

The Infrastructure Transition

Progress on power transmission, hydrogen, data centers, and further updates from IDEaS.

The energy transition runs on **infrastructure**: power lines, hydrogen pipelines, data centers, rail networks. This quarter, the IDEaS newsletter showcases our **evidence-based approach** to questions that are widely debated but rarely quantified: where are hydrogen infrastructures and policies most useful, how long do transmission grid projects actually take to get built or what are the consequences of inefficient transmission? We also introduce **new open-source datasets** that make infrastructure more visible and measurable, alongside teaching and community engagement connecting this research to real decisions.

— Kavita Surana



QUARTERLY DATA INSIGHT

THE NUMBER

14,000

Potential **green-hydrogen offtakers across industry, transport, power and heating** are tracked in a new **open-source** database compiled by IDEaS. Using this database, we find that incorporating demand-side elements and regional targeting could increase hydrogen policy efficiency by **up to 40%**.



[Read more](#)

Energy infrastructure technologies are capital-intensive, complex and difficult to scale. Our research asks what enables their deployment. Here, we present work on **hydrogen, electricity transmission and energy storage**. Further projects — including on data centers — are already under way.

1 Spatially-informed demand-side policies for green hydrogen diffusion in Europe · Christian Rumpelnik et al.

Our analysis of **14,000 potential green-hydrogen offtakers** in Europe finds that spatially informed, **demand-side policies could improve the cost-effectiveness of hydrogen support by up to 40%** and identifies target regions and sectors (see figure). Better targeting could help close the implementation gap — only 7% of projects are delivered on time — while limiting pressure on public budgets.

[!\[\]\(0f848bbd71cef6b345273b16f905912a_img.jpg\) Read the preprint \(accepted at Nature Energy\)](#)

2 Timelines and delays in European grid expansion · Damiano Alessi et al.

Using a 16-year dataset of more than **900 European transmission investments**, this study shows that grid projects take far longer, face more delays, and are cancelled more often than official planning assumptions suggest—creating a **hidden bottleneck for net-zero targets**.

[!\[\]\(de95854c7ee024cfadc48187bbb781b2_img.jpg\) Working paper. See the poster presented at AGU 2025 in New Orleans:](#)

3 Implications of intercontinental renewable electricity trade for energy systems and emissions · Behnam Zakeri et al.

This study shows that **long-distance transmission can help unlock renewable electricity trade across regions**, boosting clean power generation while reducing emissions, air pollution, and investment needs elsewhere in the power system.

[!\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\) Read paper](#)



4 The climate mitigation opportunity in legacy energy infrastructure · Kavita Surana et al.

Electricity lost between power plants and customers drives nearly **1 GtCO₂e** of avoidable emissions each year. Reducing technical and non-technical losses could cut emissions by up to **544 MtCO₂e annually** — while ensuring more low-carbon power reaches consumers.

[Read paper](#)

Beyond carbon, transmission and distribution losses are linked to **1.3 Mt of NO_x, 1.6 Mt of SO_x and 2 Mt of PM_{2.5}** pollution each year. Reducing non-technical losses — including through smart meters — can curb these emissions and make renewable-power investments more effective:

[Read paper](#)

Gas-fired power produced **10% (3.6 GT) of energy-related emissions**. **Carbon capture, methane abatement and efficiency improvements could cut this by up to 71%**; without them, gas risks locking in high-carbon electricity.

[Read paper](#)

5 Digitalization and AI can make or break climate progress

Ongoing research by Behnam Zakeri finds that **climate-aligned digitalisation could halve energy-investment needs to \$35 trillion** and bring net zero forward to **2047**; misaligned applications raise demand and emissions, with the largest risks in buildings and transport — not data centers:

[Read the preprint](#)

Behnam Zakeri is expanding his work on the **AI-energy nexus** by examining how AI and data-centre demand reshape power systems — from grid flexibility and storage to big tech's clean-energy investment.

Shahrom Sohi is assessing gaps in Austria's **Park-and-Ride network** using open transport data and ÖBB parking sensors, and is advancing LLM-based analysis of [multilingual railway accident reports](#) with the European Union Agency for Railways.

[Read the conference paper](#)

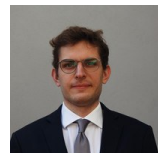
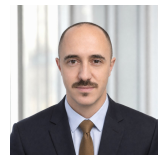
Christian Rumpelnik is assessing **stranded-asset risks for low-carbon infrastructure** as Europe's industrial footprint changes, and examining **why green-hydrogen projects progress, stall or fail**.

COMMUNITY SPOTLIGHT

IDEaS (Infrastructure) Research on the Road

IDEaS PhD students (and faculty) kicked off 2026 by showcasing our work on infrastructure and open datasets:

Christian Rumpelnik presented his research on spatially-informed demand-side policies for green hydrogen at the **World Hydrogen Energy Conference in Singapore**. Damiano Alessi participated in the **ETH Zürich PhD Academy on Sustainability and Technology**, presenting his work on European power grid expansion. He also participated in the **Iseo Summer School in Economics**, which also saw talks from novel laureates James Heckman and Micheal Spence.



Robin Fischer presented his work on the experience premium in solar photovoltaic generation at the 2026 **Climate and Energy Finance conference in Madrid**. Robin Fischer's work on the profitability gap between renewable and fossil power firms in Europe (under review in Energy Economics) was discussed in **Germany's Bundestag in the context of windfall profits of fossil energy firms** during the conflicts in Ukraine and the Middle East.

Tracking Momentum in Carbon Dioxide Removal

Kavita Surana contributed to the "Demonstration and Upscaling" chapter of the 2026 **State of Carbon Dioxide Removal** report. CDR investment rebounded in 2025, reaching **2.6% of climate-tech funding**. Growth was driven largely by public and quasi-public grants and debt finance — underscoring both renewed momentum and the sector's continued dependence on volatile funding sources.

[Read the report](#)

Getting recognized for teaching excellence

Robin Fischer was presented with the **WU Excellence in Teaching Award** in recognition of his outstanding teaching performance.

🔗 [Learn more here](#)



Infrastructure in the classroom



As part of our **Master's in Digital Economy elective**, students used a new dataset covering more than **60,000 U.S. energy projects** and **120,000 permitting documents** to identify what drives **permitting duration across renewables**, conventional energy and transmission.

They also examined the **energy–AI nexus**, from AI companies' clean-energy investments to the operational flexibility of data centers with and without energy storage.

In our upcoming Industry Lab series – a practice-oriented teaching series, where students tackle real world problems co-defined with our partner companies – we will continue to tackle the **AI-energy nexus**, with topics including technology and venture foresight or the roll-out of AI agents in an energy context.

🔗 [Learn more about Industry Labs](#)

→ WHAT COMES NEXT

Continuing our research on the **infrastructure needed for the energy transition** (papers on industrial transformation and hydrogen project delivery in the work, presentation at the

World Hydrogen Energy Conference in Singapore in June)

Connecting with the **industrial policy community** at the Industry Association Conference in Oxford in September

At the **Austria Energy Congress** in September, speaking on technology sovereignty

[Read more](#)

And much more!



We wish you a great summer!

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Previous newsletters:

- Energy Startups and Innovation (2025 - Q4)
- Digitalization and the Green Transition (2026 - Q1)

IDEaS in Review · Q2 2026 · Vienna University of Economics and Business ·