

Hackathon Case Study 1: AI-Powered Wind Power Forecasting

Google DeepMind and Engie. Student Version.

The Scenario

Wind is abundant but unpredictable, and inconsistent output has always made it less valuable to the electricity grid than a source that can promise exactly how much power it will deliver, and when. In 2019, Google's AI research lab DeepMind set out to fix that.

DeepMind trained a neural network on freely available weather forecasts and historical turbine data from 700 megawatts of wind capacity that Google operates across the central United States, enough to power a medium-sized city. The model learned to predict, 36 hours in advance, how much power the wind farms would generate. Using those predictions, it then recommended firm hourly delivery commitments that Google could make to the grid a full day ahead of time, something wind operators have historically struggled to do given how unpredictable weather is.

Machine learning boosted the value of Google's wind energy by around 20%, without adding a single new turbine or blade. The tool has since moved beyond Google's own use. French energy utility Engie became DeepMind's first external customer, deploying the forecasting system across 13 of its wind farms in Germany, with plans to expand further.

On the surface, this looks like a straightforward win for the energy transition: better forecasting makes renewables more commercially attractive, which should speed up the shift away from fossil fuels. Look past the headline figure, though, and it raises a set of questions that sit squarely in RRI territory.

Further Reading

- DeepMind, *Machine learning can boost the value of wind energy*: deepmind.google/blog
- Best Practice AI, *DeepMind increases value of wind power by 20% by predicting supply 36 hours in advance*: bestpractice.ai
- Data Center Dynamics, *Google's DeepMind uses AI to predict wind farm output*: datacenterdynamics.com

RRI Discussion Questions

Work through these following six questions as a team.

1. Anticipate

When DeepMind built this forecasting model, whose problem was it solving first: the grid's, the climate's, or Google's own commercial position as one of the world's largest electricity buyers? What risks or downsides, if any, do you think went unconsidered at the design stage?

2. Reflect

Engie now depends on a proprietary DeepMind model to decide how its wind farms bid into the German energy market. What don't Engie's own engineers know about how the model reaches its predictions, and does that matter? If a forecast is wrong and Engie misses a grid delivery commitment as a result, who should be accountable: Engie, DeepMind, or the grid operator for relying on a single external input?

3. Engage

Google is simultaneously one of the world's largest electricity consumers (through its data centres) and, through this tool, an influence on how wind energy is priced and traded. Who should have had a seat at the table when this tool was designed and licensed out: grid operators, competing utilities, energy regulators, consumers? Who wasn't consulted, and should they have been?

4. Act

If AI-driven forecasting becomes standard across the wind industry, and the underlying models are controlled by a small number of technology companies, what happens to smaller or newer wind operators who can't access or afford comparable tools? Could this concentrate advantage in the renewables market in ways that work against a fair, wide-reaching energy transition?

5. Scoring It

Using ORBIT's own tools, score this case study: what Technology Readiness Level (TRL) would you assign it, which Sustainable Development Goals does it affect, and what RRI Intensity Level (RIL) does that combination suggest? Be ready to explain your reasoning, since different teams with different opinions might reasonably score this differently.

6. Your Proposal

You've been asked to advise a mid-sized UK offshore wind operator that is considering licensing a similar AI forecasting tool from a large technology company. As a team, draft a short (3-5 point) proposal covering:

- What due diligence you'd want completed before signing
- What contractual or governance safeguards you'd push for
- What you'd want to be able to explain to your own board about how the tool works, and what happens if it gets it wrong

Presentation Task

In your team, prepare a 15-minute presentation covering your answers to all six questions above, with at least one slide per question. You should all participate in both the development and delivery of your presentation.