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Towards Graph-Based and Logic-Based Methods for Explaining Misleading Claims

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Countering the spread of misinformation

- Infodemic is „an over-abundance of information—some accurate and some not—that makes it hard for people to find trustworthy sources and reliable guidance when they need it.“ (World Health Organization, 2020)
- Two main strategies for countering the spread of misinformation:
  - Debunking – explaining misinformation *after* a person is exposed to it and believed in it (e.g. fact-checking)
  - Prebunking – explaining main misinformation techniques, teaching people to think critically, so they become *resistant* to misinformation (e.g. games – Bad News, Cranky Uncle)

Fact-checking process

IDENTIFYING A CLAIM

COLLECTING EVIDENCE

REACHING A VERDICT

WRITING A REPORT

PUBLISHING THE REPORT

Problem statement and goals

- Fact-checking reports are lengthy, and people unfamiliar with the given topic may struggle to understand the core issue in the claim
- We need to find more appealing approaches for explaining misleading claims than just plain text

Goals

- Offer methods that would help with explaining misleading claims
- Develop an ontology that would support explaining misleading claims
- Study the formal representation of misleading claims, and help to find logical fallacies

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Proposed Methods for Explaining Misleading Claims

Example

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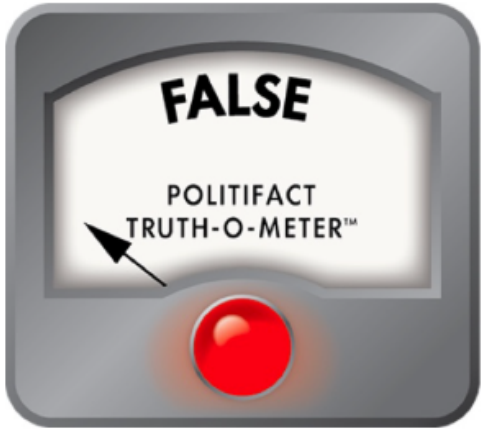
Claim

POLITIFACT
The Poynter Institute

U.S. Energy Department

stated on September 5, 2025 in a post on X:

> **“Wind and solar energy infrastructure is essentially worthless when it is dark outside, and when the wind is not blowing.”**



https://www.politifact.com/factchecks/2025/sep/09/us-energy-department/energy-wind-solar-power-electricity-federal/

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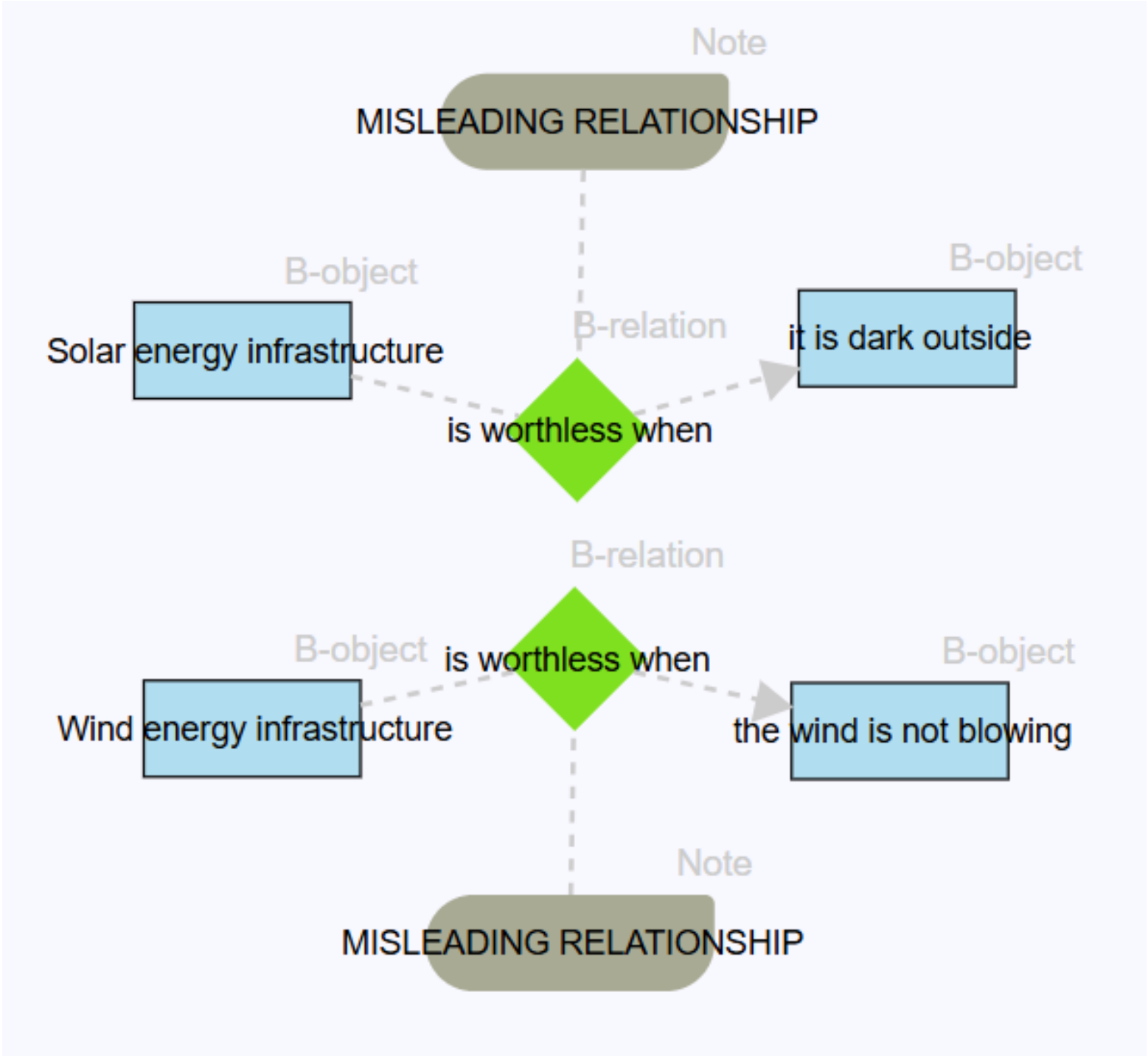
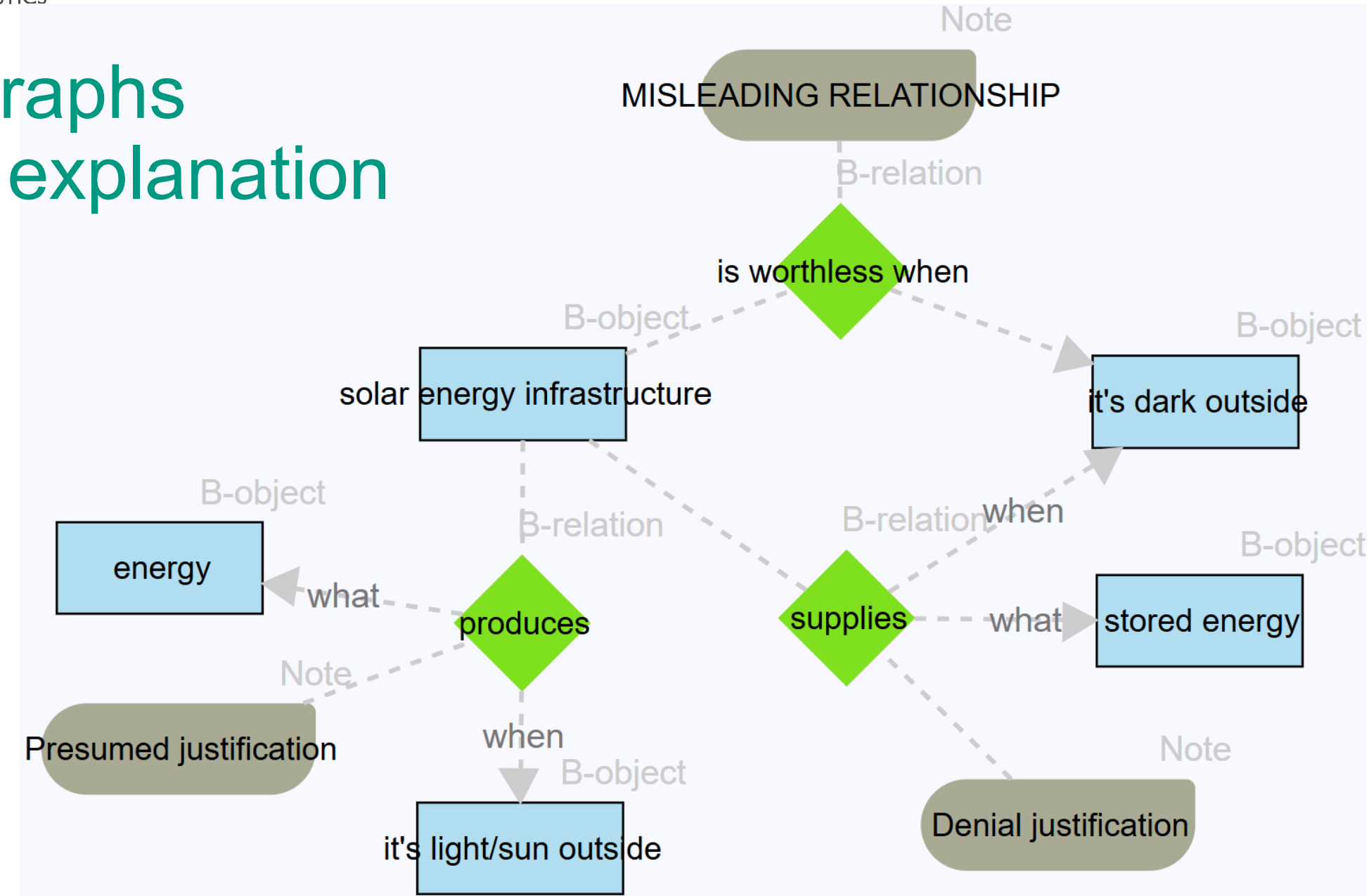
Entity graphs



Entity graphs with an explanation



Logic-based explanations

- **Step 1:** Formal representation of the claim

C: SolarEnInf(i) ∧ Energy(e) ∧ NoSun(i) → ¬useful(i, e)

- **Step 2:** Formal representation of the facts

F1: SolarEnInf(i) ∧ Energy(e) ∧ NoSun(i) → ¬generates(i, e)

F2: SolarEnInf(i) ∧ Energy(e) ∧ NoSun(i) → suppliesStoredEnergy(i, e)

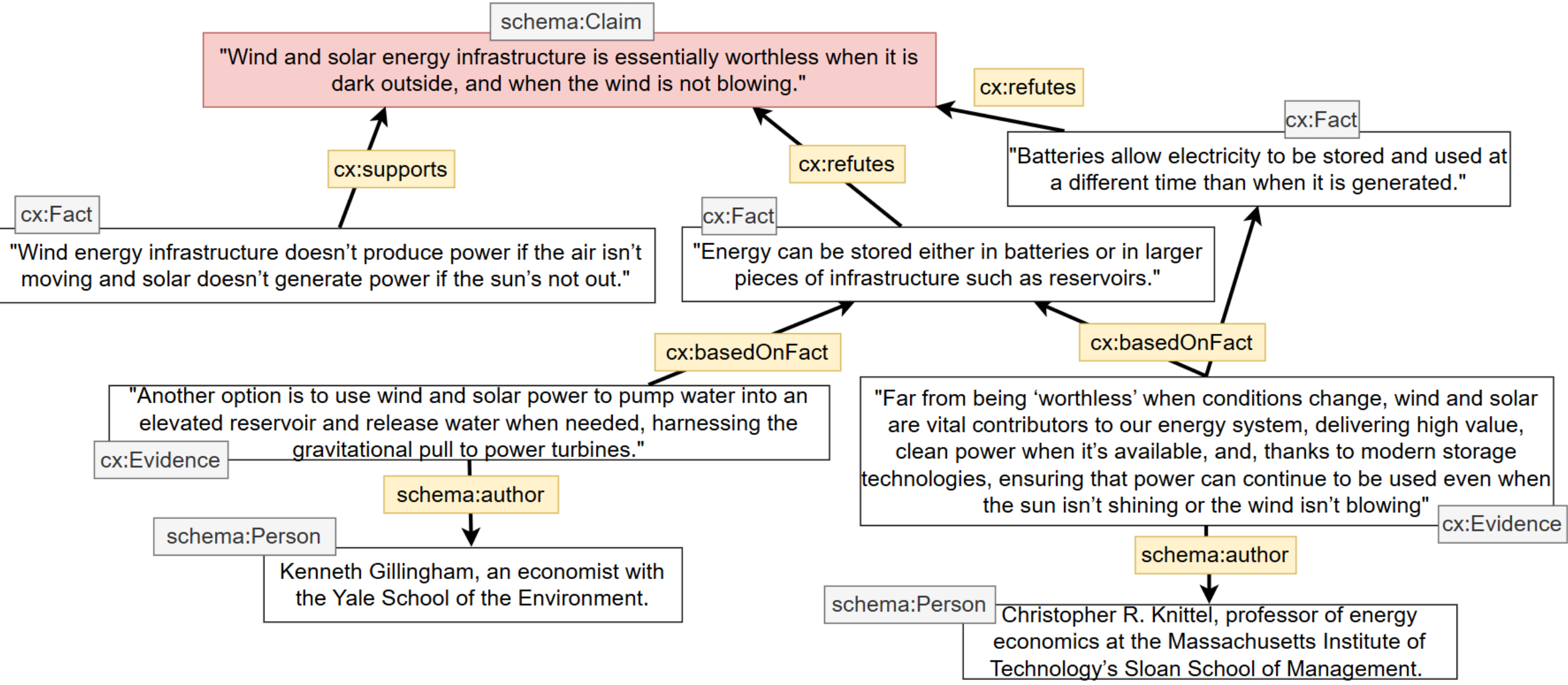
- **Step 3:** Representation of additional information

Ad: useful(i, e) ↔ generates(i, e) ∨ suppliesStoredEnergy(i, e)

- **Step 4:** Validating the claim based on facts

Checking whether C follows from F1, F2, and Ad.

Knowledge graphs



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Results and future work

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Results

- Catalogue of models of entity graphs
  - Guidelines for recognizing the misinformation patterns
- Annotated dataset of fact-checked claims
  - Misinformation pattern, important snippets from text, and explanation
  - 50 misleading claims annotated, 5 annotators
- Experiments with LLMs for automated detection of misinformation patterns and automated drafting of entity graphs
- Initial study and method used for logic-based explanations

Current and future work

- Quantitative study exploring how people perceive and understand explanations based on an entity-graph compared to plain text
  - Metrics for how to measure the complexity of an entity graph
- Demo app using LLMs
  - Automated drafting entity graphs
  - Automated extraction of facts and evidence from a fact-check report, expanding already existing ClimateSense KG

Publications

- Haniková, K. (2025). Explaining Misleading Claims Using Graphs of Entities. In *The Semantic Web: ESWC 2024 Satellite Events* (pp. 94–103). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-78955-7_10
- Haniková, K., Chudán, D., Svátek, V., Vajdečka, P., Troncy, R., Vencovský, F., & Syrovátková, J. (2024). Towards Fact-check Summarization Leveraging on Argumentation Elements Tied to Entity Graphs. *Companion Proceedings of the ACM on Web Conference 2024*, 1473–1481. https://doi.org/10.1145/3589335.3651914

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Thank you for your attention

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