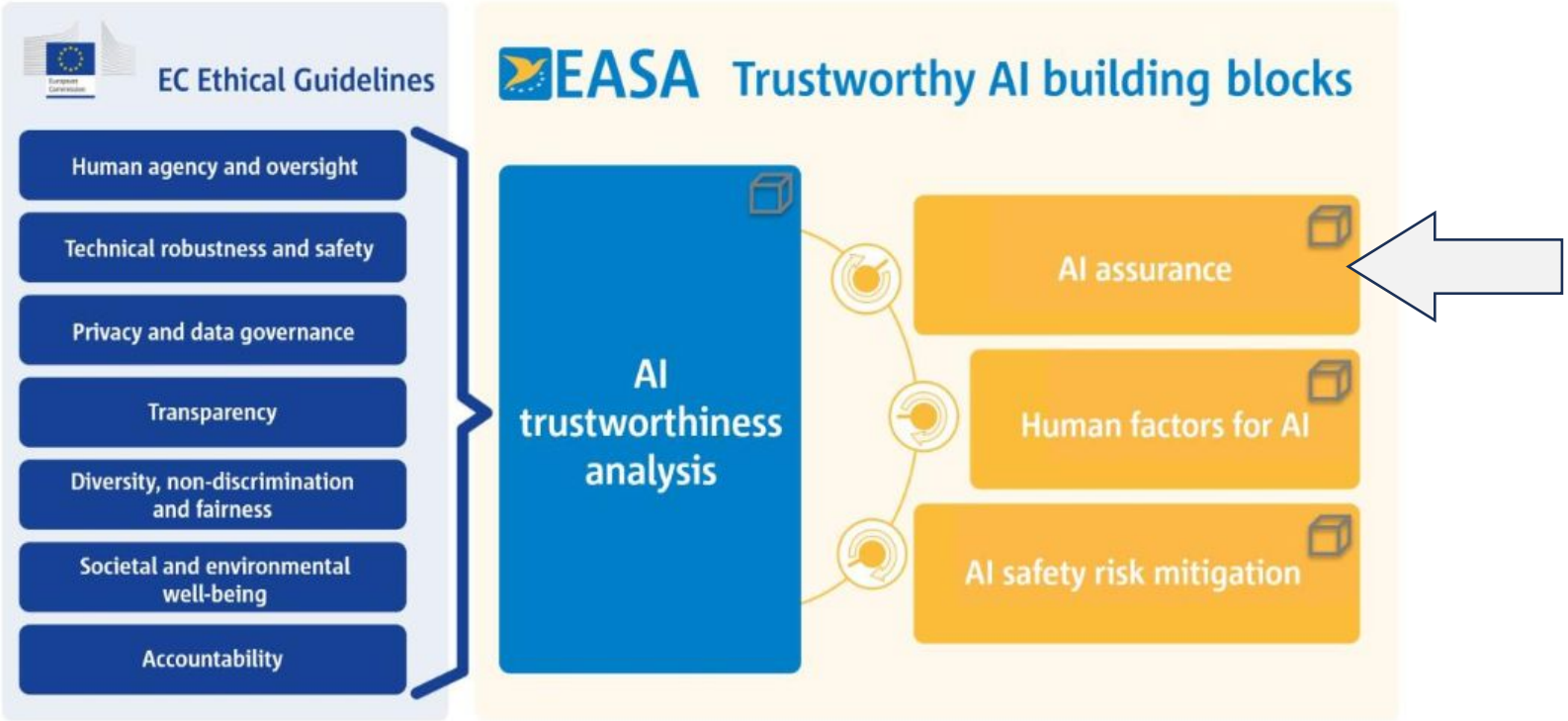
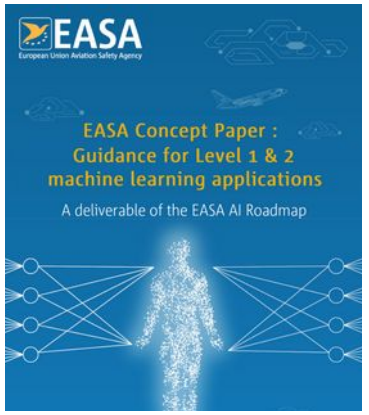
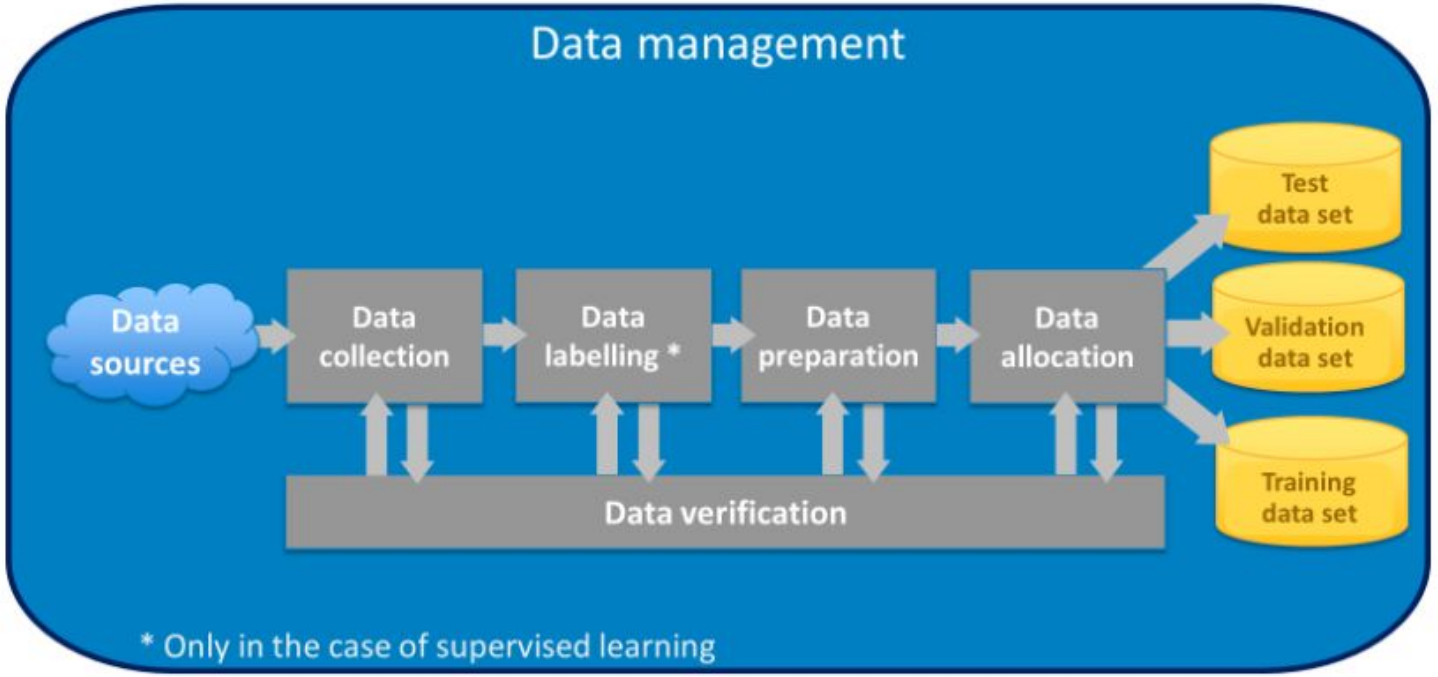



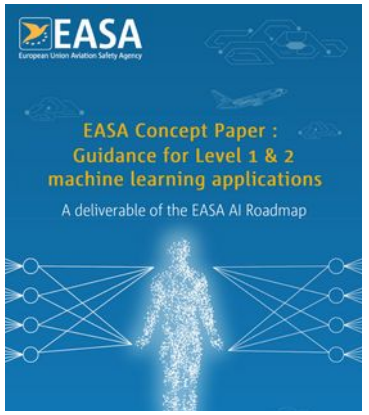

*Figure 2 — EASA AI trustworthiness roadmap building blocks*

# AI safety in the aviation sector



# AI safety in the aviation sector



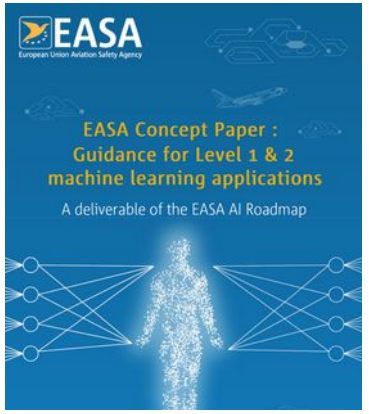

**Objective DA-04:** The applicant should capture the DQRs for all data required for training, testing, and verification of the AI/ML constituent, including but not limited to:

**Objective LM-01:** The applicant should describe the ML model architecture.

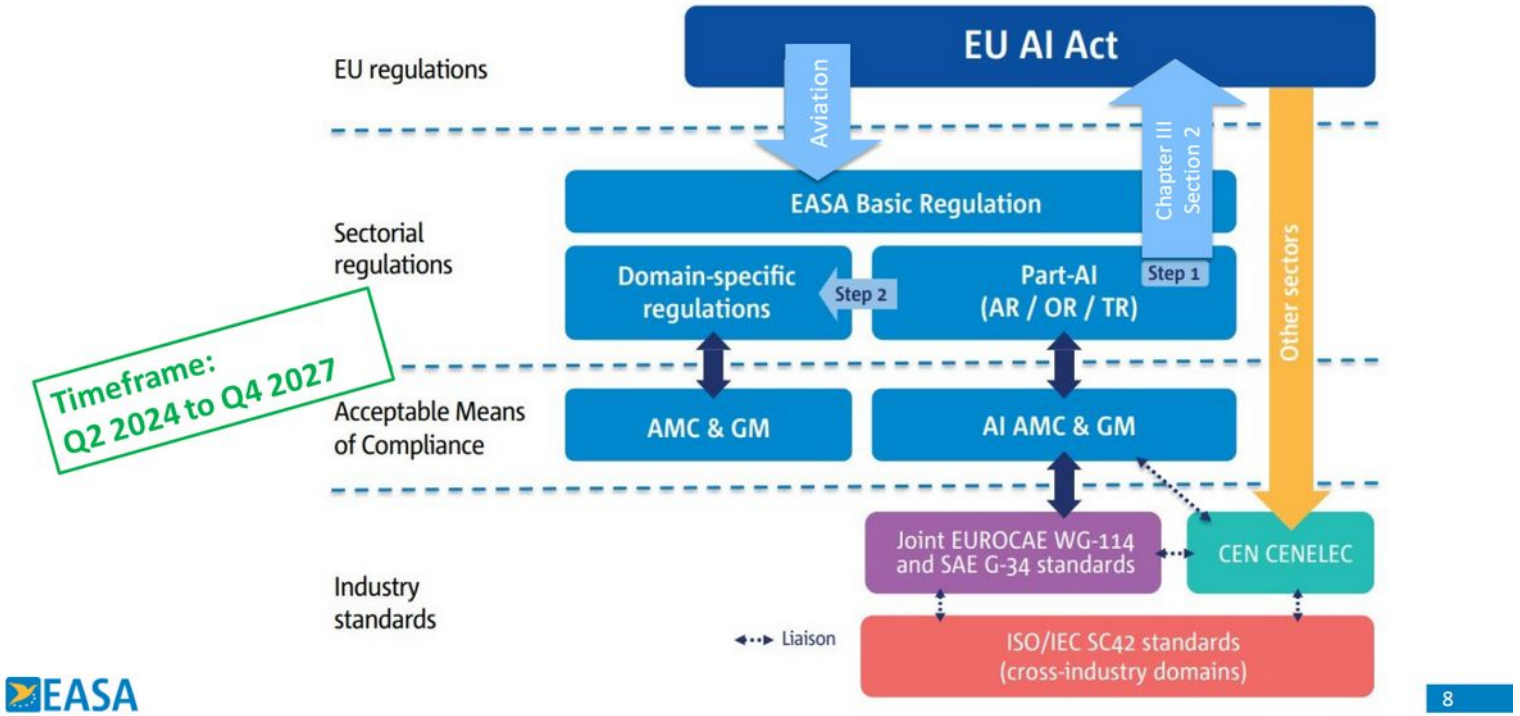
**Objective LM-11:** The applicant should provide an analysis on the stability of the learning algorithms.

**Objective LM-13:** The applicant should perform and document the verification of the robustness of the trained model in adverse conditions.

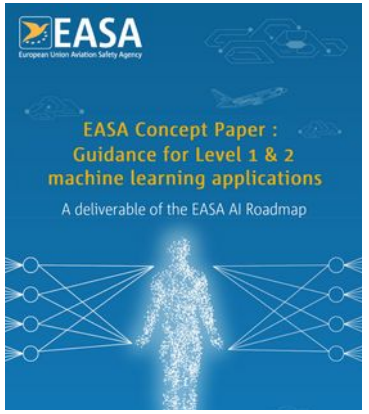
# AI safety in the aviation sector




## EASA Rulemaking plan for AI - EPAS RMT.0742



# AI safety in the aviation sector

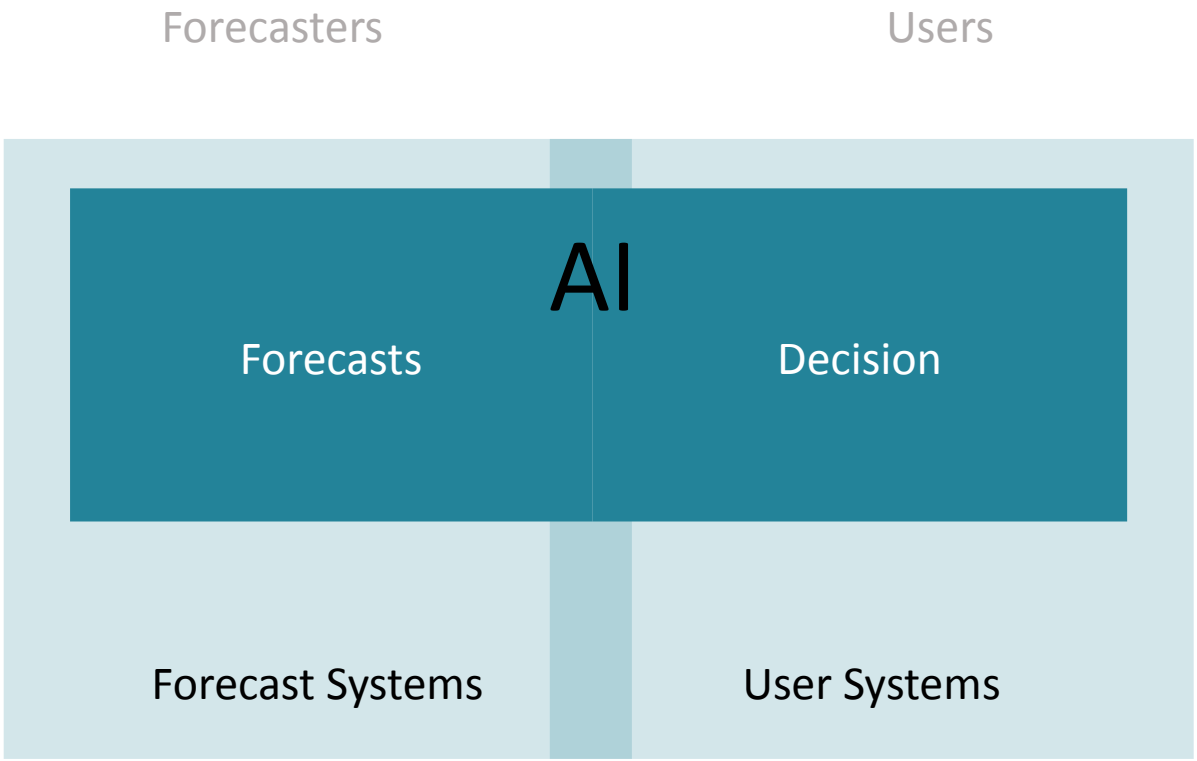



## In summary

- European effort by central organization / authority
- Inclusion of stakeholders
  - dedicated meetings
  - pilot projects
- Top-down *and* bottom-up
- From guidelines to regulations

# Discussion

# From forecasts to decisions




Discussion

## Do we need to care about AI safety?

# From forecasts to decisio Discussion

**slido #1**

*Do you think AI safety needs to be addressed – and when?*

Select your answer.

# From forecasts to decisio Discussion

**slido #2**

*Who do you think should take up this cause?*

Rank by importance.

# From forecasts to decisio Discussion

**slido #3**

*Where to start?*

Please add your thoughts or point to existing efforts. (free text)

# Ongoing efforts in the energy sector

# AI safety in the energy sector

LINK




LINK

LINK


TEF for Smart Cities & Communites
**Citcom.AI**


LINK

# AI safety in the energy sector

LINK

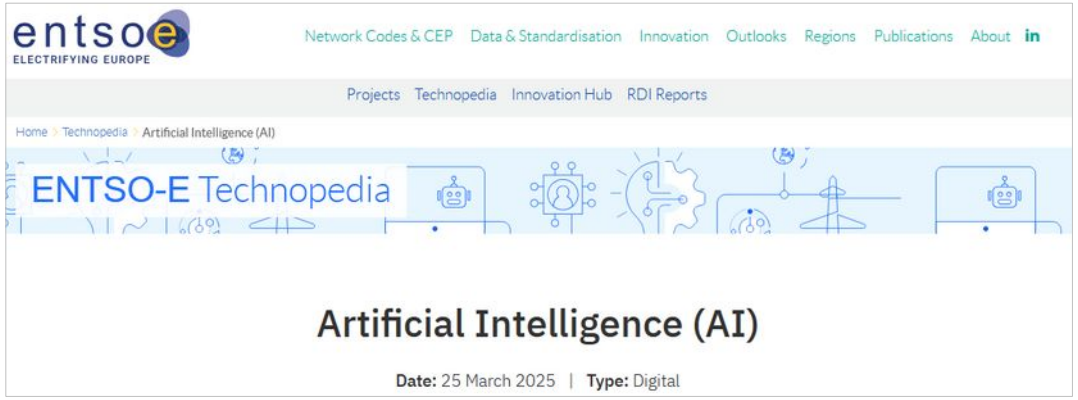

ENTSO-E

**RDI Roadmap 2024–2034**

Innovation Missions to build the power system for a Carbon-Neutral Europe

LINK

LINK



# AI safety in the energy sector

LINK

European Commission

EN

NEWS ANNOUNCEMENT | 6 August 2025 | Directorate-General for Energy | 1 min read

## Strategic Roadmap for digitalisation and AI in the energy sector – consultations opened

# AI safety in the energy sector

LINK

European Commission

EN

TRAINING AND WORKSHOPS

## Workshops on AI in the energy sector

energy efficiency | artificial intelligence | energy policy

Monday 15 September 2025, 09:30 - Thursday 25 September 2025, 11:30 (CEST)

Online only

# AI safety in the energy sector

- **15 September 2025 @ 9:30 am - 11:30 am CEST - Opportunities of AI and foundation models in the energy sector**
  The workshop will aim at identifying the potential of AI and foundation models for energy, the barriers for their development and deployment, and the interest from the actors involved in developing solutions.
  Agenda | Recording (YouTube)

Agenda (PDF)

YouTube Rec

- **25 September 2025 @ 9:30 am - 11:30 am CEST - Challenges and risks related to the use of AI in the energy sector**
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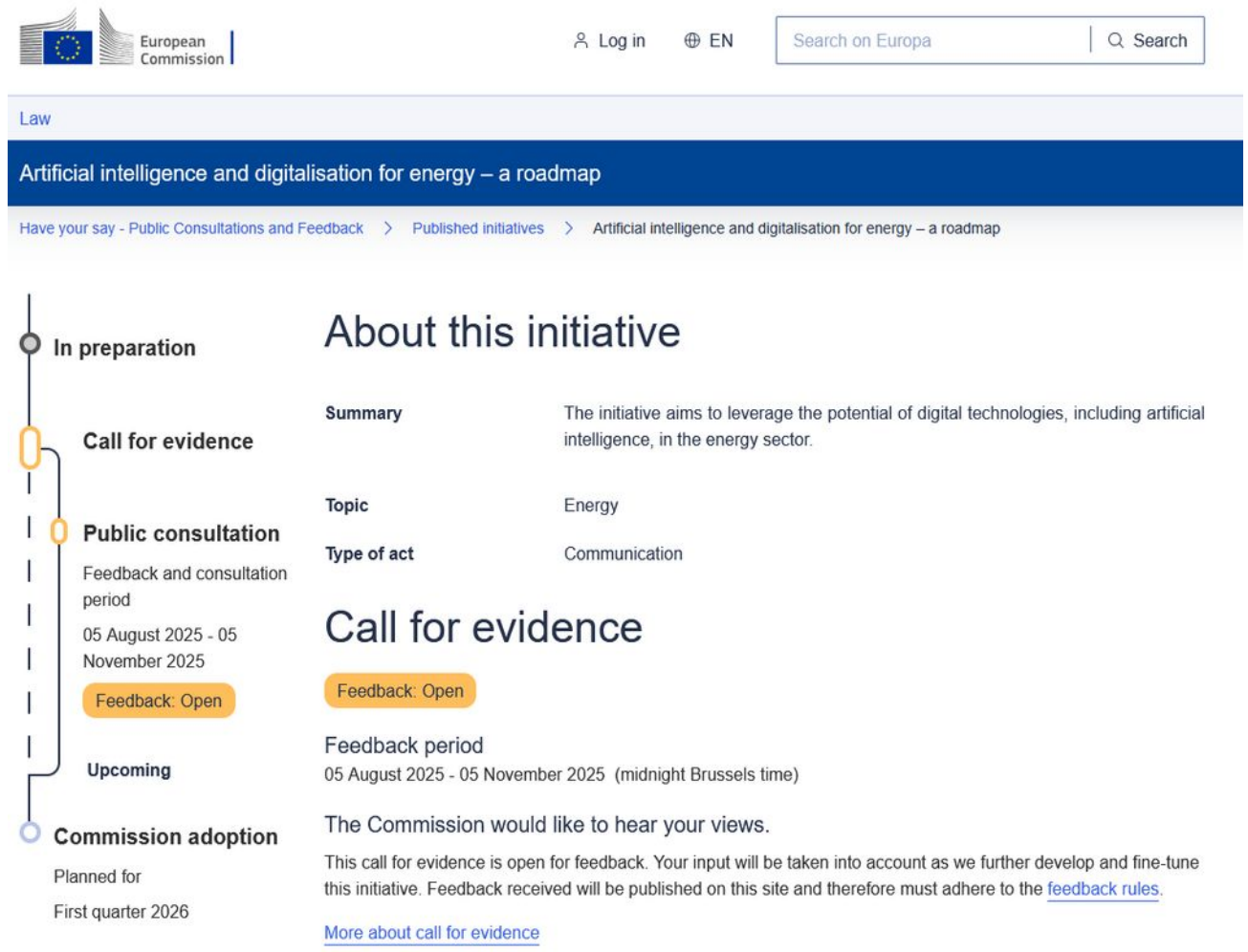

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## Strategic Roadmap for digitalisation and AI in the energy sector – consultations opened

LINK

# AI safety in the energy sector

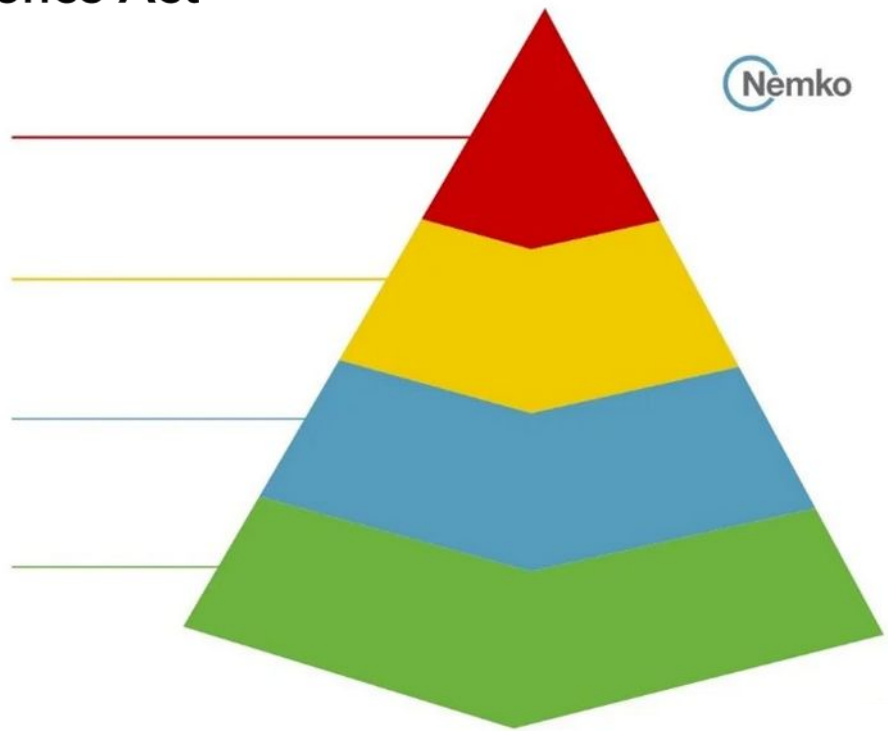
EU Artificial Intelligence Act

agentic

prescriptive

predictive

- **PROHIBITED AI SYSTEMS**
  Prohibited
- **HIGH RISK AI SYSTEMS**
  Must undergo a comformity assessment
- **LOW RISK AI SYSTEMS**
  Must adhere to transparency requirements
- **NO RISK AI SYSTEMS**
  No obligations




We need to do our AI safety homework together!

# Extra material

# AI safety in the energy sector

LINK

European Commission

EN

NEWS ANNOUNCEMENT | 6 August 2025 | Directorate-General for Energy | 1 min read

## Strategic Roadmap for digitalisation and AI in the energy sector – consultations opened

The Commission has launched an open public consultation and a call for evidence on the upcoming Strategic Roadmap for digitalisation and artificial intelligence (AI) in the energy sector. Both exercises are important elements that will feed into the preparation of this roadmap, due for publication in the first quarter of 2026.

With the Commission having previously stressed that the green and digital transitions should support each other, the aim of the strategic roadmap is to accelerate the rollout of digital solutions (including European AI solutions) in important areas for the decarbonisation process, such as electricity grid optimisation, energy efficiency in buildings and industry and demand-side flexibility. The consultation underlines that fostering research, innovation and coordination in those fields will further help prepare the energy system of tomorrow. It will also consider the increasingly heavy energy consumption of data centres and look at how they can be more sustainably integrated into the energy system. Another area of interest is the need to implement safeguards to mitigate potential challenges linked to the large-scale deployment of AI solutions in the energy sector.

Both consultations will remain open for 13 weeks and will close on 5 November 2025. As well as the open public consultation and the call for evidence, the Commission is holding targeted consultations through dedicated workshops with stakeholders from the digital and energy fields. Foreseen in the Affordable Energy Action Plan, the strategic roadmap also complements the multiple initiatives announced in the AI field such as the AI Act and the AI Continent Action Plan.

# AI safety in the energy sector

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European Commission

TRAINING AND WORKSHOPS

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The use of Artificial Intelligence (AI) in the energy sector presents a significant opportunity for reduction of costs, decarbonisation and energy efficiency. The energy system is becoming more and more complex, with rising electrification, inverter-based renewables, distributed energy resources, more data available and digitalised communications and controls. Foundation models could be a powerful tool to tackle these challenges, with the use of large amounts of unstructured data.

Multiple applications in grid management, such as forecast, congestion management, anomaly detection, power flow solutions, transient modelling or predictive maintenance, could enhance real time operation, planning, and asset management. Additionally, they could be combined with consumption data enabling enhanced renewable integration and demand side flexibility.

# AI safety in the energy sector

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TRAINING AND WORKSHOPS

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Online only

The workshops are addressing mainly stakeholders from digital and energy value chains, including network operators, IT suppliers, SMEs, aggregators, system integrators, digital solutions providers, data center operators, cloud service providers, consumers, energy communities, appliance manufacturers, research community, energy intensive industries, building operators, car manufacturers and providers of e-mobility solutions.

Agenda (PDF)

YouTube Rec

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Agenda (PDF)

YouTube Rec

# State of affairs in the energy sector?

**"Operating AI Systems in the Electricity Sector under Europe's AI Act – Insights on Compliance Costs, Profitability Frontiers, and Extraterritorial Effects"** (2023),
F. Heymann, K. Parginos, **R.J. Bessa**, M. Galus

This article examines the implications of the European Union's proposed Artificial Intelligence Act on AI applications within the electricity sector. It provides an in-depth analysis of **compliance costs** associated with the Act, explores how these costs might affect the profitability of AI implementations. The study aims to offer valuable insights for stakeholders in the energy industry to navigate the evolving regulatory landscape effectively.

"Since the energy sector is a high-risk sector, aspects such as explainability and interpretability of AI-based systems are becoming fundamental requirements for AI adoption by industry (Heymann et al., 2023)"

**Artificial Intelligence and humans collaborate to increase safety of critical infrastructures"** (BIP, INESCTEC Magazine, 2023), **Ricardo Bessa**

AI4REALNET
AI FOR REAL-WORLD NETWORK OPERATION

This article discusses the AI4REALNET project, led by INESC TEC, which aims to integrate AI into critical infrastructure operations—such as power grids and transport systems—to enhance decision-making, efficiency, and safety. The project emphasizes human-AI collaboration to support operators, facilitating decarbonization and improving service quality.

# Integrated power system forecsting


Source: Austrian Power Grid, EnliteAI – LinkedIn-Post by Clemens Wasner, Dec 2024