

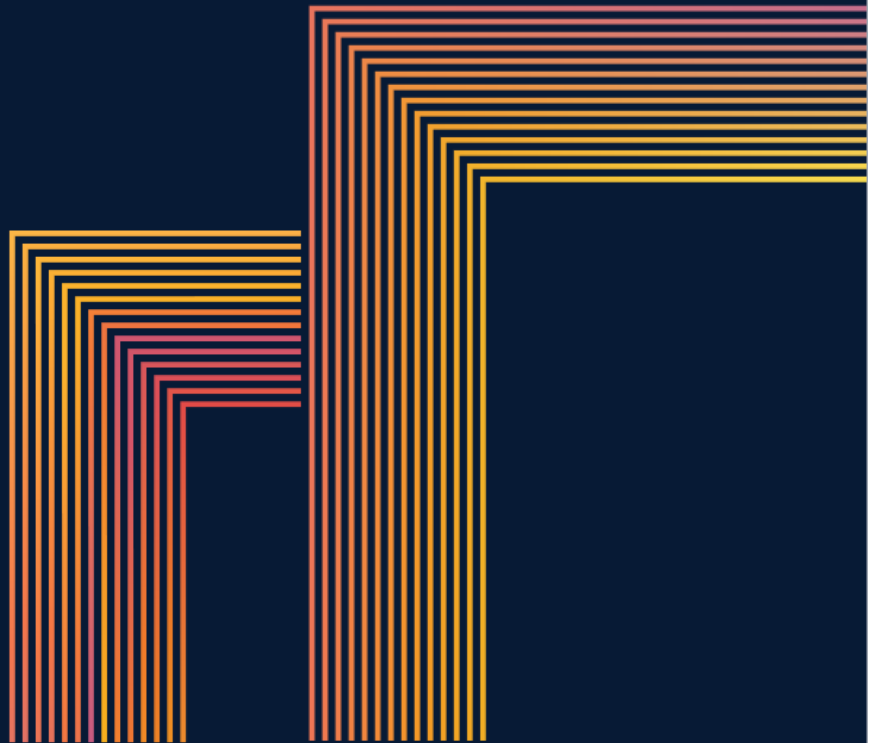


Energy & AI Student Fair

Challenge Questions and Guidelines 4 December 2024

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International
Energy Agency





Event Context

Artificial Intelligence (AI) is emerging as one of the most consequential technologies of our time. Recent progress in AI models shows huge improvements, with the latest generation approaching and even exceeding expert human-level performance on key benchmarks. AI's impact on the energy sector could be transformative. Innovation is taking place rapidly, and new use cases are emerging every day. The sector is already applying artificial intelligence to improve how energy is produced, consumed and distributed – making the operation of complex systems, such as the electricity sector, more secure, efficient and sustainable. Yet, complex challenges regarding the potential applications of AI in the energy sector remain.

Goals

The goal of the Energy & AI Student Fair is to open student's minds to the potential impact of AI in the energy sector and get their views on emerging challenges and opportunities. During a time of climate crisis and pivotal technological advancements, the opportunity to explore the interconnectedness of these fields offers a valuable learning exercise for students from a variety of subject domains. This is also an opportunity for the participating students to engage with energy and technology sector experts, who can reflect on their ideas.

Artificial Intelligence Definition

For this challenge, you may use a wide variety of AI applications, ranging from, but not limited to:

- Generative AI: Used for natural language processing tasks such as content generation, translation, and summarization
- Predictive AI: Used for analytics, pattern recognition and other decision-making
- Machine learning: Used for improving efficiency and performance in tasks such as resource allocation or shipping optimisation
- Agentic AI: Used for autonomous task execution, real-time adaptation and workflow automation

Energy Sector Definition

Energy is the building block of daily life, from powering homes, providing transportation, creating industry and goods to developing new technology. The energy sector encompasses the following value chains:

- Energy supply, including the production of primary energy sources like coal, oil, gas, and bioenergy
- Energy transformation, including electricity generation from fossil fuels or renewables, as well as other transformation processes like hydrogen production or crude oil refining.
- Energy transmission and distribution, including electricity networks, gas pipelines, tankers and terminals for transporting crude oil, etc.

- Energy consumption in all final consumption sectors, including commercial and residential buildings, the transportation sector, and industry and agriculture.

Example Application of AI in the Energy Sector

Methane is responsible for around 30% of the rise in global temperatures since the Industrial Revolution, and a large share of methane emissions come from the energy sector. Reducing methane emissions is key to limiting near-term global warming and improving air quality. Some methane emissions stem from methane leaks, a natural gas leak from an industrial facility or pipeline. However, identifying the locations where methane leaks occur can pose some challenges to governments and industry.

A new project, MethaneSAT, will use Google's AI to map methane leaks from satellite images. MethaneSAT will measure methane plumes from fossil fuel operations, using spectrometers and Google's image detection algorithms to map the industry's infrastructure. By identifying the location of methane leaks and who is responsible, this data can be leveraged to pressure companies to clean up operations and reduce methane

1. AI in Energy Supply and Generation

Electricity generation derives from various sources such as fossil fuels (coal, oil, natural gas), renewables (solar, wind, hydro, geothermal), and nuclear power. Efficient generation and distribution of electricity from these sources are vital for minimizing waste, integrating renewable energy, and maintaining a resilient grid. Because electricity cannot be cost-effectively stored at scale with today's technologies, electricity demand and supply must be balanced at all times and all locations on the grid. This makes the electricity system one of the most complex systems ever built and operated by human beings.

Challenge: *Imagine you are consulting for an electricity distribution company (such as EDF). The company has asked you to develop a strategy and/or product to use AI to reduce waste, optimise energy distribution, promote renewable integration and improve resilience and security. Prepare a pitch deck to the senior leadership team outlining your solution that addresses this challenge.*

2. AI in End Use/Data Centres

End use energy is the energy directly consumed by users, for example in homes, vehicles, and industries. Enhancing energy efficiency in end use can significantly reduce both costs and emissions. Notably, buildings and AI data centers are two energy-intensive and often inefficient sectors. Implementing retrofitting, energy management, and demand response strategies can lead to substantial cost and emission reductions. AI has the potential to play a crucial role in analysing



building data to improve energy efficiency by identifying patterns, optimizing energy use, and predicting maintenance needs.

Challenge: *Imagine you are consulting for a company designing and building a major new commercial building with a large energy footprint. The company has asked you to develop a strategy and/or product to use AI to improve building energy efficiency, optimise energy use and suggest retrofits. Prepare a pitch deck to the senior leadership team outlining your solution that addresses this challenge.*

3. AI and Energy Innovation and Climate Change

Climate change stands as one of the most critical challenges of our era. Advancements in energy technology can play a key role in mitigating its impacts. Additionally, according to the IEA Net Zero Emissions by 2050 Scenario, nearly 10% of the emissions reductions by 2050 will result from changes in people's behavior.

Challenge: *Imagine you are consulting for a government hoping to launch a public information campaign to encourage behavioural change to combat climate change OR for an investor looking to invest in a promising technology. Prepare a pitch deck to the senior leadership team outlining a solution where AI can inform or assist behavioural changes to realise energy savings, or a technology that utilises AI to solve an innovation challenge in climate mitigation.*

4. AI in Emerging and Developing Economies

Clean energy typically has large upfront costs that prevent emerging and developing economies from benefiting from the lifetime benefits of low operational costs. Since the 2010s, fintech solutions, ranging from mobile payments and microloans, has revolutionised access to solar in developing countries by reducing financial risks.

Challenge: *Imagine an investor has asked you to identify the next way AI can drive the next step-change in cost reduction or risk management for clean energy access in emerging and developing economies. Prepare a pitch deck to the senior leadership team outlining the next AI-driven investment for clean energy access in this area.*

Proposal Guidelines

- Your presentation should consider the following questions:
 - What is your solution?
 - How does AI tackle this specific challenge?
 - How viable is it?
 - How does it address this challenge?
 - Are there any potential roadblocks to your solutions?
 - What is the implementation roadmap for this idea? In other words, how would you go about this idea?
 - Where would you get your data from? Is the data freely available? Are you able to use the data to produce a product?



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- How would your system look?
 - What is the timeline for your project?
 - What resources are needed?
 - What is this problem important?
 - Are there existing solutions to this problem and do they have limitations?
 - How would you measure progress?
What are the potential positive and negative impacts of your project?
- We encourage you to prepare a slide deck for a non-expert audience
 - We encourage the use of visuals, where possible
 - On the event day, each group will have 10 minutes to present their idea, followed by 15 minutes of Q&A and workshopping from the audience, which will include fellow student groups, observers, IEA staff and other public and private sector stakeholders
 - While the slide deck should be prepared for a non-expert audience, please note that the Q&A may be more technical due to the audience in attendance
 - Proposals will not be formally judged
 - Proposed solutions must be realistic and feasible given current technologies and trends
 - Please try to be original or creative with your solutions
 - Please do not use AI to generate your solution proposals
 - The presentations must be in English

Group Guidelines

- Groups must consist of 3-5 students

Contact and information

- For any questions, please email AIEnergyFair@iea.org